Improvements to the Department of Hawaiian Home Lands Hoʻolehua Water System | PWS No. 230

Final Environmental Assessment/ Finding of No Significant Impact Listed Under HRS 343, 11 HAR 200E

Prepared for:

Department of Hawaiian Home Lands

Prepared by:

PBR HAWAII
& ASSOCIATES, INC.

April 2016

SUMMARY

Project Name:	Hoʻolehua Water System PWS 230 Improvements
Location:	The Hawaiian Homestead Communities of Kalamaʻula and Hoʻolehua on the Island of Molokaʻi, County of Maui
Judicial District:	Molokaʻi
Tax Map Key (TMK):	portions of the following: 252010003, 252010007, 252008001, 252008002, 252008005, 252008006, 252008046, 252008079, 252008091, 52008102, 252008122, 252008123, 252008999, 252009012, 252009016, 252009018, 252009999, 252010001, 252010004, 252032068, 252033047, 252033048, 252033061, 252007055, 252007090, 252010002, 252012034, 252013021, 252007076, 252007077, 252013020, 252007035, 252007039, 252007040, 252007078, 252007079, 252007080, 252007082, 252007083, 252007084, 252007085, 252002999, 252005999, 252023009, 252024999, 252025999, 252013010, 252012999, 252007029, 252007030, 252006999, 252007999, 252021999
Land Area:	98 acres were evaluated across seven sites in Central Molokaʻi[1]
Proposing/Determining Agency:	Department of Hawaiian Home Lands
Landowner:	Department of Hawaiian Home Lands
Existing Use:	The vast majority of the Project area is being utilized by DHHL for the operation of the existing PWS 230, Hoʻolehua Water System. The proposed all-weather roadways to Sites 4 and 6 while located within existing roadway corridors are not being utilized by DHHL as roadways at this time and are undeveloped.
Proposed Action:	State of Hawaiʻi, Department of Hawaiian Home Lands (DHHL) proposes to improve treatment, storage and delivery of potable water supplied by the Hoʻolehua Water System (Public Water Supply No. 230) to 2,400 users within the service area on the island of Molokaʻi. The project will improve the health, sanitation and security of the potable water system while reducing energy costs. It will include a one-megawatt photovoltaic energy production farm, the repair and replacement of aging equipment, increase in

[1] Ninety-eight acres were evaluated for impacts to provide flexibility to avoid sensitive areas if necessary. Less than 50 acres will be affected during construction and once the improvements are fully operational.

	fire protection capability and water storage capacity. It will also improve the maintenance yard facilities and storage as well as site accessibility and security.
Current Land Use Designations:	*State Land Use:* Agricultural and Urban *Moloka'i Community Plan:* Agricultural, Rural, Conservation *Special Management Area (SMA)*: Yes *DHHL Land Designation (Moloka'i Island Plan 2005):* Supplemental Agricultural, Subsistence Agricultural, Residential, Pastoral, Community Use, and General Agricultural. DHHL preemption of State Land Use Law and County land use requirements pursuant to HHCA §206
Alternatives Considered:	Three alternatives were considered: • No action • Alternative Supply • Alternative designs
Permits & Approvals:	Building permit, grading permit, NPDES, noise permit, CZM federal consistency review, Special Flood Hazard Area Permit, flammable & combustible tank (fuel AST) installation permit, DOH approval, DAGs approval, ACOE review for Nationwide permit
Potential Impacts and Mitigation Measures:	The Project will have beneficial recreational and social impacts to the homestead community. Any potential adverse impacts would be mitigated as follows: • Design measures: o To mitigate storm water impacts resulting from an increase in impervious acreage, project design will incorporate low impact development practices such as vegetated buffer/filter strips, open vegetated channels, and infiltration as well as consider materials of higher permeability. o To inform the State Water Projects Plan update the State DLNR, Engineering Department will be provided with water demands and calculations o To mitigate potential impact to seabirds, the design will specify shielded outdoor lights in conformance with County outdoor lighting requirements o To protect low-flying, foraging bats, no barbed wire will be used for fencing. o As part of the archaeological stewardship responsibilities, construction plans should identify permanent preservation sites with the SIHP identification number and buffer zone. o Coordination with DOE regarding their service lateral relocation project.

	• Construction measures: o To minimize introduction of invasive species, all construction equipment and vehicles arriving from outside Molokaʻi should be washed and inspected prior to entering the Project Sites. o To mitigate erosion and sedimentation impacts during construction, the grading plans will specify best management practices to include things such as early construction of drainage control features; construction of temporary sediment basins to trap silt; use of temporary berms and cut-off ditches where needed; and use of temporary silt fences or straw bale barriers to trap silt. o Contractors will be advised that for work in the coastal areas of Site 2 the staging area and any construction equipment must be stored within existing hardened surfaces or north of Maunaloa Road. o Avoid removing or trimming woody plants greater than 15 feet tall during the Hawaiian hoary bat (ʻōpeʻapeʻa) breeding season (June 1 to September 15). o If a bat is present at the Project site, the area will be avoided. If a bat arrives in the construction area after work begins, work will cease until the animal leaves on its own accord. o Nighttime construction during seabird fledging period (September 15 through December 15) will be avoided or USFWS will be consulted for additional minimizations measures. o All work will cease immediately and USFWS will be contacted if a nest is discovered within a radius of 100 feet of proposed construction activity, or a previously undiscovered nest is found within said radius after work begins. Biologist surveys of the area around proposed construction sites will be conducted prior to the initiation of any work, or after any subsequent delay of work of three or more days once foraging/loafing birds have been observed at the Project site. o A survey of trees within 100 meters of the Project site shall be conducted during Hawaiian hawk (ʻio) breeding season (March 1 through September 30) if construction activities will result in noise levels greater than 60 decibels (at 5 feet) and or vegetation clearing is

	proposed. Work shall be delayed if a ʻio nest is found until the nest is no longer occupied. o To mitigate construction noise and dust, construction documents will include standard measures such as ensuring mufflers are in proper operating condition, limiting construction hours, and wetting down exposed surfaces. o The construction documents will include a provision that should historic sites such as walls, platforms, pavements and mounds, or remains such as artifacts, burials, concentrations of shell or charcoal or artifacts be inadvertently encountered during construction activities, work will cease immediately in the immediate vicinity of the find and the find will be protected. The contractor will immediately contact DHHL, the legal authority over tribal lands as described in the U.S. Native American Graves Protection and Repatriation Act (NAGPRA). DHHL will then contact the State Historic Preservation Division (SHPD). DHHL shall assess the significance of the find and recommend appropriate mitigation measures and treatment determinations in consultation with SHPD, the homestead associations in the area of the inadvertent discovery, any known lineal descendants, and the Molokaʻi Island Burial Council. o An archaeological monitor will be present during grading and ground-disturbing work in Site 2 where required by State Historic Preservation Division. o Sites recommended for preservation shall be appropriately marked to avoid impact during construction activities o Temporary disruption of potable water service will occur during construction of some project components. Coordination and notification with affected users will be conducted prior service disruptions. Where possible, construction resulting in the disruption of water service to schools will be conducted during breaks. Additional coordination and collaborative scheduling is proposed with DOE Planning to minimize tie-in impacts to school operations. • Operational measures: o The existing on-site emergency generator will be operated in compliance with HAR §11-60.1-62 (d) (7) o Hazardous material containers/tanks will be secondarily contained.

	○ Use and storage of hazardous material and/or waste will be in compliance with all applicable OSHA, EPCRA,SARA, and RCRA requirements • All Phases- design, construction and operation ○ The Project will maintain and protect the existing uses and the level of water quality necessary to protect the existing uses of receiving State waters, in compliance with Hawai'i Administrative Rules (HAR) §11-54-1.1, 11-54-3, 11-54-4, 11-54-5, 11-54-6, 11-54-7, 11-54-8. ○ If conditions change such that wastewater disposal is required, then the wastewater plans will conform to all applicable provisions of the Department of Health (DOH) Administrative Rules, Chapter 11-62, "Wastewater Systems.
Determination:	Finding of No Significant Impact

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APPENDICES

TABLES

FIGURES
(in Appendix A)

ACRONYMS

A.C.	Asbestos-cement
ACM	Asbestos-containing material
ACOE	United States Army Corp of Engineers
AFONSI	Anticipated Finding of No Significant Impact
AIS	Archaeological Inventory Survey
ALISH	Agricultural Lands of Importance to the State of Hawai‘i
APE	Area of potential effect
ARV	Air relief valve
AST	Above-ground storage tank
BFE	Base flood elevation
BMP	Best Management Practices
CDP	Census Designated Place
CFR	Code of Federal Regulations
CIA	Cultural Impact Assessment
CWRM	State of Hawai‘i Commission on Water Resource Management
CZM	Coastal Zone Management
DAGS	State of Hawai‘i, Department of Accounting and General Services
dB(A)	Decibels-weighted
DBEDT	State of Hawai‘i Department of Business, Economic Development, and Tourism
DHHL	State of Hawai‘i Department of Hawaiian Home Lands
DHS	State of Hawai‘i Department of Human Services
DLNR	State of Hawai‘i Department of Land and Natural Resources
DOE	State of Hawai‘i Department of Education
DOH	State of Hawai‘i Department of Health
DOI	U.S. Department of the Interior
DOT	State of Hawai‘i Department of Transportation
DPR	County of Hawai‘i Department of Parks and Recreation
DWS	County of Hawai‘i Department of Water Supply
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
gpd	Gallons per Day
gpm	Gallons per Minute
GV	Gate valve
HAR	Hawai‘i Administrative Rules
HDPE	High-density polyethylene
HHC	Hawaiian Homes commission
HHCA	Hawaiian Homes Commission Act, as amended
Hp	Horse Power
HRS	Hawai‘i Revised Statutes
IV	In-line valve
LEED	Leadership in Energy and Environmental Design

LF	Linear feet
LID	Low Impact Development
LSB	Land Study Bureau
LUC	State of Hawai‘i Land Use Commission
LUP	Kalaupapa Airport
MECO	Maui Electric Company
MG	Million Gallons
MGD	Million gallons per day
MIP	Moloka‘i Island Plan
MIS	Moloka‘i Irrigation System
MKK	Moloka‘i Airport
NAAQS	National Ambient Air Quality Standards
NAGPRA	U.S. Native American Graves Protection and Repatriation Act
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NHO	Native Hawaiian Organization
NHPA	National Historic Preservation Act
NHRP	National Register of Historic Places
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination Systems
NRCS	Natural Resources Conservation Service
NPS	National Park Service
NWPL	National Wetland Plant List
OEQC	State of Hawai‘i Office of Environmental Quality Control
O.F. Elev	Over-flow Elevation
OHA	Office of Hawaiian Affairs
OSHA	Occupational Safety and Health Administration
PRV	Pressure relief valve
PV	Photovoltaic
PVC	Polyvinyl chloride
PWS	Public Water Supply
RD	Rural Development
ROW	Right-of-way
SCADA	Supervisory Control and Data Acquisition System
SDWB	Safe Drinking Water Branch (State of Hawai‘i Department of Health)
SWCA	SWCA Environmental Consultants
SHPD	State of Hawai‘i Historic Preservation Division
SMA	Special Management Area
TMK	Tax map key
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

1 INTRODUCTION

Department of Hawaiian Home Lands (DHHL) works diligently to provide safe, clean drinking water to supplied by the State of Hawai‘i, DHHL Ho‘olehua Water System Public Water Supply [PWS] No. 230 to native Hawaiian homesteads located in Ho‘olehua-Pālā‘au (Ho‘olehua), Kalama‘ula, and Mo‘omomi. However, due to the age of the system, as well as the remote location of the island of Moloka‘i, system-wide improvements are necessary. This Environmental Assessment is being prepared pursuant to the provisions of the EIS Rules relating to Draft Environmental Assessments (accompanied by an Anticipated Finding of No Significant Impact (AFONSI) (Hawaii Administrative Rules Chapter 11-200, Subchapter 10).

1.1 Landowners

The DHHL is the primary fee simple landowner and is the owner/operator of PWS No. 230. A portion of the existing PWS 230 transmission system traverses across lands owned by Moloka‘i Ranch, Kualapu‘u Ranch, State of Hawai‘i Department of Transportation, and the Cathy Anne Barber Management Trust between Kauluwai and Ho‘olehua.

1.2 Proposing/Determining Agency

DHHL is the proposing/determining agency.

Contact: Department of Hawaiian Home Lands
Land Development Division
ATTN: Jeffrey Fujimoto, Project Manager
P.O. Box 1879
Honolulu, HI 96805
Phone: (808) 620-9270 Fax: (808) 620-9299

1.3 Environmental Consultant

PBR HAWAII is the environmental planning consultant.

Contact: PBR HAWAII & Associates, Inc.
ATTN: Malia Cox
1001 Bishop Street, Suite 650
Honolulu, Hawai‘i 96813
Telephone: (808) 521-5631
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1.4 Compliance with State of Hawai‘i Environmental Laws

Preparation of this document is in accordance with the provisions of Chapter 343, HRS and Title 11, Chapter 200, Hawai‘i Administrative Rules (HAR) pertaining to Environmental Impact Statements. Section 343-5, HRS established nine “triggers” that require either an EA or an

Environmental Impact Statement (EIS). The use of State or County lands or funds is one of these “triggers.”

1.5 Studies Contributing to this EA

This report incorporates information from the following consultants:

- SWCA- Biological Resource Survey
- Pacific Legacy- Archaeological Inventory Survey
- Pacific Legacy - Cultural Impact Assessment
- Akinaka and Associates- Preliminary Engineering Report
- SPS Energy & Financial- Alternative Energy Assessment and Financing Evaluation

2 PROJECT DESCRIPTION

2.1 Background Information

2.1.1 Location

The DHHL Ho‘olehua Water System, Public Water System No. 230 (PWS No. 230) includes source, storage, and conveyance equipment throughout central Moloka‘i. Tasks associated with actions designed to improve the water system will occur at seven discontiguous sites located in central Moloka‘i. Please refer to Figure 1 (Location Map). Table 2-1 below provides a description of the locations of each Site, along with the corresponding Tax Map Keys (TMKs):

Table 2-1: Site Location Description and TMK

Site No.	Location	TMKs
1	Site #1 *(Well Site Improvements)* is located in the mauka area of the Kalama‘ula DHHL lands, near the Waiakala‘e Gulch.	252010003 252010007
2	Site #2 *(Kalama‘ula Improvements)* is located in Kalama‘ula, extending from the mauka area south of Site #1, down to the makai residential areas in ‘Umipa‘a and along Mauna Loa Highway to Kaunakakai.	252008001 252009012 252008002 252009016 252008005 252009018 252008006 252009999 252008046 252010001 252008079 252010004 252008091 252032068 252008102 252033047 252008122 252033048 252008123 252033061 252008999
3	Site #3 *(Kauluwai Tank and Transmission Improvements)* is located at the existing Kauluwai Tank on Kalae Highway at the northwestern corner of the Kalama‘ula DHHL lands, and extends west along a transmission main to the Ho‘olehua Tanks.	252007055 252013010 252007090 252012999 252010002 252012034 252013021

Site No.	Location	TMKs
4	Site #4 *(Hoʻolehua Tank Site Improvements)* is located at two 3.5 MG tanks in Hoʻolehua, approximately 1 km northeast and mauka of Molokaʻi High School. The site also extends from the two tanks down to Pālāʻau Road through lands owned by Kualapuʻu Ranch.	252007076 25201300 252007077 252007029 252013020 252007030
5	Site #5 *(Hoʻolehua Transmission and Fire Protection Improvements)* is located in Hoʻolehua-Pālāʻau, along the Hoʻolehua Transmission to Molokaʻi Veterans' Cemetery and Lihi Pali Avenue, and also along the Puʻu Kāpele Avenue Transmission Main.	25007035 252007029 22007039 25207030 252007040 252006999 252007078 252007999 252007079 252021999 252007080 252007082 252007083 252007084 252007085
6	Site #6 *(Hoʻolehua Pressure Breaker Tank Facility Improvements)* is located from the intersection of Kūleʻa and Moʻomomi Avenue to Farrington Avenue.	252012999
7	Site #7 *(Hoʻolehua Maintenance Yard Improvements, and Scattered Valve and Hydrant Replacements)* is located at the site of the current Hoʻolehua Maintenance Building, and at scattered locations across Hoʻolehua-Pālāʻau.	252002999 252006999 252005999 252007999 252023009 252021999 252024999 252025999

2.1.2 **Existing Use**

Assigned by the State of Hawaiʻi, Department of Health (DOH) Safe Drinking Water Branch, the DHHL Hoʻolehua Water System, Public Water System No. 230 (PWS No. 230) provides water service to the DHHL residential, agricultural, and pastoral homesteads communities in Hoʻolehua and Kalamaʻula. According to DOH, PWS No. 230 services an area with a population of 2,400, with customers including Molokaʻi Airport, Kualapuʻu Elementary School, Molokaʻi High School, Kalamaʻula community, Hoʻolehua town, Kalae water system (PWS 235), Kipu water system (PWS 245), Meyer Ranch subdivision, and emergency back-up source for Kualapuʻu water system (PWS 229).

The existing PWS No. 230 water system consists of:

- two wells: Kauluwai Well No.1 (State Well No. 0801-01) and Kauluwai Well No. 2 (State Well No 0801-02),
- a chlorination disinfection system,
- two booster pumps,
- altitude valves,
- six storage tanks located at elevations ranging from 283 feet to 1,412 feet,
- Well Site: 21°08’45.43” N 157°00’58.93” W
- Kalama’ula Tank Site: 21°06’50.52” N 157°02’26.93” W
- Kauluwai Tank Site: 21°09’19.83” N 157°00’44.46” W
- Ho’olehua Tanks Site: 21°10’12.38” N 157°02’24.38” W
  21°10’13.88” N 157°02’24.63” W
- Ho‘olehua Pressure Breaker Tank Site: 21°09’28.09” N 157°03’8.78” W
- approximately 460 fire hydrants, and
- approximately 50 miles of pipeline and associated appurtenant equipment (see Figure 2).

History of Existing Facilities

The PWS No. 230 has been providing potable water for many years. Some of the system components have been in operation for 80 years. Soon after its appointment in 1921, the Hawaiian Homes Commission (HHC) visited Moloka‘i and decided to start the first Hawaiian homesteading on the coastal flats of Kalama‘ula. A second, larger phase of homesteading occurred in 1924, when homesteads were opened for settlement on the upper plateau of Moloka‘i, which later became known as Ho‘olehua. The development of the Ho‘olehua-Pālā‘au Homestead area necessitated the need for much larger capital outlays of water which resulted in some of DHHL’s current water infrastructure.

As DHHL’s water system expanded, additions to the system were not always mapped. Eventually, the layout of the distribution system, as well as how it was interconnected with other water systems, was unknown to the current water system operators and DHHL staff. In 2007, DHHL commissioned Akinaka & Associates, Ltd. to conduct a water study and prepare the following report “Department of Hawaiian Home Lands, Moloka‘i Potable Water System, Ho‘olehua and Kalama‘ula, Moloka‘i, Hawai‘i”, dated June 2007, herein referred to as the “2007 Water Master Plan”. The study mapped out the water systems for the PWS No. 230, the general layout of the County of Maui’s Department of Water Supply System, the Moloka‘i Ranch System and the State of Hawai‘i Department of Agriculture’s non-potable Moloka‘i Irrigation System (MIS). The study also assessed specific components of the water system and recommended improvements required to provide adequate and dependable service to the Ho’olehua and Kalama’ula communities. The recommendations identified in the 2007 Water Master Plan were incorporated into this project.

Condition of Existing Facilities

The Kualapu‘u Aquifer supplies water to the Ho‘olehua and Kalama‘ula communities. DHHL operates two wells pumping water from the Kualapu‘u Aquifer (Table 2-1). Water pumped from wells is transported to six storage tanks and then distributed to PWS 230 system users.

i. *Aquifer*
The Kualapu‘u Aquifer has an estimated sustainable yield of 5 million gallons per day (mgd). The Commission on Water Resource Management’s (CWRM) present allocation for each well is shown below in Table 2-2**.**

Table 2-2: CWRM Water Permit Allocations

Date	Owner	State Well No.	Well Name	Allocation (MGD)
9/15/1993	**State DHHL**	**0801-01**	**DHHL 1 (Kauluwai #1)**	**0.367[2] (combined)**
9/15/1993	**State DHHL**	**0801-02**	**DHHL 2 (Kauluwai #2)**	
9/15/1993	Maui DWS	1059-01	Waikalae Tunnel	0.036
3/14/1995	***State DHHL***	***Reservation***		***2.905***
10/20/1995	Maui DWS	0801-03	Kualapu‘u Mauka	0.516
12/19/2001	Kaluakoi Land, LLC	0901-01	Well #17	1.018
			Total Allocated	4.842
			Kualapu‘u Sustainable Yield	5.000
			Available Allocation	0.158

Drilled in 1948, Kauluwai Well No. 1 has been in use since 1953. Its pump has a capacity of 500 gallons per minute (gpm) and utilizes a 200 horsepower (hp) motor. Kauluwai Well No. 2 was drilled in 1979 and has been in use since 1981, while Well No.2 has a pump capacity of 750 gpm and 300 hp motor. Both wells remain in good condition. However, the motors and pumps for both wells require replacement on a periodic basis. DHHL’s current water allocation from the Kualapu‘u Aquifer is 0.367 mgd. This allocation is the total daily amount from both wells combined. However, pumping records show that they are consistently pumping over their allocation to meet water demands based on existing

[2] DHHL has requested CWRM grant an increase in the combined allocation of 0.367 MGD for wells Kauluwai #1, and #2 to 0.637 MGD to accommodate future growth including subdivision of existing DHHL homestead lots in Kalama‘ula and Ho‘olehua.

water system storage/transmission configuration. DHHL has a 2.905 mgd reservation in the Kualapu‘u Aquifer that has not yet been allocated. To date, the water quality at both the Kauluwai Wells No. 1 & 2 meet all State and Federal drinking water standards. However, rising chloride levels in water produced by the two DHHL wells due to pumping rates above 0.367 mgd have been recorded.

The Kualapu‘u aquifer has been identified as a sole source aquifer by the United states Environmental Protection Agency (EPA) as the principal source of drinking water for the area. As such, a minimum of 50% of the drinking water consumed is supplied by the aquifer.

ii. *Treatment*

At the time the 2007 Water Master Plan was prepared, the Moloka’i Water System was utilizing a degraded chlorine gas facility for water treatment. Due to health and safety concerns associated with chlorine gas and the aging of the equipment, chlorine gas is not being utilized for treatment. A Sodium hypochlorite system is currently utilized for disinfection. The Sodium hypochlorite solution is injected into the well pump’s discharge line connected to the storage tanks. The existing system appears to be in proper working order. Records indicate that the chlorine residual levels are consistently maintained. The system is in compliance with safe drinking water standards and no other treatments are being applied to the water system.

iii. *Storage*

The DHHL Water System has five storage tanks and one pressure breaker tank as follows:

a. 100,000 gallon (0.1 MG) Well Site Tank (O.F. Elev. = 1029.50’)
   Serves as storage for the two well water sources to supply water into the distribution system.

b. 1,000,000 gallon (1.0 MG) Kauluwai tank (O.F. Elev. = 1432.0’)
   Primarily serves as an intermediate pass-through tank to provide water to two 3.5 MG tanks servicing Ho‘olehua.

c. Two 3,500,000 gallon (3.5 MG) Ho‘olehua tanks (O.F. Elev. 1040.0’)
   Serves as water storage for users in the Ho‘olehua service area.

d. 200,000 gallon (0.2 MG) Kalama‘ula tank (O.F. Elev. = 247.60’)
   The 0.2 MG Kalama’ula tank serves as the water distribution storage tank for the Kalama‘ula service area.

e. 19,500 gallon pressure breaker tank (at grade Elev. = 747.0’)
   The 0.0195 MG pressure breaker tank reduces pressures within the distribution system due to elevation changes.

iv. *Transmission System*

The Transmission and distribution system is comprised of water distribution lines, as well as pumps and valves to assist in movement of water throughout the system and preventing back flow conditions.

The following transmission and distribution lines transport water from the 0.1 MG Well Site Tank to the appropriate water tanks:

a. To Kalama‘ula – A 12-inch main transports water from the 0.1 MG Well Site Tank down to the 0.2 MG storage tank that serves Kalama‘ula. A pressure reducing valve (PRV) is located along the transmission main near the 720’ elevation (upstream pressure =180 psi, downstream pressure = 38 psi).

b. To Kauluwai – An 8-inch cast iron main transports water from the 0.1 MG Well Site Tank up to the 1.0 MG Kauluwai reinforced concrete tank.

c. To Ho‘olehua – A 6-inch asbestos cement (A.C.) pipe delivers water from the 1.0 MG Kauluwai tank to the two 3.5 MG Ho‘olehua tanks. Water is then conveyed from the 3.5 MG Ho‘olehua Tanks throughout the Ho’olehua area via distribution lines located within the Farrington Avenue right-of-way and intersecting avenues. Service to the Kalama’ula area is provided from the 0.2 MG Kalama‘ula Tank via a 12-inch gravity flow pipe. The water system network is shown in Figure 2.

v. *Booster Pumps*
PWS No. 230 utilizes two 100 hp, 500 gpm booster pumps and two altitude valves at the well site to pump water to the reservoirs. The water is then gravity fed into the system.

2.1.3 **Surrounding Land Uses**

The PWS 230 water facilities are located throughout DHHL’s lands in the Kalama‘ula and Ho‘olehua-Pālā‘au, extending from mauka water source at Kauluwai to the central plains and the southern coast of Moloka‘i. The land uses in the area are rural, primarily residential and agricultural. There are also schools, parks, community centers, restaurants, and other small businesses located within the Project area. Moloka‘i Airport (MKK) is adjacent to DHHL’s land holdings in Ho‘olehua.

2.2 **Purpose and Need**

DHHL works diligently to provide safe, clean drinking water to the homesteaders and the other users. However, due to the age of the system, as well as the remote location of the island of Moloka‘i, improvements are necessary. In the past five years, there have been several failures that have affected system-wide delivery of water or isolated communities. The Department of Hawaiian Home Lands (DHHL) began its Regional Planning Process in 2007, at which time the community on Moloka‘i identified several issues with the potable water system. In 2015, DHHL

identified additional improvements that if incorporated into the Project would improve fire protection, reliability, security, health, and sanitation and decrease long-term energy costs. These projects have been incorporated into the proposed improvements to the DHHL Ho‘olehua Water System, PWS No. 230, Moloka‘i, Hawai‘i. Agencies, organizations, and individuals previously consulted are being re-engaged for consultation based on the expanded scope of the Project.

The proposed improvements to the disinfection, storage, and distribution system will be integrated into PWS No. 230. These project actions will improve reliability and functionality while decreasing operational energy cost of the system.

a) Health, Sanitation, Security, and Access

The proposed Project is designed to improve reliability, reduce potential for contamination and is protective of public health. The following deficiencies that affect the health, sanitation, access and security of the PWS No. 230 have been identified and are anticipated to be corrected as a result of the Project:

- *Limited Water Storage for Kalama‘ula Residents*

  The existing 0.1 MG well tank located at the 283-foot elevation limits water service to both the Ho‘olehua and Kalama‘ula service areas. Both well sources, Kauluwai Wells No 1 and 2, pump into the 0.1 MG Well Site Tank. Water is then distributed to the 0.2 MG Kalama‘ula tank and the 1.0 MG Kauluwai tank, with priority going to the 0.2 MG Kalama‘ula tank During periods of high demand, the booster pump that serves the 1.0 MG Kauluwai tank could be locked out of additional water due to high demand in Kalama‘ula. Additionally, fires that have previously occurred in the Kalama‘ula area have been known to affect the water system’s ability to supply water. Additionally, there is a risk of low pressure and vacuum conditions in the waterline that could result in contamination to the drinking water system through an increased risk of backflow conditions. The Hawai’i Administrative Rules (HAR), Title 11, Chapter 21 Backflow and Cross-Connection Control regulates the elimination or control of cross-connection and backflow conditions. Installation of an additional 0.2 MG tank located at the 1,010-foot elevation would provide additional storage capacity and adequate pressure in the waterline which would help to reduce these risks.

- *Lack of Access to Kalama‘ula Storage Tank*

  The existing roadway which traverses over rugged terrain routinely washes out making the 0.2 MG Kalama‘ula tank inaccessible. HAR Title 11 Chapter 20§33 requires the right for entry and inspection of all public water systems. An all-weather roadway would improve accessibility of the tank to health officials and water system operators.

- *Limited Back-up Energy Capacity and High Energy Costs*

Electrical power failures on Moloka‘i occur on a fairly regular basis. DHHL installed an emergency back-up power source for use during prolonged power outages which would otherwise keep the wells out of service. This emergency back-up power source has been in operation for a few years and has responded well to prolonged power outages. The current back-up generator has a fuel storage capacity that can operate the well pumps and chlorination system for a maximum of 24 hours. In the event of a severe electrical power failure, a sanitation crisis could occur after several days without potable water. In those situations, Title 11 HAR 19§5 requires water suppliers to execute an emergency response plan to deal with the consequential drinking water problems. Installation of additional fuel storage capacity would provide extended power for the back-up energy system under emergency situations. In addition to periodic power failures, power supplied by Maui Electric Company (MECO) accounts for more than half the operating expense of PWS230.

- *Water Stagnation*

  The 1.0 MG Kauluwai tank has approximately eight feet of unusable water storage volume as the distribution pipe from the tank is four to eight feet higher than the floor of the tank. This design also increases the potential for the storage of stagnant water in the system. Stagnant water can contribute to elevated disinfection by-products and bacterial growth within the distribution system, potentially affecting the health of water customers. Maximum contaminant levels for disinfection byproducts in community water systems are listed in Title 11 HAR 20§4. Redesign of portions of the piping will eliminate the potential for stagnant water.

- *Maintenance Equipment and Critical Components*

  Title 11 HAR 20 requires ground water systems with a significant deficiency to complete corrective actions or be in compliance with an agreed upon corrective action plan and time schedule within 120 days of receiving a written notice of deficiency. Failure to comply with Title 11 HAR 20 may result in penalties and discontinued service. The Project’s remote location increases the risk of non-compliance with the correction action plan time schedule requirement. The storage of critical components on island will address the normally long delivery time. This will provide operators with the materials and equipment necessary to readily maintain the system, thereby minimizing system down times and complying with local regulations.

- *Water System Security*

  Existing fencing does not restrict access to all of storage and booster tanks. The construction of fencing around the two 3.5 MG tanks in Ho‘olehua and the new

energy and water storage components for the well site (Site 1) are proposed to secure the facilities from unauthorized access.

- *Access*
  Currently the 0.0195MG Pressure Breaker tank, and two 3.5 MG storage tanks (site 4) in located in Ho‘olehua are not accessible through DHHL lands. The tanks are accessed through lands owned by private land owners and are subject to their authorization. The existing privately owned access routes are unpaved making access difficult and sometimes dangerous during rainy conditions.

  In addition, while access to the 0.2MG tank at Kalama‘ula is through DHHL lands, the roadway is unpaved and often washes out during heavy rains.

b) Aging Infrastructure without Automation and Limited Fire Protection

Portions of this water system have been in operation since the 1930s and 1940s. Approximately 19,000 LF of decaying pipeline has been identified. The age and subsequent deterioration of the infrastructure has made it increasingly difficult for DHHL to provide adequate water service to the residents within the community without substantial upgrades to the system. This has created a high level of concern directly related to safety and water quality.

- *Distribution System Deterioration and Limited Fire Protection*

  There is approximately 19,000 LF of decaying pipeline system wide. These pipes partially account for PWS 230’s higher than optimal unaccounted water loss. While some water loss is anticipated within every water system, PWS 230’s unaccounted water loss is 50% higher than would be expected under optimal operations.

  Pipes containing asbestos concrete (A.C.) are utilized within portions of the distribution system. The decay of the A.C. pipe is the main source of asbestos contamination in drinking water, potentially affecting the health of water customers. Maximum contaminant levels of inorganic chemicals including asbestos for community water systems are listed in Title 11 HAR 20§3. Replacement of the pipe would mitigate asbestos contamination and reduce health risks to the public, and also reduce water losses associated with aging A.C. pipe failures.

  The existing Ho‘olehua 6-inch A.C. pipe connecting the 1.0 MG Kauluwai tank to the two 3.5 MG Ho‘olehua tanks is aging and may not be able to carry pressures higher than the existing conditions. This has resulted in inadequate fire protection in portions of Ho‘olehua.

The existing waterline in Ho‘olehua tanks to the veteran’s cemetery and along Lihi Pali Avenue do not provide adequate fire protection and water pressure.

The distribution system in Kalama‘ula Homestead subdivision is a one way feed. As a result, there is inadequate pressure in the upper limits of the subdivision.

The existing 1-1/4-inch galvanized waterline in Ho‘olehua along Pu‘u Kāpele Avenue does not provide adequate fire protection and water pressure.

- *Storage Tank Deterioration*

  The two 3.5 MG Ho‘olehua tanks have been in operation since 1934 and several of the valves, ladders, and other appurtenant structures are rusted or non-operational.

- *Manual Operation of Water System*

  The manual operation of pumping and other water distribution activities has resulted in unintentional draining and overfilling of tanks. Connection of system components to the Supervisory Control and Data Acquisition (SCADA) system will improve overall site security and operation by providing remote monitoring and automation of system components.

c) Reasonable Growth

This report has identified the components of the water system requiring improvement to meet the existing demands of the community. While growth on Moloka‘i is relatively slow, additional upgrades to the existing water system are needed to accommodate limited future growth.

Long-range land use planning priorities were developed as part of the Moloka‘i Island Plan (MIP) prepared in 2005. With a 20-year planning horizon, the MIP proposes development of 417 new residential lots on the island Moloka‘i with the majority of the properties located outside the existing water systems service area. Homestead development projects within the water system service area were identified as lower priority with the exception of the 58 previously awarded Nā‘iwa agriculture lots located within Ho‘olehua.

The HHC recently lifted its moratorium on subdivision of agriculture and pastoral lots. Lessees residing in eligible Kalama’ula and Ho’olehua homesteads will have permission to subdivide their lots once DHHL’s application request for increased pumping is approved by CWRM. This could potentially impact the water system by increasing water service to newly subdivided lots and residences. The project as proposed will not accommodate

increased demand for water service that may be required as a result of agriculture and pastoral lot subdivisions.

d) Other Actions Proposed for PWS 230

The State of Hawai'i Department of Education has proposed two separate actions to improve distinct components of the PWS 230 system that affect Kualapu'u Public Charter School (PCS) and Moloka'i High School that are not included in this document. Construction on these projects are imminent to address hydraulic issues that periodically result in unpredictable water loss at Kualapu'u PCS and to provide adequate fire protection supply.

2.3 Project Description

A description of the tasks and activities proposed for each of the seven locations is described below:

Site #1 Well Site Improvements

1-A 200,000 Gallon Storage Tank: This task includes the installation of 200,000-gallon storage tank and ancillary equipment to connect to the existing system, excavation, and disposal of overburden/construction debris. The new tank will be located adjacent to the existing 100,000-gallon tank on a hillside at the well site. The proposed storage tank is necessary to ensure uninterrupted supply of water to Kalama'ula residents. This tank will augment, not replace existing storage facilities.

1-B Above-Ground Fuel Storage Tank (fuel AST): Currently, the water system has an emergency generator to supply electricity for pump operation when grid supplied energy is not available. The generator has fuel storage capacity to operate the generator for a maximum of 24-hours. A fuel AST would augment the existing capacity, increasing operational time of the generator during emergencies. Tasks associated with this action include the installation of a fuel AST at the well site, fuel lines connecting the tank to existing generator system, automation equipment, security fencing, excavation, and disposal of overburden/construction debris.

1-C Well Site Compound Modifications: The existing well site compound does not have adequate space to accommodate a new 200,000 gallon storage tank, a fuel AST, and ancillary equipment associated with the photovoltaic solar energy (PV) system. Activities associated with this task include the redesign and construction of a roadway system and fencing for security and access, excavation, disposal of overburden/construction debris.

1-D Booster Pump Replacement: The two existing booster pumps have reached their estimated useful life. Pump failure is a concern. This task requires the replacement of both

of the existing booster pumps and ancillary equipment. It is anticipated that activities associated with the task will include grading, excavation, disposal of construction debris, demolition debris and overburden, as well as installation of a concrete pad, connection to the supervisory control and data acquisition (SCADA) and electrical systems as well as the existing water system. Reuse of existing site preparations such as a pre-existing concrete pad will be implemented if possible.

1-E Energy System Modifications: A one-megawatt PV system will be built on approximately seven acres within a 25-acre area at the well site identified for solar energy production by DHHL. This system would comprise approximately 3,500 to 4,000 fixed ground-mounted PV panels (depending on panel efficiency). An inverter bank will convert the DC output of the panels into AC that can be used to drive the existing pumps. The system will include an energy storage system to allow for pump operation at night or on cloudy days. The system will be connected to the Maui Electric Company grid for redundancy as well as to the existing diesel backup generators located at the well site. It is anticipated that the system will not export electricity to the Maui Electric Company grid. The existing electrical panels are nearing the end of their expected useful life. They will be replaced to meet existing requirements and modified as necessary to accommodate additional PV system requirements. See Appendix H for funding options for the PV system.

Site #2- Kalama‘ula Improvements

2-A All-Weather Roadway to Kalama‘ula Tank: The access road to the existing 200,000 gallon tank in Kalama‘ula is unpaved and severely eroded, hampering access for maintenance and operations. This task will modify the existing dirt roadway with the installation of a 3,000 linear-foot (LF) all-weather roadway from Hā‘ena Street to the reservoir. The new roadway will follow the existing road corridor. Tasks included in this action will include roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

2-B Kalama‘ula Transmission Main and Lateral Replacements: The conveyance system in Kalama‘ula is not a looping system, occasionally resulting in lower pressure, and water sitting in pipes for a longer than optimal period of time. Additionally, portions of the existing galvanized transmission lines are over 30 years old and have reached the end of their useable life. This task will include the installation of new larger capacity mains and 15 laterals along approximately 5,600 LF in Kalama‘ula. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water transmission mains and laterals.

2-C Valves Replacement: Three Pressure Relief Valves (PRV), 20 Gate Valves (GV), 9 Air Relief Valves (ARV) and associated ancillary equipment in Kalama‘ula have reached the end of their useful life due in part to the harsh environmental conditions. This task will include

replacing PRV, GV, and ARV valves and realigning manholes as necessary. This project will also require limited excavation at each valve site and debris disposal.

2-D Fire Hydrants: Harsh environmental conditions have reduced the life expectancy of most fire hydrants in the coastal are of Kalama‘ula. Replacement of the deteriorated hydrants will improve fire protection capabilities in the areas. This task will include the replacement of approximately 30 fire hydrants.

Site #3- Kauluwai Tank and Transmission Improvements

3-A Kauluwai Tank Transmission Main: A section of the 6-inch main transmission line at the existing 1.0 MG Kauluwai tank is approximately 12 feet above the lowest portion of the tank. As a result, the water stored at the base of the tank cannot be utilized. This task would redesign and replace the lower main increasing the useable storage capacity to the tank design capacity. Some excavation and associated disposal of debris is also anticipated. It is anticipated that completion of this task will reduce water stagnation in the bottom of the tank.

3-B Kauluwai to Ho‘olehua Transmission Main: The existing main was constructed utilizing a 6-inch A.C. pipe. Integrity of the existing pipe is a concern. This task requires the replacement of 11,000 LF of piping. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water transmission mains and laterals.

Site #4- Ho‘olehua Tank Site Improvements

4-A Ho‘olehua Tank Improvements: The tanks should be modified to improve safety and automation. This task, 4-A has been subdivided into four subtasks as described below. In addition to the subtasks described, this task will include site preparation, installation of ancillary equipment and disposal of construction debris/overburden.

4-A-1 Automation of Level and Flow Control Valves: Water flow from 1.0 MG reservoir to the two 3.5 MG tanks located in Ho‘olehua requires manual operation of a gate valve. Changes in demand require manual adjustments. This subtask would connect these tanks to the SCADA system and allow for automated adjustments providing more consistent water delivery. The sub-task will include construction of a new control valve vault, installation and connection of control equipment to existing system and ancillary equipment. The sub-task will also include construction of a new control valve vault, installation and connection of control equipment to existing system and ancillary equipment.

4-A-2 Replacement of Exposed Vertical Piping and Valves: Some of the exposed pipes and valves are corroded. This sub-task would assess and replace corroded ancillary equipment.

4-A-3 Exterior Ladder: The exterior ladder is unsafe. This sub-task would replace or repair the existing ladder and safety railing system to meet OSHA safety requirements.

4-A-4 Tank Repair: There are two 3.5 MG tanks located at Site #4 that were placed in operation approximately 80 years ago. While the tanks are still operational, the concrete is showing signs of wear and is crumbling in some areas. Rebar supports show substantial rusting. This sub-task would repair the tanks.

4-B All-Weather Roadway to 3.5 MG tanks: The existing access road to the 3.5MG tanks in Ho‘olehua is unpaved and located on non-DHHL lands owned by Kualapu‘u Ranch and subject to their authorization. This task will develop a new all-weather road within DHHL landholdings. The new roadway will extend from Pālā‘au Road approximately 5,280 LF to the 3.5 MG tanks. Tasks included in this action will include grubbing, grading, roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

4-C Fencing: Existing fencing does not completely restrict access to the area surrounding the tanks. Additionally, the large grassy areas surrounding the 3.5 MG tanks render the standard six-foot high fence ineffective at restricting deer. Security as well as health and sanitation of water stored at the tank may be compromised with unauthorized access by trespassers and/or deer to the areas in and around the tanks. This task will include the removal of the existing fences, excavation, installation of minimum 8 foot tall deer deterrent fencing, and disposal of overburden/construction debris.

Site #5- Ho‘olehua Transmission and Fire Protection Improvements

5-A Ho‘olehua to Veterans’ Cemetery to Lihi Pali Avenue Transmission Main: The existing water transmission main is comprised of 3-inch HDPE from the Ho‘olehua tanks to the Veteran’s Cemetery where it reduces to 2-inch PVC to service the northern extent of Lihi Pali Avenue. Both the PVC and HDPE mains are inadequately sized for fire protection. This task would include the replacement of the existing main with approximately 11,000 LF of 8-inch main. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water transmission mains and laterals.

5-B Fire Protection: The Veterans’ Cemetery as well as the homesteads in this section of Ho‘olehua do not have fire protection. This task would improve brush fire protection as well as provide fire protection for existing homes in the vicinity through the installation of 17 fire hydrants between Ho‘olehua and the Veterans’ Cemetery. Tasks included in this

action will include excavation, disposal of overburden/construction debris in addition to the installation of fire hydrants.

5-C **Puʻu Kāpele Transmission Main:** The existing 1.25 inch galvanized transmission line is over 30 years old and has reached its useable life. Main breaks interrupt service to the areas. This task includes the replacement of approximately 3,350 LF of transmission main and laterals, and the installation of two new fire hydrants. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water transmission mains and laterals not being replaced.

Site #6- Hoʻolehua Pressure Breaker Tank Facility Improvements

6-A **All-Weather Roadway to the Pressure Breaker Tank:** The existing access road to the 19,500 gallon pressure reducer tank in Hoʻolehua is unpaved and inaccessible during heavy rains. This task will modify an existing dirt roadway easement. Approximately 7,920 linear feet (LF) of all-weather roadway will be installed from the intersection of Kūleʻa and Moʻomomi Avenue to Farrington Avenue. The new roadway will follow an existing, overgrown road corridor. Tasks associated with this action will include grubbing, grading, roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

6-B **Ancillary Equipment Improvements:** Several of the equipment located at the Pressure Breaker Tank Facility such as the butterfly valves have reached the end of their useful life. This task will replace equipment in kind. This project may include limited excavation, disposal of demolition/construction debris and replacement of equipment.

Site #7- Hoʻolehua Maintenance Yard Improvements, and Scattered Valve and Hydrant Replacements

7-A **Valve and Hydrant Replacement:** Seven Pressure Relief Valves (PRV), seven Gate Valves (GV), five In-line Valves (IV), 11 Air Relief Valves (ARV), up to five fire hydrants and associated ancillary equipment in Hoʻolehua have reached the end of their useful life. This task will include replacing hydrants, PRV, GV, IV, ARV valves and realigning manholes as necessary. This project will also require limited excavation at each valve site and debris disposal.

7-B **Maintenance Yard Improvements:** The Maintenance Building, built in 1969 is not large enough to house necessary equipment and materials needed to maintain the water system. Based on an evaluation of the existing structure, the deterioration of support structures dictated building replacement rather than expansion of the existing. This task will include the demolition of the existing structure, re-use of the existing concrete pad and expanding it to accommodate a 4,800 square foot warehouse type facility. A fire hydrant and water

meter will be installed to provide fire protection for the building and surrounding DHHL lands. An additional concrete pad, up to 2,400 square feet, will be constructed to accommodate outside storage, loading, unloading, and parking. Tasks included in this action will include grubbing, grading, excavation, disposal of demolition, overburden, and construction debris as well as the installation of fire hydrant and ancillary equipment and construction of the building and concrete pad. The purchase and storage of supplies and equipment necessary to maintain PWS230 are also included within this project task.

2.4 Development Timetable and Preliminary Costs

Design, construction, and contingency costs are estimated at $25,000,000 to $30,000,000. The design of the Project is expected to take approximately 12 to 18 months after entitlement process is completed. Specific details of the phasing plan will be developed during Project design to maximize efficiency and economies of scale. Construction can be completed within 2 years provided work at the seven sites is done in no more than two phases constructed concurrently or within 10 years if construction at each Site is done consecutively. It is anticipated that construction of the Project will occur in two phases.

DHHL also evaluated financing mechanisms as part of the preliminary costs and time table development for the energy component of the Project. Options included utilizing Federal funding sources or outside financing through a lease to a developer with a Power Purchase Agreement. DHHL elected to pursue the use of Federal funds. See Appendix H for funding options for the PV system.

Coordination with major water users will be conducted during the Project design.

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3 DESCRIPTION OF THE NATURAL ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

This section describes existing conditions of the natural environment, potential impacts related to the improvements to the Hoʻolehua Water System (PWS 230), and mitigation measures to minimize impacts.

3.1 Climate

The Project consists of seven discontiguous sites located at native Hawaiian homesteads in Hoʻolehua-Pālāʻau (Hoʻolehua), Kalamaʻula, and Moʻomomi, in central Molokaʻi. Average monthly temperatures range from 71°-78° Fahrenheit in the makai areas of Kalamaʻula, and 68°-75° F in the mauka areas of Hoʻolehua. The area receives its comfortable temperatures from prevailing trade winds from the northeasterly direction, which are present approximately 70% of the time (Fletcher III, Grossman, Richmond, & Gibbs, 2002). During Kona weather conditions, the winds blow from a southerly direction. Rainfall averages approximately 15" annually in the makai areas of Kalamaʻula, and 35" annually in the mauka areas of Hoʻolehua. Most precipitation occurs from October to April (Giambelluca, et al., 2014).

POTENTIAL IMPACTS AND MITIGATION MEASURES

No negative impacts are anticipated. The project will however have a positive impact on the State of Hawaiʻi's climate change mitigation efforts. PWS 230 is one of the largest MECO energy consumers on Molokaʻi. By converting from MECO supplied power (utilizing diesel fuel) to solar power (PV system), the Project will reduce fossil fuel consumption on Molokaʻi. The proposed 1MW PV field[3] will replace MECO as the primary energy source utilized to operate the water pumps at the well site (Site 1). This will improve DHHL's energy efficiency, self-sufficiency, and significantly reduce carbon emissions[4] associated with PWS 230's operations.

3.2 Geology and Topography

The Project's seven sites are located within central Molokaʻi on the western and southwestern slopes of Wailau, the East Molokaʻi Volcano, an extinct shield volcano that last erupted 1.3 million years ago. Flows from Wailau make up the eastern two-thirds of the island of Molokaʻi. The seven sites can be broken into two areas with Site 1 and 2 in Kalamaʻula and the remaining sites (3-7)

[3] The size of the solar field was based on PWS 230's actual energy consumption over a 12-month period.

[4] Under current conditions, a majority of the emissions from energy consumed for PWS230 operations occur at the MECO power plant, not at Site 1, the well site. The requirement for MECO supplied energy will be reduced, by this project thereby reducing that portion of MECO emissions.

in Ho‘olehua--Pālā‘au. The seven sites are located at various elevations, ranging from sea level at Site 2 to approximately 1,400 feet at Site 3.

Sites 1 and 2, located in Kalama‘ula, span an area mauka to makai on a south-southwest axis through gulches and hilly terrain.

Sites 3 through 7 are located in an area that slopes in a westerly direction from mauka down into Ho‘olehua-Pālā‘au on the relatively flat and gently sloping terrain of the Ho‘olehua Saddle[5] (University of Hawai‘i at Mānoa, School of Ocean and Earth Science and Technology, 2015).

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project will include grading to achieve a level area for the installation of a new 200,000 gallon water tank at Site 1 and will affect the topography within the immediate area of the well site. It is not anticipated to have any negative impacts on the stability of the region’s geology. The overall topography of the Project surrounding areas will remain the same.

This is a mitigable impact. All grading will be in conformance with the Maui County Grading Ordinance. The hill cut associated with the installation of the 200,000 gallon water tank at Site 1 will be designed by civil engineers in a manner to ensure the long term stability of the slope. To minimize potential impacts, grading will be segmented and exposed areas will be immediately grassed or landscaped before commencement of grading in the next phase.

3.3 Soils

Three soil suitability studies prepared for lands in Hawai‘i describe the physical attributes of land and the relative productivity of different land types for agricultural production; these are: 1) the U.S. Department of Agriculture Natural Resource Conservation Services (NRCS) Soil Survey; 2) the University of Hawai‘i Land Study Bureau (LSB) Detailed Land Classification; and 3) the State Department of Agriculture’s Agricultural Lands of Importance to the State of Hawai‘i (ALISH) system.

Natural Resource Conservation Service Soil Survey

The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) identifies a range of soil classifications[6] within the seven Sites (see Figure 3). Table 3-1 provides a more detailed description of the soil series identified with the Project.

Site 1 consists of soils from the Oli (OME), Naiwa (NAC3), and Rough Broken Land (rRR) series, and has erosion potentials that are moderate to severe.

[5] The Ho‘olehua Saddle is a broad isthmus between the Wailau and Maunaloa Volcanoes.

[6] Diacritical markings associated with words of Hawaiian language origin are not included in NRCS’s soil classifications, and therefore are not included in the names of the soil series in this section.

The mauka areas of Site 2 are on Rock Land (rRK), Very Stony Land (rVT2), Molokai series (MuB, MuC, MvD3), and Holomua series (HvB3, HvC3), which have moderate to severe erosion potentials. Meanwhile, the makai areas of Site 2 are on soils in the Mala (MmA, MmB), Jaucas (JaC), Kealia (KMW), and Marsh (MZ) series, which have slight to moderate erosion potentials.

Site 3 primarily runs through soils in the Naiwa (NAC) and Rough Broken Land (rRR) series, but also runs through soils belonging to the Hoolehua (HzA), Kalae (KcB, KcC3), and Kawaihapai (KlcB) series. The erosion hazard on these soils ranges from slight to severe.

Site 4 is located on Kalae (KcB) series soils, while Site 5 consists of soils in the Kalae (KcB, KcC) Lahaina (LaB, LaC), Hoolehua (HzB), and Molokai (MuB) series, which all have moderate erosion potentials.

Site 6 runs through soils in the Hoolehua (HzA, HzC), Kalae (KcB, KcC3, KcD3), Kawaihapai (KlcB), Lahaina (LaA, LaB, LaD3), and Molokai (MuB, MuC, MuD3) series, which have slight to severe erosion potentials.

Site 7 is located on soils in the Hoolehua (HzA), Kalae (KcB, KcD3), Lahaina (LaA, LaB, LaC), and Molokai (MuA, MuB, MuC, MuC3, MvD3) series. The erosion potential of these soils ranges from slight to severe. A more detailed description of each of the soil series is provided in Table 3-1: Soil Series Description.

Aside from the Rough Broken Land, Very Stony Land, and Rock Land, most of the soils on these sites are well-draining with moderate to moderately rapid permeability. Storm water runoff ranges from slow to medium. The surface layer generally consists of strong to medium acid soils that are dark reddish-brown silty clay and are typically around 15 inches thick.

Areas with these soils primary uses are wildlife habitat and woodlands, as well as pastures, sugarcane and pineapple production.

Table 3-1: Soil Series Description

Series	Series Description
Holomua Silt Loam	Consists of deep, well drained soils that formed in material weathered from basic igneous rock influenced by volcanic ash. Occurs at elevations between 100 and 1,000 feet, with mean annual rainfall of approximately 18 inches.
Hoolehua Silty Clay	Present in depressions and drainage-ways, developed in old alluvium. The subsoil is sub-angular blocky silty clay and silty clay loam and is 45 to 57+ inches thick.
Jaucas Sand	Consists of very deep, excessively drained, very rapidly permeable soils on vegetated beach areas along the sea coast. Formed in calcareous sand deposits, in sand-sized fragments of coral and sea shells.

Series	Series Description
Kalae Silty Clay	Upland soils, developed from material weathered from igneous rock. Upper part of subsoil, about 26 inches thick, is sub-angular blocky silty clay compact in place. Lower part of subsoil, about 21 inches thick, is silt loam. Substratum is silt loam and soft weathered rock. In many places, gravelly, relatively soft rock fragments have been brought in the surface layer through cultivation and erosion.
Kawaihapai Silty Clay Loam	Soils in drainage-ways and on alluvial fans along coastal plains, formed in alluvium derived from basic igneous rock in humid uplands. Occurs at 750 to 1,750 feet, and annual rainfall amounts to 40-55 inches.
Kealia Silt Loam	Consists of deep, poorly drained soils that formed in alluvium, and are characterized by slow to very slow runoff and moderately rapid permeability. Found on low coastal plains, with mean annual rainfall of approximately 20 inches.
Lahaina Silty Clay	Upland soils, developed in material weathered from basic igneous rock. Some areas underlain by consolidated sand at a depth below 30 inches. Cobblestones are common in the surface in a few places, while in some places near the coastal plains, the profile contains fragments of coral, stones, gravel, or sand. The subsoil is sub-angular blocky silty clay and silty clay loam about 45 inches thick over soft, weathered basic igneous rock.
Mala Silty Clay	Consists of well drained soils that formed in recent alluvium. Found on bottoms of drainage-ways and on alluvial fans on coastal plains. Underlain by coral sand or weathered rock at depths of more than 40 inches. Pebbles and stones are found throughout the soil, which is highly stratified. Mean annual rainfall is about 15 inches.
Marsh	Consists of very poorly drained soils found in marshes at elevations of up to 800 feet. Top layers of mucky peat to depths of 0 to 60 inches, with frequent flooding.
Molokai Silty Clay Loam	Consists of very deep, well drained soils that formed in material weathered from basic igneous rock. Found on uplands at elevations from near sea level to 1,500 feet, with mean annual rainfall at about 25 inches.

Series	Series Description
Naiwa Silty Clay Loam	Upland soils, developed in volcanic ash and material weathered from basic igneous rock. Surface layer is dusky-red silty clay loam about 11 inches thick. The subsoil, about 30 inches thick, is sub-angular blocky silt loam and loam over a weathered basic igneous rock. In areas of severely erosion, 75% of the original surface layer and in some places part of the subsoil have been removed.
Oli Silty Loam	Moderately deep to deep upland soils, developed in volcanic ash deposited over basic igneous rock. The surface layer, about 13 inches thick, is dark-brown silt loam and loam. The substratum is slightly weathered hard rock. The soils are easily eroded because it is very friable and powdery.
Rock Land	Consists of pahoehoe lava flows, occurring on mountain sides. Runoff is rapid, and erosion hazard is very severe. Soils are 0-8 inches deep over lithic bedrock of basalt parent material.
Rough Broken Land	Steep land broken by numerous intermittent drainage channels, occurring in gulches and mountain sides. Runoff is rapid, and geologic erosion is active. Soils are 20 to 60+ inches deep over soft, weathered rock. Some weathered rock fragments are mixed with the soil material. Small areas of rock outcrop, stones, and soil slips are common.
Very Stony Land, Eroded	Large areas of severely eroded soils. About 50 to 75% of the surface is covered with stones and boulders. In most places, it is less than 24 inches deep to bedrock, but deeper in a few low-lying areas.

Source: (Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture, 2015)

Land Study Bureau Detailed Land Classification

The University of Hawai'i Land Study Bureau (LSB) developed maps and publications to provide an analysis of lands and their suitability for agricultural production. A range of factors including soils, geology, topography, climate, and water resources were analyzed, and a rating scheme for assessing overall agricultural productivity was developed. Lands are classified from "A" to "E" according to their agricultural suitability with "A" indicating a master productivity rating of "Very Good," and "E" indicating a rating of "Very Poor" for agricultural uses. The State Land Use Law (HRS Chapter 205) considers Class A and B soils to be prime farmland.

The soils of Site 1 are classified as D and E ("Poor" and "Very Poor"). The mauka areas of Site 2 are also on soils classified as D and E, while the makai areas are rated A ("Very Good") and E. The remaining sites (Sites 3-7) are located on lands with C ("Fair"), D, and E soils. Land classification of project lands are identified in Figure 4.

Agricultural Lands of Importance to the State of Hawai'i (ALISH)

ALISH maps were prepared by the State Department of Agriculture in 1977 to determine the agricultural importance of agricultural property within the State of Hawai'i. There are three ALISH designations: Prime, Unique, or Other Agricultural Land. Prime Agricultural Land is defined as "land best suited for the production of food, feed, forage, and fiber crops." This class of land has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed (including water management) according to modern farming methods. Prime Agricultural Land produces the highest yields with the lowest inputs of energy or money, and with the least damage to the environment. Lands designated as Unique or Other Agricultural Land are successively less productive soils. Lands that do not meet the criteria for the designations, Prime, Unique or Other Agriculture Land are not considered to have important agricultural properties.

A majority of the lands located within Sites 1 and 2 are in areas without ALISH designations. However, portions of both Sites 1 and 2 meet the ALISH designation Other. Site 3 includes lands designated as Prime and Other by ALISH as well as undesignated lands. Sites 4 and 5 are located entirely on lands designated as Prime. Site 6 includes Prime, Other and undesignated lands based on the ALISH criteria. Site 7 is located primarily on Prime ALISH lands, but also includes Other ALISH and lands not designated by ALISH. The location of ALISH lands within the Project boundaries are shown on Figure 5 and summarized on Table 3-2.

Table 3-2: ALISH Designations by Site

	Prime	Unique	Other	No Designation
Site 1			●	●
Site 2			●	●
Site 3	●		●	●
Site 4	●			
Site 5	●			
Site 6	●		●	●
Site 7	●		●	●

POTENTIAL IMPACTS AND MITIGATION MEASURES

No impact is anticipated. Based on soil suitability, the majority of the Sites are on lands that are not considered prime agricultural land. The LSB ratings of C, D, and E for most of the Sites correspond to the NRCS rating of "not prime farmland", irrespective of ALISH's ratings.

The proposed tasks within Sites 3, 4, 5, 6, and 7 designated as prime are not currently in agriculture production[7] and are overgrown primarily with naturalized non-native vegetation. The proposed tasks within Sites 3 and 5 are designed to replace existing deteriorating water mains. In addition, 17 new fire hydrants will be installed at Site 5. The tasks proposed within Sites 4 and 6 are designed to replace/repair existing valves/equipment, and improve Site access through the installation of all-weather roadways. The task proposed within Site 7 are designed to replace existing valves and hydrants located within existing roadways, and replace the existing maintenance facility with a larger building/parking apron.

Upon completion of tasks, all Sites will be allowed to re-vegetate to the maximum extent possible. Due to the nature of the proposed tasks, portions of Site 5, 4, 6, and 7 will not be revegetated. These include a small area surrounding each fire hydrant (approximately 20 ft^2/hydrant within Site 5) the proposed for the roadways within Site 4 and 6, and the parking apron and new maintenance facility in Site 7. Wild fire is a natural hazard due to the brush on Site 5 (see Figure 6). The hydrants are necessary to provide fire protection for the homesteads and the surrounding area, while the new roadways ensure year-round access to PWS 230 storage facilities, even during inclement weather. The new maintenance facilities will provide secure storage for necessary maintenance equipment and supplies.

The Project as proposed will allow DHHL to provide to eligible native Hawaiians and other PWS 230 users with a safe and secure water supply, improved fire protection, installed in conformance with appropriate State and County standards.

It is estimated that there will be a loss of less than 2 acres of lands identified as “Prime” by ALISH. These lands will not be revegetated. Mitigation measures are not required for the installation of fire hydrants required for fire protection of houses and agricultural activities in the area, roadways for water system access. Additionally, the LSB ratings designate DHHL lands as “not prime farmland”, irrespective of ALISH’s ratings.

3.4 **Hydrology**

The project sites are located in six different watersheds: the Kaunakakai, Kalama‘ula, Manawainui, Kāluape‘elua, Mane‘opapa, and Mo‘omomi Watersheds. A watershed area captures rainfall and atmospheric moisture from the air and allows the water to percolate into underground aquifers or enter stream channels, eventually draining to the ocean. The Kaunakakai, Kalama‘ula, Manawainui, and Kāluape‘elua Watersheds all drain to the south shore of central Moloka‘i, while the Mane‘opapa, and Mo‘omomi Watersheds drain towards the north. None of the affected watersheds contain perennial streams (Hawai‘i Institute of Marine Biology, 2015).

[7] Lands in Ho‘olehua were once used for pineapple production; however a majority of commercial pineapple production in the area ended by 1983.

Site 1 is located in the Manawainui Watershed. Site 2 is located primarily in the Kalamaʻula Watershed, and also crosses into the Manawainui and Kaunakakai Watersheds. Site 2 is located entirely in the Kalamaʻula ahupuaʻa. Site 3 crosses the Manawainui, Kāluapeʻelua, and Maneʻopapa Watersheds (and the Kahanui, Nāʻiwa, Pālāʻau, and Hoʻolehua ahupuaʻa). Site 4 is located in the Maneʻopapa Watershed and the Hoʻolehua ahupuaʻa. Site 5 is located entirely in the Maneʻopapa Watershed, and crosses from the Hoʻolehua ahupuaʻa into Pālāʻau. Site 6 is located in the Maneʻopapa and Kāluapeʻelua Watersheds, and the Pālāʻau and Hoʻolehua ahupuaʻa. Site 7 is located primarily in the Maneʻopapa Watershed, but with additional locations in the Kāluapeʻelua and Moʻomomi Watersheds, as well. Site 7 is located in the Hoʻolehua and Pālāʻau ahupuaʻa. Table 3-3 identifies the watershed(s) where each of the Project Sites is located.

Table 3-3: Watersheds

	Kaunakakai	**Kalamaʻula**	**Manawainui**	**Kāluapeʻelua**	**Maneʻopapa**	**Moʻomomi**
Area of watershed:	9.27 sq. mi.	9.12 sq. mi.	14.03 sq. mi.	14.21 sq. mi.	13.76 sq. mi.	11.45 sq. mi.
Site 1			●			
Site 2	●	●	●			
Site 3			●	●	●	
Site 4					●	
Site 5					●	
Site 6				●	●	
Site 7				●	●	●

Source: (Hawaiʻi Institute of Marine Biology, 2015)

Surface Water

Hardened access roads and other improvements are anticipated to increase impervious areas within Sites 1, 2, 4, 6, and 7. It is anticipated that actions will increase the impervious surface area in central Molokaʻi by approximately 4.8 acres.

At Site 1 a new access road is proposed with a footprint of approximately 0.1 acres (440 linear feet x 12-ft wide). Additional impervious surfaces proposed at Site 1 include fuel AST (approximately 0.009 acres) and a 0.2 MG reservoir (approximately 0.054 acres), with an overall impervious area of approximately 0.2 acres.

Site 2 currently has a compacted dirt access road leading to the Kalamaʻula Tank. Due to the steep terrain and compaction, the existing road is semi-pervious. Runoff typically sheet flows downhill towards the ocean, rather than being absorbed within the compacted dirt road. Approximately

3,000 LF of roadway is proposed to be replaced by a 12-ft roadway made of asphaltic concrete, resulting in approximately 0.8 acres of impervious surface.

At Site 4, an asphaltic concrete access road approximately 5,280 LF long and 12-ft wide is proposed, resulting in approximately 1.5 acres of impervious surface.

Site 5 will include the installation of 17 new fire hydrants. Each hydrant and appurtenant stabilization pad will cover up to 20 ft^2 with an overall impervious surface area of 0.008 acres.

At Site 6, an asphaltic concrete access road approximately 7,920 LF long, 12-ft wide is proposed, resulting in approximately 2.2 acres of impervious surface.

Site 7 will include the replacement of the existing storage building with a new building 2,400 square feet larger than the existing. In addition, a 2,400 SF concrete pad is also being proposed. These improvements are anticipated to increase the impervious surface area by 0.1 acres.

The remainder of the tasks described in Section 2.3, Project Description, are located underground, or within existing hardened areas and will not result in a net increase to the impervious surface area.

Wetlands

Pursuant to the Section 404 of the Clean Water Act, a permit from the U.S. Army Corps of Engineers (ACOE) is required whenever material is dredged or discharged in "Waters of the United States."

The EPA describes wetlands as follows:

> *Wetlands are areas where water covers the soil or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season. Water saturation largely determines how the soil develops and the types of plant and animal communities living in and on the soil. Wetlands may support both aquatic and terrestrial species. The prolonged presence of water creates conditions that favor the growth of specially adapted plants and promote the development of characteristic wetlands soils.*

The U.S. Fish and Wildlife Service (USFWS) and ACOE have identified three major attributes that are utilized to delineate wetlands.

(1) Hydrophytic vegetation*: at least periodically, the land supports predominantly hydrophytes (plants specifically adapted to live in wetlands);*

(2) Hydric Soils*: the substrate is predominantly undrained hydric (wetland) soil; and*

(3) Hydrology: *the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.*

The ACOE maintains a list of plants that could indicate the presence of wetlands. Each plant species is placed in one of five categories indicating typical location that it may be found within Hawai'i. The five categories follow:

- Obligate (OBL) Hydrophyte- Almost always occur in wetlands
- Facultative Wetland (FACW)- Hydrophyte Usually occur in wetlands, but may occur in non-wetlands
- Facultative (FAC)- Hydrophyte Occur in wetlands and non-wetlands
- Facultative Upland Facultative Upland (FACU)- Nonhydrophyte Usually occur in non-wetlands, but may occur in wetlands
- Upland (UPL)- Nonhydrophyte Almost never occur in wetlands

Both OBL and FACW listed species provide good indications that wetlands may be present, however plants from these lists can be found outside wetlands where adequate moisture (for example, splash zone near coast) is available.

Surveys of natural resources within the proposed Project area were conducted in 2012 and 2015 (Appendix C). The lists of plants species observed during the surveys was then compared to the 2014 National Wetland Plant List (NWPL) to identify all OBL and FACW listed species. While no wetlands were specifically identified during the surveys, four indicator species were observed in Site 2[8] along the makai edge of the existing utility/roadway corridor where the replacement of several valve, hydrant, and transmission pipes are proposed. See Table 3-4.

Table 3-4: Hydrophytic Indicator Plants

Scientific Name	Common Name	Site	Frequency*	Indicator Status
Rhizophora mangle	American mangrove	2	Common	OBL
Batis maritima	Pickleweed, Akulikuli kai	2	Common	OBL
Paspalum vaginatum	Seashore crown grass	2	Uncommon	FACW
Commelina diffusa	Dayflower, Honohono	2	Rare	FACW

**Common- Individuals found locally abundant in small areas within the Site*
Uncommon- scattered sparsely or occurring in a few small patches
Rare- only a few isolated individual plants found within the site

The Project Site was compared NRCS soil classifications as described in Section 3.3, and cross-referenced with the National List of Hydric Soils, 2015. Soils classified as Kealia and Marsh are identified as hydric and are expected to be found in Site 2 (See Table 3-1 for description, and see

[8] The survey data indicated *Commelina diffusa* was found within Site 3. However follow up discussion with the SWCA staff indicated that all 4 plant species including *Commelina diffusa* were found in Site 2.

Figure 2 for general location). No other Sites included hydric soils on the National List of Hydric Soils.

The Project area was compared to U.S. Fish and Wildlife Service (USFWS) wetlands mapping data. This tool was utilized to provide preliminary indications of wetland hydrology. No wetland features were identified within Sites 1 through 7 utilizing the USFWS mapping tool. However, two freshwater emergent wetlands are indicated to be within 500 feet and down-gradient of Sites 3, 4, and 5. Sites 2, 3, and 6 cross multiple riverine non-perennial stream channels. Makai portions of Site 2 are located within 100 feet of estuarine/marine wetland and freshwater forested/shrub wetland, and within 700 feet of freshwater emergent wetland. Currently there is a system wide unaccounted water loss that is 50% higher than the acceptable standard. Previous leaks in Kalama'ula that have been repaired in the last five years have been substantial, accounting for thousands of gallons per day being released into the environment from a single point. This release of water into the environment may artificially contribute to ground saturation and resulting in ponding particularly in Kalama'ula. Maps of the National Wetlands Inventory are depicted in Figure 7.

Ground Water

The Project area overlies the Moloka'i Aquifer[9], a designated sole source aquifer. For most of the soils at the sites, the depth to groundwater is more than 80 inches according to the soil survey (Natural Resources Conservation Service, United States Department of Agriculture). However, at the makai portions of Site 2, the depth to groundwater for the Kealia soil is about 12 to 42 inches, and about 0 inches for the Marsh soil. Groundwater depth may be impacted by the system-wide unaccounted for water loss through the artificial increase in groundwater from.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project will maintain and protect the existing uses and the level of water quality necessary to protect the existing uses of receiving State waters, in compliance with Hawai'i Administrative Rules (HAR) §11-54-1.1 regarding antidegradation, and in accordance with the designated uses classified in HAR §11-54-3.

Surface Water

Site work includes earthwork activities that will expose soil creating opportunities for runoff and erosion. Trenching, grading, and stockpiling of soil will be performed in accordance with erosion control ordinances of the County, as well as approved grading plans.

The Project will result in an increase of impervious surface areas affecting drainage and percolation.

[9] The Kualapu'u Aquifer is also been referred to as Molokai Aquifer, primarily by the US EPA.

In the short-term, there may be a slight increase in the impermeable surface area due to construction. Upon completion of the Project, a majority of the new facilities will be located underground or within existing road rights of way. The above ground facilities are anticipated to decrease permeability on 4.8 acres within the Project boundaries. Any increase in runoff will be accommodated by infiltration on DHHL property. During the design phase of the Project, a drainage plan will be developed to ensure that run-off quality and quantity are not impacted by the new roadways (Sites 2, 4, and 6), well site (Site 1) configuration, and new fire hydrants (site 5).

Best Management Practices (BMPs) for erosion and drainage control during and after construction will be prepared for review and approval by the County Department of Public Works. In addition, this project will disturb greater than one acre; therefore, a National Pollution Discharge Elimination System (NPDES) General Permit for construction activities will be required. These measures will ensure that water quality levels are maintained and protected in receiving State waters, in accordance with Hawai'i Administrative Rules (HAR) §11-54-5 regarding inland waters, and HAR §11-54-6 regarding marine waters. Water quality will also be protected for the Moloka'i South Coast, in accordance with HAR §11-54-7 regarding marine bottom types. The Project will not include harbor development.

No other mitigation measures are required.

Wetlands

Storm water runoff has the potential to increase non-point source pollutant load of down-gradient wetlands and waterways. None of the wetlands in the vicinity of the Project Sites have been listed as impaired in the Hawaii Water Quality Monitoring and Assessment Report a report identifying 303(d) listed water bodies. The project is not expected to result in adverse impacts.

On March 30, 2012 and again on October 30, 2015, DHHL submitted letters to USFWS indicating that no wetlands or riparian areas identified on the National Wetlands Inventory Mapper were located within the Project boundaries. DHHL requested a response within 30 days. As of January 6, 2016 USFWS has not provided any comments regarding wetlands.

On September 16 2015, DHHL submitted a letter to the U.S. Army Corp of Engineers (ACOE) requesting a review of the Project area to determine if wetlands would be affected. A response was received from ACOE dated, October 28, 2015. It stated the following:

> *"Based on our initial review of the information provided, it appears there may be waters of the U.S. on the project site….Depending on the circumstance of your project, a permit may be required from this office prior to commencing proposed work. Accordingly, we recommend the landowner or the authorized agent continue coordination of the development of this project with our office."*

Subsequent to corresponding with USFWS, a natural resource survey was conducted and documented in a report by SWCA Environmental Consultants (SWCA) dated October 2015 (Appendix C). When queried, SWCA Field investigators indicated no standing water was observed

during the natural resource survey. However, several plants listed on the NWPL were observed in a portion of Site 2. Based on the review of the location of hydric soils, plants and hydrology, there may be approximately one-tenth of an acre wetlands surveyed as part of this Project adjacent to the utility/roadway corridor of Maunaloa Highway. It is anticipated that no work will be required within wetlands but rather in the existing utility/roadway corridor. DHHL will work with ACOE and if necessary, obtain a wetland determination and National Permit #12 if work within a wetland is required. Contractors will be advised that the staging area and any construction equipment must be stored within existing hardened surfaces or north of Maunaloa Highway.

As part of the NPDES permit requirements, best management practices will be imposed during construction to ensure down-gradient wetlands are not impacted. DHHL will continue to work with ACOE for further clarification regarding waters that may be located within the Project area. Coordination with the ACOE will continue through design and construction to ensure all required permits are obtained and compliance is maintained.

These measures will ensure that water quality levels are maintained and protected in receiving State waters, in accordance with Hawai'i Administrative Rules (HAR) §11-54-5 regarding inland waters and wetlands.

No other mitigation measures are required.

Ground Water

The Project includes improvements to the storage and distribution system of an existing public water system. While the Project is not anticipated to increase consumption, water conservation is important. The replacement of pipes will reduce system wide unaccounted for water loss back to normally acceptable range. Additionally, the replacement of analog meters with digital meters will allow PWS 230 system operators to better track individual consumption and target conservation efforts.

Information required by the Ground Water Office, EPA region IX under provisions to the Safe Drinking Water Act (SDWA), Section 1424(e) was submitted on March 30, 2012. At the request of the EPA, additional information regarding the above ground storage tank was submitted on April 26, 2012. In an email dated May 8, 2012, the Ground Water Office stated, "It does not appear that the proposed project will adversely affect the Moloka'i aquifer." Correspondence pertaining to SDWA Section 14249(e) is included in Section 5, Correspondence. On October 30, 2015, the groundwater office was contacting again to provide a project update. No additional response was provided. After reviewing the Draft EA, the Drinking Water Protection Office (EPA region IX) concurred in a letter dated March 3, 2016: "it does not appear that the proposed project will adversely affect the sole source aquifer."

The DOH-Safe Drinking Water Branch (SDWB) was provided with information regarding the proposed improvements in 2012 and 2015. In a letter dated April 10, 2012, SDWB indicated that the Project will include substantial modifications to an existing public water system; therefore,

approval from the Director of Health is required. In a subsequent response letter dated October 29, 2015, SDWB requested construction plans be submitted for review.

The County Department of Public Works (DPW) was provided with information regarding the proposed improvements. In a letter dated April 17, 2012 DPW recommended coordination with the County Department of Water Supply (DWS). DPW indicated they had no additional comments in their October 5, 2015 letter.

The State of Hawai‘i, Department of Human Services (DHS) was also provided information regarding the proposed improvements in 2015. In a letter dated October 1, 2015, DHS stated, “…there may be registered child care homes that may be impacted by the repair and replacement of the water mains and tanks….”

DHHL will submit construction plans for review and approval by DOH-SDWB prior to construction and will comply with Hawaii Administrative Rules, particularly Section 11-20-30 regarding “New and modified public water systems.”

DHHL will also coordinate with DWS and advise system users in advance of system outages relating to construction activities. Coordination may allow the County system to temporarily support the Ho’olehua Water System, PWS No. 230 project when the system is down or under repair. It will also help with timing system repairs so that at least one of the systems in online.

No other mitigation measures are expected.

3.5 **Natural Hazards**

Moloka‘i is susceptible to potential natural hazards, such as flooding, tsunami inundation, hurricanes, earthquakes, and wildfires. The State of Hawai‘i Department of Defense, Office of Civil Defense in cooperation with the Maui Civil Defense Agency administer various civil defense programs and warning systems that alert the public of emergencies and natural hazards, particularly tsunamis and hurricanes and provide post disaster recovery.

Since 1982, Hawai‘i has been affected twice by devastating hurricanes, ‘Iwa in 1982 and ‘Iniki in 1992. Earthquakes in the Hawaiian Islands are associated with volcanic eruption or tectonic movement. Moloka‘i is periodically subject to episodes of seismic activity of varying intensity due to its location in the Moloka‘i Seismic Zone and proximity to the active volcanoes on Hawai‘i island. Each year, thousands of earthquakes occur within the State however the vast majority are detectable only with highly sensitive instruments. Moderate earthquakes occasionally occur in the islands; however most cause little or no damage.

Moloka‘i has also experienced tsunamis caused by earthquakes from around the Pacific Rim and from the Island of Hawai‘i. The travel time of tsunamis from distant sources can be over ten hours, while those originating on Hawai‘i Island can arrive within minutes. The last four tsunamis that had a damaging effect on either Moloka‘i or neighboring Lāna’i occurred during the period 1924 to 1960. During this time, a damaging tsunami occurred once every 9 years. However, since

1960, no damaging tsunamis have affected either island (Fletcher III, Grossman, Richmond, & Gibbs, 2002).

Flood hazards are primarily identified by the Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency (FEMA) (Figure 8). Most of the sites are located within Zone X, areas outside the 500-year floodplain. However, approximately 3.3 acres of makai portions of Site 2 are located in identified flood hazard areas. This includes 1.6 acres in Zone AE Floodway; 0.6 acres in Zone A (100-year flood with no base flood elevations); 0.9 acres in Zone AE (100-year flood with BFE); and 0.2 acres in Zone XS (500-year flood).

The Hawaiian Islands are also vulnerable to wildland fires (especially during the summer months, prolonged drought and/or high winds). The greatest danger of fire is where wildland (trees and brush) border urbanized areas. A great majority of wildfires are human-caused (intentionally caused or by negligence) and often start along roadsides. Wildfires can and do also occur naturally. The dry climate in Kalama‘ula makes it particularly susceptible to wildfires.

POTENTIAL IMPACTS AND MITIGATION MEASURES

No impact is anticipated. Most of the Project sites are located inland, away from potential coastal hazards. However, some proposed actions within the makai portion of Site 2 are located in the tsunami evacuation zone. None of these actions are being constructed for human occupation. With the exception of the replacement of fire hydrants, all Site 2 activities are either at or below grade.

As portions of the Project are located in Flood Hazard Zones, compliance with rules and regulations of Title 44 of the Code of Federal Regulations (CFR) and Maui County Code is necessary. The proposed actions located in these flood hazard areas (replacement of existing transmission pipes, in-line valves, and fire hydrants) will replace aging equipment, reducing potential for leaks that can exacerbate naturally occurring flooding.

The proposed construction activities include excavation and grading; consequently, Special Flood Hazard Permit requirements apply, as specified by Chapter 19.62 of the Maui County Code for Flood Hazard Areas and 44 CFR 59.1.

3.6 **Flora and Fauna**

Biological surveys were conducted by SWCA Environmental Consultants (SWCA) in November 2011 and September 2015 (see Appendix C)

The vegetation types and species identified during the surveys are not threatened, endangered, or candidate species. In all, 126 plant species were recorded during the 2015 survey, and 94 plant species were recorded in the 2011 survey. Of these, eight species are native to the Hawaiian Islands: ‘ākia (*Wikstroemia oahuensis* var. *oahuensis*), kou (*Cordia subcordata*), naupaka (*Scaevola taccada*), ‘ilima (*Sida fallax*), ‘a‘ali‘i (*Dodonaea viscosa*), hau (*Hibisicus tiliaceus*), milo (*Thespesia populnea*), and ‘uhaloa (*Waltheria indica*). None of these species are considered rare. In addition, four Polynesian-introduced species were recorded: kukui (*Aleurites moluccana*),

ʻihiʻai (*Oxalis corniculata*), coconut or niu (*Cocos nucifera*), and ti (*Cordyline fruticosa*). Three main vegetation types were identified in the survey area: 1) mixed non-native forest, 2) ruderal, and 3) ornamental landscaping. Host plants favored by the Blackburn's sphinx moth (*Manduca blackburni*) lava were not observed during either survey.

The fauna in the survey site areas are predominantly non-native birds and mammals common throughout Molokaʻi and the main Hawaiian Islands. The only state or federally listed animal species detected by SWCA was the endangered ʻōpeʻapeʻa (Hawaiian hoary bat, or *Lasiurus cinereus semotus*), which was detected with an ultrasonic bat detector at Site 3 (Kauluwai Tank and Transmission Improvements), in the vicinity of the pipeline replacement just south of the existing dirt access road near the 3.5MG Hoʻolehua tanks, during the 2011 survey. No evidence of bat roosting was observed within the Project area.

Besides the endangered ʻōpeʻapeʻa, the only native vertebrate species recorded by SWCA during the surveys is the kōlea (Pacific golden plover, or *Pluvialis fulva*), which is abundant throughout Hawaiʻi and uses a variety of habitats including mudflats, lawns, and rooftops. This species does not nest in Hawaiʻi.

The project area falls within the breeding range of the endangered nēnē (Hawaiian goose, or *Branta sandvicensis*), and although this species was not observed during the survey, it may be present in the vicinity of the proposed project area. Other avian species that were not detected or observed during the surveys but may be found in the area include the threatened ʻaʻo (Newell's shearwater, or *Puffinus auricularis newelli*) the endangered ʻuaʻu (Hawaiian petrel, or *Pterodroma phaeopygia sandwichensis*), the endangered ʻalae kea (Hawaiian coot, or *Fulica alai*), the endangered aeʻo (Hawaiian stilt, or *Himantopus mexicanus* knudseni) and the endangered ʻio (Hawaiian hawk, or *Buteo solitaries*).

POTENTIAL IMPACTS AND MITIGATION MEASURES

The proposed project is not expected to have a significant adverse impact on any state or federally listed candidate, threatened, or endangered plant or animal species; species of concern; and/or rare plants or animals (see Figure 9).

To avoid the unintentional introduction or transport of new terrestrial invasive plant species to Molokaʻi during this project, all construction equipment and vehicles arriving from outside of Molokaʻi should be washed and inspected, and, when possible, raw materials (e.g., gravel, rock, and soil) should be purchased from a local supplier on Molokaʻi to avoid introducing non-native plant species not present on the island.

Applicable mitigation measures based on USFWS recommendations will be incorporated into the construction documents to mitigate impacts to fauna during construction, including:

- To mitigate impacts to the endangered ʻōpeʻapeʻa (Hawaiian hoary bat), trimming or removing woody plants greater than 15-feet tall will be avoided during the breeding season (between June 1 and September 15). In addition, because ʻōpeʻapeʻa forage for

insects from as low as three feet to higher than 500 feet above the ground, barbed wire fencing will not be utilized.

- To mitigate impacts to the endangered nēnē (Hawaiian goose), if the bird is observed within the Project area during the breeding season, which is from December through April, a qualified biologist will survey the area prior to the start of construction activities. This survey will be repeated any time construction work is halted for a period of at least three days, during which the birds may attempt to nest. Should any nēnē nest be discovered within a 100 foot radius of proposed construction activities, work in this area will be halted and the USFWS will be contacted for further guidance.
- To mitigate impacts to threatened seabirds and other threatened avian species, outdoor lights associated with the Project sites will be shielded so that the bulbs can be seen only from below, and night-time construction will be avoided.

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4 DESCRIPTION OF THE HUMAN ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

This section describes the existing conditions of the human environment, preliminary potential impacts of the Project, and preliminary mitigation measures to minimize any impacts.

4.1 Archaeological and Historic Resources

A National Register of Historic Places (NHRP) contains a listing of districts, sites, buildings structures and objects significant in American history, architecture, archaeology, engineering and culture as authorized by the National Historic Preservation Act of 1966 (as amended). Properties are eligible for listing in the NRHP if they meet the criteria for evaluation as defined in 36 CFR §60.4:

> *The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, building, structures and objects that possess integrity of location, design, setting ,materials, workmanship, feeling, and association, and*
>
> *(a) That are associated with events that have made a significant contribution to the broad patterns of our history; or*
> *(b) That are associated with the lives of persons significant in our past; or*
> *(c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or*
> *(d) That have yielded or may be likely to yield, information important to prehistory or history.*

The State of Hawai'i recognizes these four criteria and an additional criteria under HRS §13-275-6 that is included in the evaluation process.

> *(e) That have an important value to the Native Hawaiian people or to another ethnic group of the State due to associations with cultural practices once carried out or still carried out, at the property due to associations with traditional beliefs, events or oral accounts- these associations being important to the group's history and cultural identity.*

Field work was conducted by Pacific Legacy, Inc., in 2011/2012 to determine if any area, met the significance criteria described above. In 2015, supplemental investigations were conducted expanding boundaries in several areas previously investigated as well as examining two new areas not included in the 2011/2012 investigations. (see Appendix D) The investigation indicated that pineapple cultivation had impacted large areas and reducing the number and quality of archaeological resources identified within the Project boundaries. A total of fourteen new archaeological sites (2516-2521 and 2565-2572) were identified and three previously

documented sites (Sites 800 – 802) were identified within the Project's area of potential effect (APE) in spite of the impacts of modern agricultural practices. One isolated 'ulu maika stone was collected. The sites included nine traditional sites, seven historic sites, and one military site. A majority of the sites identified during the 2011/2012, and 2015 investigation are located within Kalama'ula, in the vicinity of Project Sites 1 and 2, outside the areas of former pineapple cultivation. Table 4-1 provides information regarding new and previously documented sites identified within the APE, their significance, potential for impact, and proposed recommendations.The sites are identified in the AIS figure 5 included in Appendix D.

POTENTIAL IMPACTS AND MITIGATION MEASURES

No impact is anticipated. All of the sites recorded in the APE, with the exception of Site 2517 (a probable historic wind break or hunting blind) were assessed as significant under Criterion (d). These sites have either yielded or have the potential to yield information important to Hawai'i's history. In addition, Site 801, a complex of cairns interpreted as possible burial facilities is also assessed as significant under Criterion (e) because of its cultural importance.

In a letter from the Office of Hawaiian Affairs (OHA) dated March 17, 2016, it was noted that HAR §13-284-8(2) requires consultation with OHA for all Criterion (e) sites that will be impacted by the Project to develop plans for mitigation. In addition to consulting with OHA for Criterion (e) sites, DHHL will make every effort to avoid destruction of significant sites (Criteria d and e) wherever possible.

Coordination with the State Historic Preservation Division (SHPD) is on-going. It is recommended that an archaeological monitor be present during grading and sub-surface construction activities based on State Historic Preservation Division recommendations. The 16 significant archaeological sites can be avoided during construction. Pacific Legacy has recommended that no further work is anticipated for all but two of the recorded. Preservation and monitoring is proposed for Site 2572, the large lithic scatter that was probably associated with stone adze manufacture. Preservation is also proposed for Site 801, the cluster of stone cairns that were interpreted as possible human burial facilities. Information regarding all archaeological sites requiring preservation, avoidance, and/or monitoring as required by SHPD will be incorporated in to the Project design.

For inadvertent finds during construction, the construction documents will include a provision that should any remains such as artifacts, burials, or concentrations of shell or charcoal be encountered during construction activities, work will cease immediately in the immediate vicinity of the find, and the find will be protected. The contractor will immediately contact the DHHL, the legal authority over tribal lands as described in the U.S. Native American Graves Protection and Repatriation Act (NAGPRA). DHHL will then contact the State Historic Preservation Division (SHPD). DHHL shall assess the significance of the find and recommend appropriate mitigation measures and treatment determinations in consultation with SHPD, the homestead associations in the area of the inadvertent discovery, any known lineal descendants, and the Moloka'i Island Burial Council.

Table 4-1: Archaeological Resources located within Project Boundaries

SIHPID Number*	Site Significance	Justification	Determination of Effect	Recommendation
Site 1				
2572	d	PRE-CONTACT/EARLY POST CONTACT Large lithic scatter where that probably included the production of stone adze performs.	Area to be avoided during PV energy development	Preserve and monitoring during grubbing
Site 2				
800	d	TRADITIONAL Interpreted and a possible traditional habitation and agricultural complex	May be impacted by Project Area 2 improvements	No further work
801	d, e	TRADITIONAL Complex of cairns interpreted as possible human burial facilities	Will not be impacted	Preserve
802	d	HISTORIC Probably cattle wall that has been previously impacted by construction of a dirt road	May be impacted by Project Area 2 improvements	No further work
2516	d	TRADITIONAL stone structure that may have functioned as a foundation for a pole and thatch structure	May be impacted by Project Area 2 improvements	No further work
2517	*NOT SIGNIFICANT*	*NOT SIGNIFICANT* HISTORIC This site appears to be a historic wind break or hunting blind	May be impacted by Project Area 2 improvements	No further work
2518	d	TRADITIONAL Possible agricultural clearing mound.	May be impacted by Project Area 2 improvements	No further work
2519	d	TRADITIONAL This site consists of three stone mounds that appear to be possible agricultural clearing mounds.	May be impacted by Project Area 2 improvements	No further work
2566	d	HISTORIC Large probable agricultural terrace that likely dates to the historic era	May be impacted by Project Area 2 improvements.	No further work

SIHPID Number*	Site Significance	Justification	Determination of Effect	Recommendation
2567	d	TRADITIONAL Modified outcrop that may have served as a foundation for a traditional habitation Structure	May be impacted by Project Area 2 improvements.	No further work
2568	d	TRADITIONAL This site is a probable lithic reduction sites area where basalt flakes were being produced.	May be impacted by Project Area 2 improvements.	No further work
2569	d	HISTORIC-MILITARY cluster of five stone edged depressions containing shell casing and shell chain fed clips with unfired blank cartridges.	May be impacted by Project Area 2 improvements.	No further work
2570	d	HISTORIC Concrete slab probably associated with ranching activities	May be impacted by Project Area 2 improvements.	No further work
2571	d	HISTORIC Mortared basalt boulder foundations for a possible bridge spanning a stream drainage	May be impacted by Project Area 2 improvements.	No further work
Site 3				
2520	d	HISTORIC Concrete water trough probably associated with ranching activities	May be impacted by Project Area 3 improvements.	No further work
2521	d	HISTORIC Series of concrete beams that probably supported wooden water troughs associated with cattle ranching in the area	May be impacted by Project Area 3 improvements.	No further work

**SIHP- State Inventory of Historic Places identification number. All SIHP identification numbers shown are preceded by 50-60-03-*
† Treatment recommendations are pending SHPD approval of AIS.

4.2 **Cultural Resources**

Under Act 50, the Hawai'i State Department of Health "Guidelines for Cultural Impact Assessments" mandate that the Project sites be studied as well as surrounding areas where construction or development have impact potential. These guidelines also recommend personal interviews with traditional cultural practitioners and knowledgeable informants on cultural practices. A CIA (Appendix F) was prepared for this Project under Act 50 and follows the 2011 OEQC guidelines for Assessing Cultural Impacts. A rigorous effort was made to identify and locate

persons knowledgeable about traditional practices that took place in the past or that are currently taking place in project area and broader geographical area that could potentially be impacted by the expansion project. The Office of Hawaiian Affairs (OHA) was consulted for a list of potential cultural informants, as well as various civic clubs. Contact information was found for 17 individuals and organizations, all of which were solicited for participation. No invitations were accepted. See Appendix G for National Historic Preservation Act (NHPA) Section 106 consultation conducted.

Every attempt was made to locate and speak with individuals knowledgeable about the cultural practices in the vicinity of the project area, but no interviews were scheduled or conducted. The CIA prepared for this Project is based upon archival research alone.

A literature review was also prepared for all of DHHL's land holdings on Molokaʻi in an effort to consolidate information regarding cultural resources identified during previous archaeological work into a single document. The literature review has been included in Appendix E.

The seven Project sites are located in central Molokaʻi within DHHL residential and agricultural homestead communities, as well as on ranchlands that are in private ownership. The central area of Molokaʻi including the ahupuaʻa of Pālāʻau, Hoʻolehua, Nāʻiwa, Kahanui, and Kalamaʻula has a rich cultural and legendary history. However, there is little mention of the specific properties in which the proposed Project Sites are located.

The following Cultural sites and resources have been identified in the literature review are located within the Kalamaʻula Homestead include Kapuāiwa Grove, ʻŌhiʻapilo Fishpond, ʻŌpaeʻula heiau, Puʻupāpaʻi heiau, Kalamaʻula heiau, and Puʻuomoʻo heiau. Coastal cultural resources within the Hoʻolehua-Pālāʻau Homestead include the 921-acre Moʻomomi Preserve, which is home to 22 native Hawaiian plant species, as well as native birds such as the pueo (Hawaiian owl) and ʻiwa (great frigate).

Discussions with individuals not wishing to be interviewed also identified Kapuāiwa Grove and the pōhaku (stone) mauka of the intersection of Kalanianaʻole and Likelike Avenues in Kalamaʻula, and the Moʻomomi Preserve and Nāʻiwa Makahiki grounds in Hoʻolehua as culturally sensitive sites nearby the proposed Project during personal conversations on October 1, 2015.

POTENTIAL IMPACTS AND MITIGATION MEASURES

No impact is anticipated.

The pōhaku in Kalamaʻula is located in the middle of the roadway. Many years ago construction workers attempted to remove it to build Kalanianaʻole Avenue. They were unsuccessful and built the road around the stone. A metal frame has been constructed around the pōhaku to keep vehicles from running into it. While construction is not proposed near the pōhaku, there may be increased traffic in the vicinity. Contractors will be advised to avoid the pōhaku.

Since the Project is to improve an already existing system, it is unlikely that the proposed development of the DHHL Water System Improvements Project will negatively impact any ongoing cultural practices. However, as espoused by various *moʻolelo*, the area in general has a

mystical past and retains some supernatural qualities. To respect the spiritual connections that people have with the *ʻāina*, it is recommended that any major event or construction related activity be preceded by traditional Hawaiian blessing ceremony.

Consultation with DHHL homestead associations will continue throughout the development of this project through the DHHL Beneficiary Consultation Process.

4.3 Transportation

4.3.1 Roadways and Traffic

Maunaloa Highway provides the primary access to the Kalamaʻula Homestead. The local neighborhood access consists of both paved and unpaved light-duty roads and unimproved roads.

Puʻupeʻelua Avenue and the Airport Loop are both important roads within DHHL's Hoʻolehua-Pālāʻau tract, while Maunaloa Highway provides access from Hoʻolehua to either the northeast or southwest areas of the island.

The proposed Project includes improvements to access roadways to Sites 2, 4, and 6. None of these access roadways are utilized by the public. In addition to access roadway improvements, the installation and or replacement of fire hydrants and the replacement of transmission lines and valves will be made along several existing roads and Right-of-Ways. Table 4-2 identifies roadways that will be affected and the type of improvement proposed.

Table 4-2: Improvements Along Roads

Activity	Locations	Site
Transmission lines	Lihi Pali Road	5
	Puʻu Kāpele	5
	unnamed Road to Lihi Pali Road	5
	Hoʻolehua to Kalamaʻula	3
	Kahiwa Street	2
Fire hydrant	Puʻupeʻelua (install)	7
	Puʻu Kāpele (install)	5
	unnamed Road to Lihi Pali (install)	5
	Kapuāiwa Road (replace)	2
	Likelike Avenue (replace)	2
	Maunaloa Hwy (replace)	2
Valve Replacement	Farrington Highway	7
	Moʻomomi Avenue	7
	Kōlea Avenue	7
	Lihi Pali Avenue	7
	Puʻu Kāpele Avenue	7
	Kūleʻa	4,6

Activity	Locations	Site
	Kapuāiwa Road Hoawa Road Maunaloa Hwy	2 2 2
Roadway	Kūle‘a Kahanu	4, 6 2

POTENTIAL IMPACTS AND MITIGATION MEASURES

Construction within the road right-of-ways identified in Table 4-2 is anticipated to interrupt traffic. This may cause longer travel times, and generally inconvenience motorists. These impacts cannot be avoided. Construction of the Project will be designed and scheduled to minimize traffic interruption. Temporary road closures may be required during construction when the proposed activity occurs within a road right-of-way.

The schools near the Project area may be affected by the project. These schools are a source of increased transient traffic in the region particularly during the morning and in the afternoon as students are dropped off and picked up.

Prior to construction, DHHL’s project management team will coordinate with the State Department of Transportation, Highways Division, County of Maui Departments of Planning, and Transportation, and police regarding closure requirements and property access. The contractor will implement measures to provide access past work sites and to minimize the inconvenience to the community. Such measures could include

- Traffic cones and other directional devices
- Backfilling/covering all trenches at the end of the work day.
- Posting safety devices and signs for the duration of construction.
- Scheduling construction and material deliveries during non-peak traffic hours.
- Coordinating driveway crossings with homeowners and business occupants/ customers/ clients.
- Scheduling construction activities that require closures after 8:30 AM.

Conducting trench work in the evenings could potentially minimize the traffic impact to the community. However, this will be balanced against the needs of the nearby residential community for noise control particularly between 10:00 PM and 7:00 AM. In addition, operations will be designed to ensure total road closure is avoided. In the long term, no additional vehicles will be added to the Moloka‘i roadways as a result of this Project. It will not increase in traffic volumes or congestion.

In the long-term the improvements to access roadways at Sites 2, 4, and 6 may have a slight positive impact on the roadway system. The amount of debris transported by DHHL vehicles entering back on to the existing roadways and deposited will be reduced once access roads are paved, when compared to current operations, particularly during rainy/muddy conditions.

During the Draft EA public comment period, the Maui County Department of Transportation stated that they had no comments regarding the Project (see letter in Appendix I).

4.3.2 Airports

There are two airports within 10 miles of the seven Sites: Moloka'i Airport (MKK) in Ho'olehua, and Kalaupapa Airport (LUP) in Kalaupapa (see Figure 10). Site 7 is the nearest to an active runway at approximately 0.5 miles north of MKK. Sites 1 and 3 are within 5 miles of LUP.

POTENTIAL IMPACTS AND MITIGATION MEASURES

During the Draft EA review period, the U.S. Department of Transportation (USDOT) Federal Aviation Administration (FAA) recommended that a glint/glare analysis be conducted if the proposed Project's photovoltaic (PV) system is located within 5 miles of MKK (see letter in Appendix I). The FAA stated in their letter: "PV systems can become a safety issue to pilots and air traffic controllers due to glint/glare. Any glint/glare into Airport Traffic Control Towers is unacceptable. Low levels of glint/glare on the approach/departures for pilots are considered acceptable."

The proposed PV system (approximately 7-10 acres within a 25 acre area of Site 1) is approximately 5.1 miles from MKK. As it is located outside the 5-mile radius of MKK, the proposed PV system is not anticipated to have a significant impact on the safety of flights to and from MKK.

The proposed PV system is located roughly 4.8 miles from LUP. However, LUP is located approximately 18 feet amsl, while the proposed PV site is approximately 1,200 feet amsl. In addition, the flight path between LUP and MKK avoids the solar field because flights must avoid the terrain hazard of the cliffs located between LUP and the solar field. Thus, due to the differences in elevation and its location outside the flight path to LUP, the proposed PV system is not anticipated to have a significant impact on the safety of flights to and from LUP.

4.4 Noise

Ambient noise in the area is moderate and can be attributed to vehicular traffic along the roadways, air traffic of flights to and from Moloka'i Airport (MKK), noise produced by strong winds, as well as agricultural activities.

The proposed Project is anticipated to produce increased noise levels during construction. Several public schools may be affected by noise generated during project construction. The public schools located nearest to Sites 1, 3, 4, 5, 6, and 7 are Kualapu'u Elementary Public Charter School and Moloka'i Middle/High School in Ho'olehua. Portions of Sites 6 and 7 are located near or directly adjacent to the middle/high school. The closest public schools to Site 2 are Kaunakakai Elementary School and the Maui Community College-Moloka'i Education Center located in Kaunakakai.

There are two airports within 10 miles of the seven Sites. Site 7 is the nearest to an active runway at approximately 0.5 miles north of MKK (See Figure 10).

Upon completion of construction activities, it is anticipated that noise levels will be reduced back to pre-construction levels.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Construction noise cannot be avoided. Residential properties are considered noise sensitive areas and construction noise will clearly be audible when construction work takes place. Exposure to noise will vary by construction phase, the duration of each phase, and the type of equipment used during the different phases. Maximum sound levels in the range of 82-96 decibels-weighted [dB(A)] measured at 50 feet from the source would be generated by heavy machinery and pneumatic impact equipment during the site work phase. After site work is completed, reductions in sound levels, frequency, and duration can be expected during actual installation of the pipeline.

Hawai'i Administrative Rules, Title 11, Chapter 46, Community Noise Control regulations establish maximum permissible sound levels for construction activities occurring within "acoustical" zoning districts. Based on the agriculture zoning of the area, the Project is considered to be located in the Class C zoning district for noise control purposes. The maximum permissible daytime sound level in the district is 70 dB(A) all day.

In general, construction activities cannot exceed the permissible noise levels for more than ten percent of the time within any twenty minute period except by permit or variance. Any noise source that emits noise levels in excess of the maximum permissible sound levels cannot be operated without first obtaining a noise permit from the DOH. Although the permit does not attenuate noise per se, it regulates the hours during which excessive noise is allowed.

The general contractor will be responsible for obtaining the permit and complying with conditions attached to the permit. Work will be scheduled for normal working hours (8:00 AM to 3:30 PM) Mondays through Fridays. The contractor will also ensure that construction equipment with motors are properly equipped with mufflers in good operating condition.

Long-term noise levels are not expected to increase, therefore post-construction noise mitigation measures are not required

4.5 Air Quality

Regional and local climate, together with the amount and type of activity generally dictate the air quality of a given location. In the vicinity of the site, winds are predominantly trade winds. During winter, storms may generate strong winds for brief periods.

Generally, air quality in the vicinity is good and meets State and Federal Air Quality Standards. According to the EPA, there are no "non-attainment" areas on the island of Moloka'i (See Section 6, Exhibit S). A non-attainment area is defined as a locality where air pollution levels persistently

exceed National Ambient Air Quality Standards (NAAQS). During the Pre-Assessment Consultation process, the Hawai'i State Department of Health (DOH) Clean Air Branch (CAB) confirmed that the Project is located within an "attainment" area and conforms to the State Implementation Plan, and that the State of Hawai'i is in attainment with the National Ambient Air Quality Standards.

Most of the existing airborne pollutants near the Project sites can be attributed to vehicle-generated exhaust from the region's roadways, fugitive dust and equipment emissions generated by agricultural machinery and activities. Agriculture activities in the area may include the use of fertilizers and/or pesticides. There are several stationary industrial point sources of air pollution in central Moloka'i. These include power generation station, landfill, concrete batch plant, grain and seed processing facilities, and a fuel tank farm. However, the prevailing trade winds carry air pollutants from the island. These winds primarily come from the northeast, although they tend to bend at the eastern end of the island and run parallel to the south shore.

POTENTIAL IMPACTS AND MITIGATION MEASURES

In the long term the Project as proposed is not expected to increase the concentration or location of diesel exhaust emissions generated on site by the existing stationary emergency generator. Currently the generator can only operate for 24 hours before running out of fuel. The quantity of exhaust generated may increase over the status quo during emergency conditions where the generator is required to operate for longer than 24 hours without refueling.

In the short term emissions derived from operation of construction equipment and other vehicles involved in construction activities may temporarily affect the ambient air quality in the immediate vicinity. However, these effects will be minimized through proper maintenance of construction equipment and vehicles. In addition, there may be a temporary adverse impact on air quality attributable to dust generated during the Project construction, particularly earthmoving activity, including clearing and grubbing, excavating, trenching, and filling.

The DOH-Environmental Management Division (EMD) was provided with information regarding this project. In a response letter dated May 10, 2012, DOH-EMD identified construction as well as the removal of A.C. piping as potential sources of fugitive dust and asbestos containing material (ACM).

Air Emissions from Emergency Generator Mitigation Measures Not Required

The DOH Clean Air Branch was contacted as part of the pre consultation process. In a phone conversation on November 6, 2016, a permit engineer on duty confirmed that emissions generated by an emergency generator regardless of the duration of the emergency are exempt from permit requirements based on HAR §11-60.1-62 (d) (7). Additionally, exercise of the generator for non-emergency, maintenance and testing are also exempted in the same section.

Fugitive Dust Mitigation: Frequent water sprinkling may be the most effective dust control measure given the size of the sites and the type and scale of proposed improvements. The Contractor, however, may choose to implement other measures based on their experience with similar projects and job sites. Additional measures could include:

- Landscaping and rapid covering of bare areas;
- Disturbing only the areas of construction that are in the immediate zone of construction to limit the amount of time that the areas will be subject to erosion;
- Provisions for adequate dust control measures during weekends, after hours, and before daily start of construction activities;
- Installation of appropriate structural controls in areas of disturbance; and/or
- Siting of staging areas on impervious surface when possible.

The Contractor will be responsible for general housekeeping of the sites and for keeping adjacent areas free of mud, sediment, and construction litter and debris. Pollution control measures will comply with Hawai'i Administrative Rules, Title 11, Chapter 60.1, Air Pollution Control regulations of the DOH.

ACM Mitigation: Certified contractors will be involved in the inspection, project design, and abatement of ACM. The Asbestos Abatement Office of the DOH-Indoor and Radiological Health Branch will be kept apprised of the Project and will be engaged as necessary once the Project reaches the design phase.

This project is anticipated to have a long-term positive impact on air quality by reducing diesel emissions on Moloka'i. Electricity is provided to Moloka'i consumers by a MECO operated diesel power plant. DHHL's proposed installation of a 1 MW PV system will supply power to PWS230, (the largest power consumer on Moloka'i), reducing the MECO output requirements and thereby, diesel emissions, including carbon dioxide.

Because the island of Moloka'i is in attainment, no additional mitigation measures are required for compliance with NAAQS.

4.6 **Visual Resources**

The project proposes the installation of a new 0.2 MG potable water tank, and 1,000 gallon above-ground fuel tank at Site 1 (Well Site Improvements). These tanks will result in a permanent

modification of the view plane. The new equipment is of similar height and mass to the existing well and reservoir site facilities and is not expected to significantly change the views.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The proposed project involves improvements both above and below grade. The waterlines and related infrastructure will be contained underground. As such, there are no anticipated impacts to the visual resources of the surrounding environment resulting from the below grade improvements.

Meanwhile, the fire hydrants, access roads, fencing, water storage tanks, storage and maintenance facilities, above-ground fuel storage tank, and PV system will be located above grade. As these are improvements to the existing infrastructure, there are no anticipated negative impacts to the visual resources of the surrounding environment. Moreover, as these improvements will effectively replace or repair the aging system, there may in fact be beneficial impacts to the visual resources.

Some initial impact to visual character may occur on a localized scale due to construction activities and the creation of paved surfaces. However, the Project is not anticipated to affect substantially the long-term scenic character of these areas.

4.7 Infrastructure and Utilities

4.7.1 Water System

Department of Hawaiian Home Lands (DHHL) works diligently to provide safe, clean drinking water supplied by the State of Hawaiʻi, DHHL Hoʻolehua Water System Public Water Supply [PWS] No. 230 to native Hawaiian homesteads located in Hoʻolehua-Pālāʻau (Hoʻolehua), Kalamaʻula, and Moʻomomi. However, due to the age of the system, as well as the remote location of the island of Molokaʻi, system-wide improvements are necessary.

According to the 2009 Preliminary Engineering Report for Kualapuʻu School Waterline, prepared for the State of Hawaiʻi Department of Education by Ronald M. Fukumoto Engineering, Inc., water service problems include inconsistent water pressure and lack of fire protection water service, and loss of service. Other difficulties include lack of easements across private land for existing waterlines, undocumented locations of these waterlines, and overgrown maintenance trails.

Hoʻolehua is the only homestead with a dedicated irrigation water system, the Molokaʻi Irrigation System (MIS), in which homesteaders have prior rights to two-thirds of this water as mandated in the Hawaiian Homes Act. The Molokaʻi Irrigation System is owned and operated by the State of Hawaiʻi, Department of Agriculture, and is regulated under Chapter 4-152 of the Hawaiʻi Administrative Rules (HAR). The MIS is a non-potable water supply and is separate from the PWS No. 230 system.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project is anticipated to have a positive impact. The project will improve treatment, storage, and delivery of potable water supplied by the Ho‘olehua Water System (Public Water Supply No. 230) to 2,400 users. It will include a one-megawatt photovoltaic energy production farm, the repair and replacement of aging equipment, and increased fire protection and water storage capacity. It will also improve the maintenance yard facilities, storage, and well site accessibility and security.

Appropriate water resource management strategies will be utilized. Where appropriate, water efficient fixtures will be installed and water efficient practices implemented throughout the development in order to reduce the increased demand on the area’s freshwater resources.

As the proposed project is designed to develop improvements to the existing potable water system, PWS 230, use of the existing water sources (potable water wells numbered 0801-01 and 0801-02) is necessary.

During the Pre-Assessment Consultation process, the Hawai‘i State Department of Land and Natural Resources (DLNR) Commission on Water Resource Management (CWRM) commented that the system sometimes exceeds the over-pumping rate allocation on its water use permit. Although the PWS230 system occasionally exceeds it pumping rate, the quantity of water pumped is significantly below DHHL’s water allocation. The proposed Project is anticipated to improve transmission, storage, and disinfection of the water supply, not increase the pumping rate of the water sources for PWS No. 230. Additionally, the connection of the SCADA system (and new storage tank, energy supply) is expected to improve the efficiency of the system. Currently the system requires operators to visually inspect tanks and manually operate pumps to ensure tanks are full over the weekend. The proposed improvements are expected to automate pumping based on the drop in water levels rather than by visual inspection, evening out pumping rate. It is anticipated that this will reduce spikes in pumping rates that result in the current occasional rate exceedance.

Water demands and calculations will be provided to the DLNR Engineering Division for inclusion in the State Water Projects Plan Update during the design/construction phase of the Project.

Prior to the start of construction, construction plans for the proposed water system improvements will be provided to the Hawai‘i State Department of Health (Safe Drinking Water Branch) for review and approval as required by Hawai‘i Administrative Rules (HAR) Chapter 11-20-30.

As the proposed improvements to Sites 2, 4, 5, 6, and 7 are in close proximity to the Moloka‘i Irrigation System (MIS), the Hawai‘i State Department of Agriculture will continue to be included in the EA review process.

As recommended by the Highways Division of the Maui County Department of Public Works during the Draft EA public comment period, DHHL will coordinate with the Highways Division and

the County Department of Water Supply regarding provision of emergency back-up support of the potable water systems (see letter in Appendix I).

4.7.2 **Wastewater System**

On the island of Moloka’i, wastewater service is provided by Maui County in Kaunakakai Town and the Kualapu‘u subdivision. Wastewater from the Kaunakakai system is conveyed to the County-owned Kaunakakai Wastewater Reclamation Facility for treatment and reuse. Wastewater from the Kualapu‘u system is conveyed to a private wastewater treatment facility owned and operated by Moloka‘i Ranch.

Wastewater in Kalama‘ula and Ho‘olehua-Pālā‘au Homesteads is collected and treated by Individual Wastewater Systems (IWS). Although Kalama‘ula is in close proximity to the County wastewater system in Kaunakakai Town, it is cost prohibitive to connect the area to the existing system. As Ho‘olehua-Pālā‘au is located even farther away, it is similarly not feasible to connect Ho‘olehua to the County wastewater system.

POTENTIAL IMPACTS AND MITIGATION MEASURES

No impact is anticipated. During the Draft EA public comment period, the Wastewater Reclamation Division (WRD) of the Maui County Department of Environmental Management commented that there are no County owned and operated sewer or reclaimed water facilities within the Project areas, and that WRD does not anticipate any potential effects to their infrastructure (see letter in Appendix I).

The proposed improvements to the PWS No. 230 potable water system are not anticipated to involve the disposal of any wastewater. Thus, the proposed project is not anticipated to have any impacts on the Individual Wastewater Systems (IWS) in the area, nor on the Kaunakakai and Kualapu‘u systems.

If conditions change such that wastewater disposal is required, then the wastewater plans will conform to all applicable provisions of the Department of Health (DOH) Administrative Rules, Chapter 11-62, “Wastewater Systems.”

4.7.3 **Drainage System**

Drainage problems on Moloka‘i from runoff during periodic rain and storm events have caused damage to homes and businesses for years. The resulting flooding threatens public health and safety for residents and visitors. A combination of natural and manmade factors contribute to the problem including poorly drained soils in low-lying areas and flat terrain as well as inadequate, incomplete, or poorly maintained drainage systems in Kaunakakai Town (County of Maui Department of Planning, 2015).

Existing drainage systems on Moloka‘i were designed to convey, divert, or retain runoff generated within the vicinity. However, many of these systems are regionally inadequate, and many of the downstream systems (ditches and roadway culverts) are incapable of

accommodating the runoff generated from developed conditions upstream (County of Maui Department of Planning, 2015).

In Kalama‘ula, most of the land makai of Maunaloa Highway is subject to flooding. A flood area also extends into the center of the Kalaniana‘ole Colony where several runoff streams converge. Both Kalama‘ula and Ho‘olehua Homesteads generally lack storm water drainage infrastructure.

POTENTIAL IMPACTS AND MITIGATION MEASURES

As mentioned in Section 3.4 (Hydrology) above, site work includes earthwork activities that will expose soil creating opportunities for runoff and erosion. Trenching, grading, and stockpiling of soil will be performed in accordance with erosion control ordinances of the County, as well as approved grading plans.

In the short-term, there may be a slight increase in the impermeable surface area due to construction. Upon completion of the Project, a majority of the new facilities will be located underground or within existing road rights of way. The above ground facilities are anticipated to decrease permeability on 3.2 acres within the Project boundaries. During the design phase of the Project, a drainage plan will be developed to ensure that run-off quality and quantity are not impacted by the new roadways (Sites 2 and 5) and well site (Site 1) configuration.

Best Management Practices (BMPs) for erosion and drainage control during and after construction will be prepared for review and approval by the County Department of Public Works. In addition, this project will disturb greater than one acre; therefore, a National Pollution Discharge Elimination System (NPDES) General Permit for construction activities will be required.

The Project will also have a positive impact by reducing non-storm water discharges from leaks and catastrophic failures of deteriorating water transmission mains and laterals. Discrepancies between water pumped versus water distributed have been identified. Replacement of deteriorating pipes will reduce system water loss and impact on storm water.

No other mitigation measures are required.

4.7.4 **Utilities**

The Maui Electric Company, Inc. (MECO) supplies electricity for the County of Maui and the Island of Moloka‘i. On Moloka‘i, the power plant is located in Pālā‘au, with a substation at Pu‘unānā. Main transmission voltage is 34.5 kV. Electricity is supplied via overhead transmission lines.

Telephone service is provided to DHHL’s lands by Sandwich Isles Communications, and to non-DHHL lands by Hawaiian Telcom.

Cable television service is provided by Oceanic Time Warner Cable.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The project will reduce energy load on MECO’s power generation facility. Currently standard operations require the PWS 230 system operators to notify MECO when the existing pumps at the well site are switched on due to the high energy demand required at pump start up. The proposed improvements at site 1 including the installation of a one-megawatt PV system with an energy storage component and the replacement of the pumps with new more efficient pumps designed to modulate the initial energy demand will reduce the fluctuating demand requirements placed on MECO’s power generation. This is anticipated to have a positive impact by stabilizing demand.

However, PWS230 is one of MECO’s largest customers on Moloka‘i averaging 3,590.7 kilowatt hours per day between July 24, 2014 and July 24, 2015. The proposed the installation of a one-megawatt PV system with an energy storage component will reduce need for energy supplied by MECO. DHHL is proposing to maintain connection to MECO for redundancy should the PV system, energy storage system, and emergency generator fail. MECO was contacted as part of the pre-consultation, but did not comment. It is not known what if any impact the elimination of the PWS230 account will have on MECO operations

In order to provide electricity for the existing water pumps at Site 1, a one-megawatt PV system will be built on approximately seven acres within a 25-acre area at the well site identified for solar production by DHHL.

4.7.5 **Solid Waste**

The County of Maui Department of Environmental Management (DEM) provides weekly garbage pick-up for a fee and disposes at the County landfill at Pālā‘au and the Moloka‘i-Nā‘iwa Landfill & Recycling Center, located in Maunaloa.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Mitigable impact. In the short-term solid waste generated at the Sites during the construction phase will increase over current conditions. Waste is expected to include materials from construction and grading activities. Efforts will be made to reduce the waste generated during the construction phase and when possible materials/structures will be re-used and/or recycled, in order to minimize the amount of materials that end up in the landfill. In the long-term after the construction phase, the Project will not result in increased generation of solid waste, and is thus not anticipated to adversely impact existing solid waste services on Moloka‘i.

During the Draft EA public comment period, the Solid Waste Division of the Maui County Department of Environmental Management stated that they had no comments regarding the Project (see letter in Appendix I).

4.8 **Hazardous Materials**

The proposed Project will include the installation of an AST that will contain diesel fuel once constructed. The AST is necessary to ensure adequate fuel is available to operate the backup generator.

The following hazards are associated with diesel fuel:

Physical Hazards:	Class II Combustible Liquid
Health Hazards:	Fatal if Swallowed Skin Irritant Suspected Carcinogen Specific Organ toxicity following repeated exposure (Blood, Thymus, Liver)
Environmental Hazards	Toxic to aquatic life

The exhaust generated through diesel combustion is also a health hazard. It is a mixture of gases and particulates. Exposed individuals risk health effects including irritation, headaches, nausea, respiratory disease and cancer.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The installation of an AST containing diesel increases risk of diesel spills at the well site (Site 1).

The quantity of diesel exhaust may increase however the concentration and location of the exhaust generated on site by the existing generator are expected to remain constant. Currently the generator can only operate for 24 hours before running out of fuel. The quantity of exhaust generated is expected to increase over the status quo during emergency conditions where the generator is required to operate for longer than 24 hours without refueling.

Long-term mitigable impacts are anticipated.

<u>Accidental Release of Diesel</u>

The diesel fuel tank will be installed with an integrated secondary containment vault system with leak detection to minimize the risk of releasing diesel fuel into the environment and/or exposing workers to direct contact with the fuel. Security fencing will be constructed to limit access by the public. Based on preliminary engineering the tank system is proposed meet the following requirements:

> A primary tank shall be constructed above ground of "3/16" and enclosed non-metallic insulated secondary containment with a manual leak detection tube with 6" reinforced 5000 psi concrete protection, tested for 2 hour fire, ballistics, vehicle impact and corrosion. The tank system will at a minimum meets U.L. 142, U.L. 2085 insulated secondary containment protected type vented by way of construction, UFC 79-7, NFPA, 30 & 30A, CARB, G-70-116.

Storage, use and disposal will follow the requirements established under the U.S. Emergency Planning and Community Right-to-Know Act (EPCRA), the Superfund Amendments and Reauthorization Act (SARA), and Resource Conservation and Recovery Act (RCRA), and

Occupational Safety and Health Administration (OSHA). Secondary containment will be monitored for releases based on manufacturer recommendations and EPCRA requirements.

Diesel Exhaust

Proper ventilation as well as routine maintenance of the generator can substantially reduce worker exposure to diesel exhaust. Site 1 improvements shall be designed to limit the channeling of emissions from the generator to the workers breathing zone caused construction of new equipment, work areas, etc. DHHL shall ensure that the generator maintenance schedule follows the manufacturer’s guidelines.

In the short-term, construction will necessitate the use of materials of various toxicities. Adhesives, paints, oils, and fuel for equipment are the primary materials that have the potential to be accidentally spilled. The contractor will provide adequate training on topics such as spill prevention and clean up. Certified contractors will address the clean-up of any releases of hazardous materials in compliance with all State and Federal laws.

4.9 Socio-Economic Characteristics

Population on Moloka‘i Island declined slightly (0.8%) to 7,345 persons in 2010, from 7,404 in 2000, with the majority of the decline occurring in the Kalaupapa settlement. Moloka‘i and Lāna‘i Islands were the only islands with declining populations between 2000 and 2010. The majority of the people on Moloka‘i are Native Hawaiians and Other Pacific Islanders. Population with mixed races accounted for 41.1% of the total population in 2010 and was the highest among all islands in the state. The housing vacancy rate was the highest among the islands at 30.5% in 2010, which was an increase of 6.5 percentage points from 2000 (24.0%).

The two Census Designate Places (CDPs) affected by the Project are the Kualapu‘u CDP (which includes Ho‘olehua-Pālā‘au and Mo‘omomi) and Kaunakakai CDP (which includes Kalama‘ula). According to the 2010-2014 American Community Survey 5-Year Estimates, the total population of Kualapu‘u CDP was 2,061, with a median household income of $44,554. It is estimated that 44.1% of the Kualapu‘u CDP families were living below the poverty level. Meanwhile, the total population of Kaunakakai CDP was 3,239, with a median household income of $51,714. It is estimated that 43.9% of the Kaunakakai CDP families were living below the poverty level. Kualapu‘u and Kaunakakai represent the two main population centers of Moloka‘i.

The 2010 U.S. Census documented a population of 1,292 people in Ho‘olehua and 300 people in Kalama‘ula. In these communities, the percentage of the population that is Native Hawaiian is 43.0% and 41.3% respectively. The percentage of Native Hawaiian residents in both communities is significantly higher than rate of Native Hawaiians residents within Maui County and statewide.

The development of 58 of the 417 new residential lots proposed in the MIP are located within the PWS 230 service area. Additionally, the HHC recently lifted its moratorium on subdividing agriculture and pastoral lots, allowing families residing in Kalama’ula and Ho’olehua to subdivide their lots.

The proposed the installation of a one-megawatt PV system with an energy storage component is designed to eliminate the need for energy supplied by MECO except in emergency situations.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The proposed Project is not a population generator. Consequently, there are no anticipated long-term impacts on the socio-economic characteristics of the general population. It is anticipated that improved water service to the community will a beneficial impact on the quality of life for the existing population.

The PWS 230 account generated an average of $1,136.51 daily between July 24, 2014 and July 24, 2015 for MECO. The proposed installation of a one-megawatt PV system with an energy storage component is designed to eliminate the need for energy supplied by MECO except in emergency situations. Therefore the income generated by MECO will be reduced. It is not known what if any impact the elimination of a majority of the income generated on the PWS 230 account will have on MECO personnel requirements on Molokai. MECO was contacted as part of the pre-consultation, but did not comment. The reduction energy cost will have a positive impact on DHHL finances allowing money previously earmarked for energy to be spent on its primary mission of providing homesteading opportunities to native Hawaiians.

The removal of the moratorium is anticipated to impact the PWS 230 water system by increasing the quantity of water needed to service to newly subdivided lots and residences. The Project as proposed will not increase the pumping rate, nor does it include the advancing of a new well. Impacts associated with source development or other options to meet the increased demand resulting from agriculture and pastoral lot subdivisions will need to be explored separately.

4.10 Public Services and Facilities

4.10.1 Schools

The public schools located nearest to Sites 1, 3, 4, 5, 6, and 7 are Kualapu‘u Elementary Public Charter School and Moloka‘i Middle-High School in Ho‘olehua. Portions of Sites 6 and 7 are located near or directly adjacent to the middle-high school. There are no public schools within one mile of Site 2. The closest public schools to Site 2 are Kaunakakai Elementary School and the Maui Community College – Moloka‘i Education Center located in Kaunakakai.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The proposed project is anticipated to produce increased noise levels during construction. The schools noted above may be affected by noise generated during project construction. Measures to mitigate noise impacts during construction are detailed in Section 4.4 (“Noise”) above. Upon completion of construction activities, it is anticipated that noise levels will be reduced back to pre-construction levels.

In the long term, the Project is anticipated to have a beneficial impact on nearby schools, as it will provide improved infrastructure and service of safe, clean drinking water for students and

the broader community. Several PWS230 improvement projects directly impacting the public schools in Ho‘olehua have been evaluated separately from the proposed Project by the DOE.

During the Pre-Assessment Consultation process, the Hawai‘i State Department of Human Services commented that there may be registered child care homes that may be affected by construction activities as part of the proposed project. DHHL will work with the contractors selected for construction to ensure adequate notification of users, including schools and registered child care homes, and will make every effort to minimize service disruptions. In the long term, by improving the reliability of equipment and service, the proposed water system improvements are anticipated to minimize future unscheduled repairs (and associated service disruption) due to equipment failure.

4.10.2 Police, Fire and Medical Services

Police Protection

The Island of Moloka‘i is served by Maui County Police Department officers assigned to the Moloka‘i Police Station, located in Kaunakakai, at 110 Ainoa Street.

Fire Protection

Fire protection services for Moloka‘i are provided by the Maui Fire Department’s Ho‘olehua and Kaunakakai stations. The Ho‘olehua station is located at 2190 Farrington Avenue by Moloka‘i High School, near project Sites 4, 6, and 7. Meanwhile, the Kaunakakai station is situated at 130 Ainoa Street, approximately one mile east of the nearest segment of project Site 2. The Project’s facilities will meet fire code requirements; moreover, additional fire hydrants will be installed.

Medical Services

Moloka‘i General Hospital (MGH), which is part of The Queen’s Health Systems, is located in Kaunakakai, at 280 Home Olu Place. MGH is a critical access hospital as defined by Medicare, furnishing 24-hour emergency services seven days a week. The hospital also provides various other medical services.

POTENTIAL IMPACTS AND MITIGATION MEASURES

A positive impact in anticipated. Improvements such as the installation of new fire hydrants and replacement of deteriorating fire hydrants will enhance Fire Department services, resulting in increased public safety. Where possible, the installation/replacement of fire hydrants will meetthe required fire flows and hydrant spacing for the designated land-use of the areas: Agriculture (minimum 500 gpm with maximum spacing of hydrants at 500 feet) and Rural (1,000 gpm with maximum spacing of hydrants at 500 feet). The installation of the system will follow "Best Engineering Practices" and the National Fire Protection Agency's standard for the installation of private service mains (NFPA 24).

The installation of a fuel containing AST is a mitigable impact. The AST proposed for installation

at Site 1 requires a permit through the Maui County Fire Department’s Fire Prevention Bureau. The flammable and combustible tank installation permit will be obtained prior to installation.

4.10.3 Recreational Facilities

County parks in central Moloka‘i include Kualapu‘u Park and Recreational Center in Kualapu‘u (near project Sites 3, 4, and 6), as well as six parks in Kaunakakai: Pu‘u Hauole Park, Kaunakakai Lighthouse/Mālama Park, Mitchell Pau ‘Ole Community Center, Cooke Memorial Pool, Kaunakakai Ball Park, and the Duke Maliu Regional Park. In addition, Pālā‘au State Park is located northeast of Kualapu‘u.

Kualapu‘u Park is within 0.5 miles of a segment of project Site 3, and approximately 0.6 miles from Site 6. Pu‘u Hauole Park and the Kaunakakai Lighthouse/Mālama Park are both within 0.5 miles of project Site 2. See Figure 11.

POTENTIAL IMPACTS AND MITIGATION MEASURES

No impact. The project is not anticipated to adversely impact the existing recreational facilities in the area.

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5 LAND USE CONFORMANCE

State of Hawai‘i and Maui County land use plans, policies, and ordinances relevant to the Project are described below.

5.1 State of Hawai‘i

5.1.1 State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

The State Land Use Law (Chapter 205, HRS), establishes the State Land Use Commission (LUC) and authorizes this body to designate all lands in the State into one of four Districts: Urban, Rural, Agricultural, or Conservation.

All of the Project sites are located within the State Agricultural District with the exception of portions of Site 2 (improved water facilities and water lines). Portions of Site 2 are located within the State Rural and Conservation Districts in Kalama‘ula/‘Umipa‘a. Pursuant to the Hawaiian Homes Commission Act (HHCA) §206, Hawaiian home lands are not subject to land use controls by the State or County. Notwithstanding, the Project is a permitted use within the State Rural, Agricultural and Conservation Districts as public utility facilities (HRS §205-4.5(a) (7)). See Figure 12.

5.1.2 DHHL Planning System and Land Use Designations

DHHL has developed a three-tiered planning system to guide planning of its land holdings and policies for resource management, for the benefit of current and future beneficiaries. The planning system includes an over-arching General Plan, followed by Strategic Program Plans and Island Plans in the second tier and Regional and Development Plans in the third tier. Specific goals, objectives, policies, and implementing actions of DHHL planning system applicable to the proposed Project are discussed below

5.1.2.1 General Plan

The General Plan, approved by the HHC in February 2002 is a statewide plan with a long-term perspective that established seven categories of goals and objectives to meet DHHL’s mission. The seven categories are: Land Use Planning, Residential Uses, Agricultural and Pastoral Uses, Water Resource, Land Resource Management; Economic Development,; and Building Healthy Communities. The following water resource goals and relevant to the Project

> *Provide Access to quality water in the most cost effective and efficient manner*
>
> *Land and Resource Management*
>
> *Be responsible, long-term stewards of the Trust’s lands and the natural, historic and community resources located on these lands.*

5.1.2.2 Strategic Program Plans

The Strategic Program Plans provide strategic direction, implementing actions, and budgets for major program areas based on the goals and objectives of the General Plan. They provide specific objectives and work tasks for the near-term 3-5 year period. Strategic Program Plans exist or are in development for four program areas: native Hawaiian development, energy, water and agriculture. Two of the four strategic program areas, energy and water are applicable to the development of the proposed Project.

Hoʻomaluō Energy Policy Plan
In 2009, Hoʻomaluō, DHHL's energy policy was adopted. It was created to facilitate native Hawaiians and the broader community in working together to lead Hawaiʻi's effort to achieve energy self-sufficiency and sustainability. The following energy policy objectives are relevant to the proposed Project.

Mālama ʻāina (Respect and protect our native home lands)

Koʻo (Facilitate the use of diverse renewable energy resources)

Water Policy Plan
The Water Policy Plan was adopted in 2014. It provides policy direction for DHHL and the Hawaiian Homes Commission on all water-related matters based on the vision, mission and set of values adopted by the Commission. DHHL has distinct water rights based on the HHCA, the State Constitution, State statutes and case law. The main water responsibilities are to develop sources, to manage systems, to plan for water requirements and advocate for rights. The Water Policy Plan guides the HHC and DHHL in making both short and long term decisions. The following water policy goal is relevant to the proposed Project.

Manage water Systems

5.1.2.3 Molokaʻi Island Plan

The Molokaʻi Island Plans was developed to provide recommendations for the use of 25,899 acres with homestead development identified as the top priority. This plan has a long-term perspective (around 20 years with an update at 10 years). It established land use goals and objectives based on the General Plan, developed land use designations to meet the needs of DHHL that also ensure proper stewardship of the ʻāina.

Land Use Designations

DHHL is not subject to the County of Maui, nor the State Land Use Commission guidelines, zoning regulations, or other land use designations when developing lands for homesteading or other uses. Being exempt from these regulations provides DHHL with the opportunity as well as the responsibilty to ensure that DHHL's designated land uses are appropriate and meet the tenets of the HHCA.

DHHL landholdings are categorized into ten different land use designations. These land uses are summarized in Table 5-1. There are four homesteading designations: Residential, Subsistence Agriculture and Supplemental Agriculture and Pastoral. The remaining six are non-homesteading designations. The non-homesteading designations are General Agriculture, Special District, Community Use, Conservation, Commercial and Industrial. While the latter two designations are utilized primarily to generate revenue in support of DHHL, all non-homesteading designations can provide income generation. Project actions are proposed on lands designated Residential, Subsistence Agriculture, Supplemental Agriculture, General Agriculture, Special District, Community Use and Commercial (See Figure 13). Utility improvements are allowed within in all 10 Land Use designations.

5.1.2.4 Moloka‘i Regional Plan

The Regional Plans are developed through a series of meetings with beneficiaries and stakeholders to identify issues and opportunities that affect that region. By proactively engaging the community on regional issues and developing priorities through beneficiary consensus, DHHL is able to affect development rather than reacting to actions by other organizations. The Moloka‘i Regional Plan, updated in 2010, has a short-term focus. Five regional priority projects were identified in 2010. Two priority projects are applicable to the Project.

Alternative Energy Initiative

Conduct Water Pressure Testing in Kalama‘ula

Discussion: The Project is designed to improve the existing PWS230 water system and supports goals, objectives, and priorities developed as part of the DHHL Planning System. The improvements to the SCADA system are designed to increase efficiency in automation while the installation of the 1 MW PV energy systems improves cost efficiency. New transmission lines in Kalama‘ula are proposed to address water pressure. The replacement of deteriorating lines, valves and hydrants improves DHHL’s ability to effectively deliver potable water and increase safety and security. These improvements support the goals of the DHHL General Plan, the Water Policy’s management goal, the Ko‘o objective of the Energy policy, appropriate land use as designated in the Island Plan , and the water pressure and renewable energy priority projects identified in the Island of Moloka‘i Regional Plan.

Table 5-1: DHHL Land Use Designations

Land Use Designation	Setting, Intent, Purpose†	Lot Size	Minimum Infrastructure
HOMESTEADING USES			
Residential	Residential lot subdivisions built to County standards in areas close to existing infrastructure. Residential waiting list.	1 acre or less	Water (potable), all utilities, road access (paved), County standards
Subsistence Agriculture	Small lot agriculture. Close proximity to existing infrastructure. Lifestyle areas intended to allow for home consumption of agricultural products.	5 acres or less *(min. 10,000 sq. ft.)*	Water (catchment, potable or surface); road access (unpaved)
Supplemental Agriculture	Large lot agriculture. Intended to provide opportunities for agricultural production for supplemental income and home use. Agriculture waiting list.	40 acres or less	Water (catchment or surface); road access (unpaved)
Pastoral	Large lot agriculture specifically for pastoral uses. Ranch plan and fencing required. Pastoral waiting list.	1,000 acres or less	Water (for livestock) and road access (unpaved)
NON-HOMESTEADING USES			
General Agriculture	Intensive or extensive farming or ranching allowed. May serve as an interim use until opportunities for higher and better uses become available.	To be determined	N/A
Special District	Areas requiring special attention because of unusual opportunities and/or constraints, e.g. natural hazard areas, open spaces, cultural resources, raw lands far from infrastructure, mixed use areas, and greenways.	To be determined	To be determined
Community Use	Common areas for community uses and public facilities. Includes space for parks and recreation, cultural activities, community based economic development, utilities, and other public facilities and amenities.	To be determined	County Standards
Conservation	Environmentally sensitive areas. Lands with watersheds, endangered species, critical habitats, sensitive historic and cultural sites, other environmental factors. Very limited uses.	To be determined	N/A
Commercial	Lands suitable for retail, business, and commercial activities.	To be determined	County Standards
Industrial	Lands suitable for processing, construction, manufacturing, transportation, wholesale, warehousing, and other industrial activities.	To be determined	County Standards

† Land Use Designations are utilized Statewide.

5.1.3 Coastal Zone Management Act, Chapter 205A, Hawai'i Revised Statutes

Portions of Site 2 of the Project are located within the Special Management Area (SMA) (see Figure 14). Moreover, since the entire state is defined to be within the Coastal Zone Management Area, pursuant to Hawai'i Revised Statutes (HRS) 205A-1, a discussion of the Project's ability to meet the objectives and policies set forth in HRS 205A-2, is provided below.

5.1.3.1 Recreational Resources

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

Policies

- *(A) Improve coordination and funding of coastal recreational planning and management; and*
- *(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:*
  - *(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;*
  - *(ii) Requiring replacement of coastal resources having significant recreational value including, but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;*
  - *(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;*
  - *(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;*
  - *(v) Ensuring public recreational uses of County, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;*
  - *(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;*
  - *(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and*
  - *(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and County authorities; and crediting such dedication against the requirements of section 46-6;*

Discussion: As public utility infrastructure, the proposed project does not provide recreational resources, and is not located directly on the coastline; therefore, policies regarding shoreline recreation resources are not applicable; however, to protect marine resources for purposes

including recreation, the State of Hawai'i has adopted water quality standards. Generally, these standards will require the submittal and adherence to a National Pollution Discharge Elimination System (NPDES) permit. This permit requires compliance with best management practices during construction to minimize soil erosion into adjacent waterways. The NPDES permit will also include requirements to maintain water quality during operation. A NPDES permit will be required for the proposed project. These measures will help ensure protection from pathogens during recreational contact in State waters, in accordance with HAR §11-54-8 regarding recreational criteria for all State waters. The Project will meet all potable water standards and conduct testing, notification, etc., as required as part of the operation of PWS 230 by DOH Clean Water Branch.

5.1.3.2 Historic Resources

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

Policies

(A) Identify and analyze significant archaeological resources;

(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and

(C) Support state goals for protection, restoration, interpretation, and display of historic resources;

Discussion: Efforts will be made to protect, preserve, and, where desirable, restore natural and manmade historic and prehistoric resources in the Project sites that are significant in Hawaiian and American history and culture. Preservation has been proposed for sites and is detailed in Section 4.1, Archaeological and Historical Resources. A portion of project located within Site 2 includes the replacement of transmission line within a roadway adjacent to Kapuāiwa coconut grove. It is considered a sacred-storied place as the grove of trees was planted by and for Kamehameha IV, (Kapuāiwa). Kapuāiwa is actively managed by DHHL. Access into the historic wahi pana is not required for this Project, nor will the proposed actions affect access to Kapuāiwa. Neither short-term construction nor long term maintenance of the transmission line will affect Kapuāiwa.

5.1.3.3 Scenic and Open Space Resources

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

Policies

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

Discussion: Since the majority of the proposed project sites are located inland, away from the shoreline, there will be no effect on the quality of the coastal open space and scenic resources. The proposed improvements to segments of Site 2 that are located near the shore will involve the replacement of existing underground valves, transmission mains and laterals with underground valves, transmission mains and laterals. The above ground fire hydrants proposed in Site 2 will replace existing hydrants and will be of similar scale and weight to the existing. No long-term impacts to coastal open space and scenic resources are anticipated.

5.1.3.4 Coastal Ecosystems

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

Policy A: Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

Policy C: Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

Policy D: Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

Policy E: Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion: Construction will require earth moving activities, however no actions are proposed within existing streams or waterways. Project actions are not anticipated to meet requirements for the application of either State stream channel alteration permit or ACOE 404 permits. NPDES and grading permits will be obtained and requirements followed during construction to mitigate potential nonpoint source runoff during construction and Low Impact Design (LID) drainage measures will promote infiltration over runoff through swales and other means (see section 4.7.3). A major component of this water system improvement project is the replacement of

existing deteriorating water transmission mains and laterals. Large release of any liquid, including potable water can disrupt the delicate balance of the coastal ecosystem by changing salinity, temperature and chemical composition. The replacement of pipes (particularly those within Site 2) some of which contain asbestos cement (A.C.) will control on-going releases at unknown locations occurring through deteriorating pipe walls (non-point source). The replacement of A.C. piping will reduce asbestos released from the operation of PWS 230 when compared to current conditions, in compliance with HAR §11-54-4 regarding basic water quality criteria applicable to all waters. No new industrial discharges with the exception of flushing of potable water from new hydrants are proposed as part of the project. The replacement of A.C. piping also reduces the potential for catastrophic pipe failure (point-source pollution) of deteriorating pipes that could result in a large influx of non-saline water to the coastal environment supporting this objective.

5.1.3.5 Economic Uses

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

Policy A: Concentrate coastal dependent development in appropriate areas;

Policy B: Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

Policy C: Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(i) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

(iii) The development is important to the State's economy.

Discussion: The proposed project provides improvements to public utility facilities and supports the conversion to clean energy. Both actions are important to the State's economy, thereby supporting this objective.

5.1.3.6 Coastal Hazards

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Policy A: Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and non-point source pollution hazards;

Policy B: Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and non-point source pollution hazards;

Policy C: Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

Policy D: Prevent coastal flooding from inland projects.

Discussion: Most of the Project sites are located inland, away from potential coastal hazards. However, segments of the makai portion of Site 2 are located in the tsunami evacuation zone.

As portions of the Project are located in Flood Hazard Zones, compliance with rules and regulations of Title 44 of the Code of Federal Regulations (CFR) and Maui County Code is necessary. The proposed actions located in these flood hazard areas (replacement of existing transmission pipes, in-line valves, and fire hydrants) will replace aging equipment, reducing potential for leaks that can exacerbate naturally occurring flooding.

The project's impact in relationship to natural hazards is discussed in section 3.5.

5.1.3.7 Managing Development

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

Policy A: Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

Policy B: Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

Policy C: Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Discussion: Opportunity for public input was provided through this environmental assessment process. Pre-assessment consultation was conducted (comments and responses reproduced in Appendix B). In addition, this EA discusses potential impacts and mitigation measures of the proposed project and provided an opportunity for input during the Draft EA Public Comment period (comments and responses reproduced in Appendix I).

5.1.3.8 Public Participation

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

Policy A: Promote public involvement in coastal zone management processes;

Policy B: Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

Policy C: Organize workshops, policy dialogues, and site- specific mediations to respond to coastal issues and conflicts.

Discussion: Opportunity for public input was provided during the environmental assessment process, as discussed in the preceding section.

5.1.3.9 Beach Protection

Objective: Protect beaches for public use and recreation.

Policy A: Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

Policy B: Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

Policy C: Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion: The majority of the proposed project sites are located inland, away from the shoreline. The proposed improvements to segments of Site 2 near the shore will be located inland from the shoreline setback, and will not involve any structures seaward of the shoreline. As such, the proposed project supports this objective to protect beaches for public use and recreation.

5.1.3.10 Marine Resources

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

Policy A: Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

Policy B: Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

Policy C: Assert and articulate the interests of the State as a partner with Federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

Policy D: Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

Policy E: Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion: To protect marine water quality, the Project will be designed and built in compliance with all applicable Federal, State, and County regulations pertaining to storm water management (see section 4.7.3).

5.1.4 Hawai'i State Plan

The Hawai'i State Plan (Chapter 226, HRS), establishes a set of goals, objectives and policies that serve as long-range guidelines for the growth and development of the State. Objectives and policies pertinent to the proposed project are as follows:

§226-13 Objectives and policies for physical environment – land, air, and water quality.

Objectives: *(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources. (2) Greater public awareness and appreciation of Hawaii's environmental resources.*

Policies related to land, air, and water quality:

(1) Foster educational activities that promote a better understanding of Hawaii's limited environmental resources.
(2) Promote the proper management of Hawaii's land and water resources.
(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters.
(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaii's people.
(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.
(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.
(7) Encourage urban developments in close proximity to existing services and facilities.

(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaii’s people, their cultures and visitors.

Discussion: The Project is consistent with and implements the objectives and policies related to water quality. The purpose of this project is to improve treatment, storage, and delivery of potable water supplied by the DHHL’s Ho‘olehua Water System (Public Water Supply [PWS] No. 230) to native Hawaiian homesteads and the broader community of Moloka‘i. As such, the proposed project helps maintain and improve water quality, while also promoting the proper management of Moloka‘i’s water resources. To protect marine water quality, the Project will be designed and built in compliance with all applicable Federal, State, and County regulations pertaining to storm water management and hazardous material storage. NPDES and grading permits will mitigate potential nonpoint source runoff during construction and Low Impact Design (LID) drainage measures will be incorporated into the Project design particularly at Site 1, the maintenance yard improvements in Site 7, and the roadways proposed for Sites 2, 4, and 6.

§226-16 Objective and policies for facility systems – water

Objective: *Planning for the State’s facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.*

Policies related to water facility systems:

(1) Coordinate development of land use activities with existing and potential water supply.
(2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.
(3) Reclaim and encourage the productive use of runoff water and wastewater discharges.
(4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.
(5) Support water supply services to areas experiencing critical water problems.
(6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs.

Discussion: The Project is consistent with and implements the objective and policies related to water facility systems. The proposed project assists in improving the quality, efficiency, service, and storage capabilities of water systems for domestic use within native Hawaiian homesteads in the PWS 230 service area and the broader community of Moloka‘i. The Project also supports water supply services to areas experiencing critical water problems by replacing critical system components that have exceeded the recommended estimated useful life.

5.2 County of Maui

County-specific land use plans and ordinances pertaining to the Project include the County of Maui 2030 General Plan – Countywide Policy Plan (2010), Moloka‘i Community Plan (2001), and zoning code (Maui County Code Title 19). Pursuant to the Hawaiian Homes Commission Act (HHCA) §206, Hawaiian home lands are not subject to land use controls by the State or County.

5.2.1 General Plan

As required by the County of Maui Charter, the General Plan sets forth the desired sequence, patterns, and characteristics of future development. This is accomplished through long-range objectives focusing on the social, economic, and environmental effects of development coupled with specific policies designed to implement the objectives. The Countywide Policy Plan, adopted in 2010 as part of the update to the 1990 General Plan, presents a comprehensive policy plan for the islands of Maui County to the year 2030, and provides broad goals, objectives, policies, and implementing actions – organized around core themes – that portray the desired direction of the County’s future.

Specific objectives and policies applicable to the proposed Ho‘olehua water system improvements are discussed below.

Core Theme I: Improve Physical Infrastructure

Goal: *Maui County’s physical infrastructure will be maintained in optimum condition and will provide for and effectively serve the needs of the County through clean and sustainable technologies.*

Objective 1: *Improve water systems to assure access to sustainable, clean, reliable, and affordable sources of water.*

Policies:

b) Develop and fund improved water-delivery systems.
e) Retain and expand public control and ownership of water resources and delivery systems.
f) Improve the management of water systems so that surface-water and groundwater resources are not degraded by overuse or pollution.

Discussion: The Project is consistent with and implements the objective and policies related to water systems. The proposed project assists in improving the quality, efficiency, service, delivery, storage capabilities as well as overall management of the PWS 230 water system for domestic use.

Objective 3: *Significantly increase the use of renewable and green technologies to promote energy efficiency and energy self-sufficiency.*

Policies:

a) Promote the use of locally renewable energy sources, and reward energy efficiency.
d) Encourage small-scale energy generation that utilizes wind, sun, water, biowaste, and other renewable sources of energy.
e) Expand renewable-energy production.
i) Promote the retrofitting of existing buildings and new development to incorporate energy-saving design concepts and devices.
j) Encourage green footprint practices.
k) Reduce Maui County's dependence on fossil fuels and energy imports.
l) Support green building practices such as the construction of buildings that aim to minimize carbon dioxide production, produce renewable energy, and recycle water.
m) Promote and support environmentally friendly practices in all energy sectors.

Discussion:

The Project includes modifications to the energy system at Site 1, with the proposed installation of a one-megawatt PV system including an energy storage component. The system will be comprised of approximately 3,500 to 4,000 fixed ground-mounted PV panels built on approximately 7-10 acres. The new, more efficient PV system will replace MECO as the primary energy supplier to the pumps at the site. The 1-MW system will provide renewable electricity that reduces carbon dioxide emissions generated on Moloka'i. This is consistent with the objective and policies related to renewable and green technologies to promote energy efficiency and self-sufficiency.

Objective 4: *Direct growth in a way that makes efficient use of existing infrastructure and to areas where there is available infrastructure capacity.*

Policies:

a) Capitalize on existing infrastructure capacity as a priority over infrastructure expansion.
c) Utilize appropriate infrastructure technologies in the appropriate locations.

Discussion: The project is consistent with the objective and policies regarding capitalizing on and utilizing existing infrastructure capacity. The project repairs and augments the existing, aging water infrastructure, and utilizes appropriate infrastructure technologies in the appropriate locations, in order to improve the quality, efficiency, and delivery of water service to the community.

Objective 5: *Improve the planning and management of infrastructure systems.*

Policies:

a) Provide a reliable and sufficient level of funding to enhance and maintain infrastructure systems.
d) Maintain inventories of infrastructure capacity, and project future infrastructure needs.

e) Require social-justice and –equity issues to be considered during the infrastructure-planning process.
f) Discourage the development of critical infrastructure systems within hazard zones and the tsunami-inundation zone to the extent practical.
h) Ensure that basic infrastructure needs can be met during a disaster.
j) Promote the undergrounding of utility and other distribution lines for health, safety, and aesthetic reasons.

Discussion: The project is consistent with the objective and policies regarding improving the planning and management of water infrastructure systems. The project would provide a reliable and sufficient level of funding to enhance and maintain water infrastructure systems while considering present capacity and future infrastructure needs.

Social-justice and social-equity issues have been taken into consideration throughout the infrastructure-planning process, as the communities was identified in the 2010 census as having higher than statewide averages of Native Hawaiians and multiple criteria for low income communities, including high poverty and unemployment rates. The project would help to alleviate inequities in access by providing reliable, quality potable water, and improving fire protection in areas previously lacking access to one or both.

The majority of the Project sites are not located within hazard zones or tsunami-inundation zones. Although portions of Site 2 are located within areas designated as Flood Zones A, AE (1% annual chance flood), or XS (0.2% annual chance flood), the improvements will enhance the resilience of the water system and its ability to ensure that basic infrastructure needs can be met in the event of a disaster. The majority of the actions within Site 2 are located below grade and will not be impacted tsunami inundation or flooding.

5.2.2 Moloka'i Community Plan

The *Moloka'i Community Plan* (County of Maui 2001) is one of nine community plans for Maui County. It reflects current and anticipated conditions for the Moloka'i planning region and advances planning goals, objectives, policies, and implementation considerations as a decision-making guide in the region through the year 2010. The *Moloka'i Community Plan* provides specific recommendations addressing the goals, objectives, and policies contained in the *General Plan*, while still recognizing the values and unique attributes of Moloka'i enhancing the region's overall living environment. Specific goals, objectives, policies, and implementing actions of the *Moloka'i Community Plan* applicable to the proposed Project are discussed below (see Figure 15).

Infrastructure

Goal: *Culturally and environmentally sensitive infrastructure systems, developed and maintained in a timely fashion, which protect and preserve the safety and health of Moloka'i's residents and visitors.*

Objectives and Policies (Water):

1) *Future water allocations for agriculture/aquaculture and Hawaiian Home Lands use should be given first priority and then consideration should be given to other viable economic development initiatives.*
2) *Provide adequate and competitively priced irrigation water to agricultural lands without altering or endangering fresh water streams.*
3) *Improve current water quality and distribution system and develop new water sources for the Moloka'i Community Plan area without taking water from Pelekunu and Wailau Valleys.*
4) *Develop improved transmission and/or storage systems to provide better fire protection.*
5) *Promote programs for water conservation as well as ground water and wellhead protection.*
6) *Recognize Hawaiian water rights.*
7) *Establish a Moloka'i Water Advisory Committee to the Commission of Water Resource Management to better address Moloka'i water issues on Moloka'i.*

Implementing Actions:

1) *Amend building code requirements to require the installation of water conservation devices (i.e., irrigation systems, toilets, shower and faucet heads, etc.)*
2) *Update and revise the current Moloka'i Water Use and Development Plan to include the recommendations of the 1993 Moloka'i Working Group Report.*

Discussion: The project is consistent with the community plan objectives and policies regarding water infrastructure systems. In particular, the Project will improve the current water quality and distribution system for the community, and will also improve the provision of fire protection in areas with deteriorated fire hydrants, or without any fire protection at all.

Department of Hawaiian Home Lands

Goal: *The timely implementation of programs and settlement of Native Hawaiians on Department of Hawaiian Home Lands.*

Objectives and Policies:

1) *Encourage and support planning and implementation of Department of Hawaiian Home Lands projects that benefit native Hawaiians.*
2) *Ensure a water supply which will support the development of Department of Hawaiian Home Lands projects.*
3) *Recognize and support the “first call” allocation of water resources for Department of Hawaiian Home Lands projects.*
4) *Encourage cooperative planning programs with the native Hawaiian community in order to foster a desired lifestyle and perpetuate the culture.*
5) *Encourage the development of cooperative planning programs between the County and the Department of Hawaiian Home Lands to ensure that infrastructure and public service needs adequately address the needs of the entire Moloka‘i community.*
6) *Encourage the development of cooperative agricultural development programs between the County and the Department of Hawaiian Home Lands to support diversified agricultural pursuits (i.e., programs, for example, which may identify opportunities for creating efficiencies in scale which will benefit all Moloka‘i farmers).*
7) *Support educational facilities and programs development by the Department of Hawaiian Home Lands.*

Implementing Actions:

1) *Create a Department of Hawaiian Home Lands – County Task Force to study and identify opportunities for developing cooperative programs and projects.*
2) *Support the development of alternate subdivision standards for infrastructure which insures the health, safety and welfare but also is consistent with the desired lifestyle of the Native Hawaiian community and the reduction of construction costs.*

Discussion: The project is consistent with and implements the community plan objectives and policies regarding Department of Hawaiian Home Lands programs and homestead. The project will ensure a water supply which is supportive of DHHL projects that benefit not only native Hawaiians, but also the broader Moloka‘i community.

5.2.3 **Zoning**

Title 19 of the Maui County Code provides the zoning provisions for all of Maui County, including the District of Moloka‘i. However, pursuant to HHCA §206, Hawaiian home lands are not subject to zoning or other land use controls by the County.

5.3 Approvals and Permits

The table below lists the anticipated permits and approvals required for the Project:

Table 5-2: Anticipated Approvals and Permits

Permit/Approval	Responsible Agency
NEPA Compliance	U.S. Department of Agriculture and U.S. Housing and Urban Development
Chapter 343, HRS Compliance	State Department of Hawaiian Home Lands Office of Environmental Quality Control
Historic Preservation, Section 106	State Historic Preservation Division
Chapter 6E, HRS Compliance	
National Pollutant Discharge Elimination System (NPDES) Permit	State Department of Health
Noise Permit	
Construction Plan Review/Approval	
ADA Compliance	
Grubbing, Grading, and Stockpiling Permits	Maui Department of Public Works
Plan Approval, Building Permits (including electrical, plumbing, civil, and demolition)	
Road Closure Approval	
Occupancy	
Sole Source Aquifer Review	U.S. Environmental Protection Agency
CZM Federal Consistency Review	State, Office of Planning
Special Flood Hazard Area Permit	Maui Department of Planning
Flammable & Combustible Tank (Fuel AST) Installation Permit	Maui County Fire Department
Road Closure approval	State of Hawai‘i, Department of Transportation

6 ALTERNATIVES

This section identifies and evaluates a range of alternatives that could meet the purpose and need and possibly avoid, reduce, or minimize adverse environmental effects. The reference point to compare alternatives is the “no action” alternative.

6.1 No Action Alternative

The “no action” alternative will not require any construction activities or new improvements. PWS would continue to deteriorate and system failures would be repaired as they occur.

The existing generator has a limited fuel supply. Hurricanes, tsunamis, and other less catastrophic events can and have caused extended power outages. During extended power outages which periodically occur, the system is unable to supply water to the community without additional fuel or alternate sources of energy. The water system would likely continue to experience water outages during high flows and would be unable to meet the required fire flows under the no action alternative. Additionally, the distribution system and pumps would continue to deteriorate resulting in water losses via leaks and loss of service due to pump failure.

6.2 Water Supply Alternatives

Connecting to an additional water supply source was considered as an alternative to improving the existing system. However, the PWS No. 230 is already connected to all adjacent water systems, which already have taxed capacities. During water shortages or outages, the interconnected water systems rely on each other for support. In order to address PWS No. 230’s capacity requirements, the adjacent water systems would need to be substantially upgraded. Due to the complexity of connecting to other water systems, time, coordination, project planning, and costs this option was considered technically infeasible.

Dedicating the entire water system to the County DWS was also considered; however, the HHCA prohibits this action without an act of the U.S. Congress. Additionally, the County DWS would need to accept the DHHL water system and they typically only accept water systems that meet all county water standards and are in new condition. Due to the complexity of transferring the water system to the County DWS, the time, coordination, Act of Congress, project planning, and costs associated with this option, this option was also determined to be technically infeasible.

6.3 Alternative Design, Full Build-out

This alternative proposes improvements that would provide the infrastructure necessary to support full build-out of the Ho‘olehua and Kalama‘ula communities as well as meeting the increased demand resulting from agriculture and pastoral lot subdivisions. In addition to improvements proposed in the preferred alternative, the following would also be included. To accommodate future demand on the system, exploration and development of new water sources and wells within the Kualapu’u Aquifer would be necessary. At a minimum a third well should be developed to provide additional capacity. An emergency generator and 1,000 gallon above

ground fuel storage tank would be installed at the new well site to provide back up power should the primary power supply fail. An upgraded treatment facility with adequate space for storage of disinfection chemicals and safety improvements would be integrated into the design. Additional storage would be necessary to meet water demand in Kalama‘ula. Full buildout would require an increase in storage capacity by a minimum of 800,000 gallons over the Project as proposed, or 1 MG over the no-action alternative. The proposed full buildout alternative would vastly improve the existing water system at a design and construction cost of $39,000,000. DHHL must balance the needs of existing lessees on Moloka‘i with the needs of lessess on the other islands, the pool of nearly 40,000 applicants awaiting leases as well as managing over 200,00 acres of land. While DHHL is securing various funding sources to offset the cost of improvement to PWS 230, it cannot allocate such a large portion of trust resources over the next five to six years to the benefit of just the lessees and other users in Ho‘olehua and Kalama‘ula.

7 FINDINGS AND DETERMINATION

To determine whether the proposed improvements to the DHHL Ho‘olehua Water System, Public Water System No. 230 (PWS No. 230) may have a significant impact on the physical and human environment, all phases and expected consequences of the Project have been evaluated, including potential primary, secondary, short-range, long-range, and cumulative impacts. Based on this evaluation, the Proposing Agency (Department of Hawaiian Home Lands) anticipates issuing a Finding of No Significant Impact (FONSI). The supporting rationale for this finding is presented in this chapter.

7.1 Significance Criteria

The discussion below evaluates the significance of the Project’s impacts based upon the significance criteria set forth in Hawai‘i Administrative Rules section 11-200-12. An action shall be determined to have a significant impact on the environment if it meets any one of the following criteria:

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

Discussion: The proposed Project will improve the existing potable water system. Project components will primarily replace existing infrastructure and road right-of-ways. New fire protection, will be located along existing utility lines. The new PV energy system and tanks are proposed adjacent to the existing built area surrounding the well site. The proposed Project is not anticipated to involve any construction activity that may lead to a loss or destruction of any natural or cultural resource. Site investigations revealed the absence of any resources potentially subject to irrevocable loss as a result of construction. The 7 Sites have been the subject of flora/fauna and archaeological investigations. As discussed in Section 3 of this report, the proposed Project is not expected to have a significant adverse impact on any state or federally listed plant or animal species. As discussed in Section 4 of this report, the proposed Project is not expected to have a significant impact on archaeological resources. During the design phase, plans will be developed to ensure archaeological resources identified in Site 2 are avoided. Additional on-site monitoring will ensure that any identified archaeological sites are not affected by construction activity.

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

Discussion: The proposed water infrastructure improvements will not curtail the range of beneficial uses of the environment. Rather, the improvements will allow for more efficient use of water resources. The current use of the Sites will not change as a result of this project.

(3) Conflicts with the State's long term environmental policies or goals and guidelines as expressed in Chapter 344, HRS; and any revisions thereof and amendments thereto, court decisions, or executive orders;

Discussion: The proposed Project conforms to the environmental goals and policies set forth in HRS Chapter 344. Improvements to the water system are particularly supportive of the State’s

Environmental Policy to conserve natural resources, promote the general welfare, and maintain conditions under which humanity and nature can co-exist [§344-3(1)].

(4) Substantially affects the economic or social welfare of the community or State;

Discussion: The proposed Project provides economic and social welfare benefits to the surrounding community by providing an essential public utility while substantially reducing energy cost required for delivery.

(5) Substantially affects public health;

Discussion: The proposed Project will improve the health, sanitation and security of the potable water system, thereby enhancing public health. There will be temporary impacts to noise and air quality levels during the construction phase of the Project; however, these potential impacts will be short-term and are not expected to substantially affect public health. All construction activities will comply with applicable regulations and will implement appropriate mitigation measures. After construction, the development should have minimal impact on ambient noise levels or air and water quality.

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

Discussion: The proposed Project will not result in substantial secondary impacts such as population changes, nor will it place additional infrastructure demands on existing roads, wastewater, or drainage systems. The proposed Project will enhance and improve potable water system service for the community.

(7) Involves a substantial degradation of environmental quality;

Discussion: As discussed in Chapter 3, the proposed Project is not anticipated to have significant adverse impacts on the region's geology, surrounding topography, soil quality, or hydrology. The proposed project will allow DHHL to provide to eligible native Hawaiians a clean and safe environment with the improvements, including water and fire protection, installed in conformance with appropriate State and County environmental standards.

(8) Is individually limited but cumulatively has considerable effect on the environment, or involves a commitment for larger actions;

Discussion: The proposed Project is to improve the existing water system The Project is not part of a larger project, nor does it commit the State to any other larger actions, and will not generate any additional actions having a cumulative effect on the environment..

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

Discussion: As discussed in Chapter 3, the proposed Project is not anticipated to have an adverse effect on threatened or endangered species. During construction, the project will follow precautionary mitigation measures set forth by USFWS.

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

Discussion: No State or Federal air quality standards will be violated as a result of the improvements during or after the construction of the Project. The anticipated issues related to air quality are anticipated during construction only. Long-term negative impacts related to air quality are not expected. There will be a slight decrease in carbon emissions generated on Moloka'i as a result of the proposed installation of a 1 MW PV energy generation and storage system replacing energy supplied by the MECO diesel power generation plant having a positive effect on air quality. The storage of diesel fuel at the well site is not anticipated to increase air emissions as the generator operations are not expected to increase.

No State or Federal water quality standards will be violated as a result of the improvements during or after the construction of the Project. The Project will comply with nonpoint source prevention measures through the NPDES permit. While the Project will result in an increase in impervious surface area, over the site's former vacant use; any increase in runoff will be accommodated by infiltration on DHHL property. There is a slight increased probability of a release due to tank failure over the status quo that could affect water quality. However, the proposed AST is being designed with secondary containment with leak detection. In 2012 the EPA evaluated the proposed design and concurred that the proposed would not negatively affect the underlying aquifer. Operation of the existing generator will not increase as a result of the construction of the fuel storage tank. The storage tank installation may reduce the number of trips fuel vehicles need to make to the well site. By reducing the number of manual generator fills, the probability of a spill due to human error will likely decrease.

The project will not result in long term detrimental effect on ambient noise levels. The storage tank installation may reduce the number of trips fuel vehicles need to make to the well site. This will have a positive impact on noise by reducing total number of fuel tank trips required. Construction activities however will inevitably create temporary noise impacts. If necessary, contractors will employ mitigation measures to minimize those temporary noise impacts including the use of mufflers and implementing construction curfew periods. Pursuant to Chapter 11-46, Hawai'i Administrative Rules, all construction activities must comply with all community noise controls. Upon completion of construction activities, noise impacts are expected to return to preconstruction levels.

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

Discussion: The Project will not affect any environmentally sensitive areas. As portions of the Project are located in tsunami and flood hazard zones, compliance with rules and regulations of Title 44 of the Code of Federal Regulations (CFR) and Maui County Code is necessary. The proposed actions located in these flood hazard areas (replacement of existing transmission pipes, in-line valves, and fire hydrants) will replace aging equipment, reducing potential for leaks that can exacerbate naturally occurring flooding.

(12) Substantially affects scenic vistas and view planes identified in County or State plans or studies; or,

Discussion: As the proposed Project involves improvements to the existing infrastructure, most of which is underground, there are no anticipated negative impacts to the visual resources of the surrounding environment. The proposed water tank at the Site 1 is not anticipated to have a negative impact on view shed due to its location next to the existing water tank at the well site. Moreover, as a majority of the improvements will effectively replace or repair the aging equipment and facilities, there may in fact be beneficial impacts to the visual resources.

(13) Requires substantial energy consumption.

Discussion: The Project improvements will not require energy consumption substantially greater than what is presently required. Electricity for pumping and disinfection at Site 1 will be provided primarily by the proposed on-site one-megawatt PV energy generation and storage system instead of by MECOs off-site diesel power plant. Conversion to a renewable energy source is a positive impact when compared to the status quo.

7.2 Determination

Pursuant to Chapter 343, HRS, the determining agency, the Department of Hawaiian Home Lands has issued a Finding of No Significant Impact (FONSI) for this environmental assessment based on the impacts and mitigation measures examined in this document, comments received during the pre-assessment consultation, public comment received during the public review period, and analyzed under the above criteria.

8 CONSULTATION

8.1 Consultation Overview

During DHHL's Regional Planning Process that began in 2007, the community identified several issues with the potable water system. The Department of Health also identified several issues that while not eminent hazards would improve the safety, security, and reliability of the water system. DHHL, in consultation with USDA-RD, developed a list of improvements to be included in an application request for federal funds. Consultation with agencies, Native Hawaiian Organizations (NHO), and individuals began in 2011 based on the preliminary project list. In 2015 DHHL identified additional improvements that if incorporated into the Project would improve fire protection, reliability, security, health, and sanitation and decrease long-term energy costs. These projects were incorporated into the proposed improvements. Agencies, organizations, and individuals previously consulted were then re-engaged for consultation based on the expanded scope of the Project.

8.2 Pre-Assessment Consultation

Prior to preparation of the Draft EA, the agencies, organizations and individuals listed in Table 8-1 were sent pre-assessment consultation letters in 2011/2012. The purpose of the pre-assessment consultation was to identify environmental issues and concerns to be addressed in the Draft EA. In 2015, additional actions were added, expanding the Project scope. A second pre-assessment consultation was mailed to agencies and individuals in 2015 (Table 8-1). This list includes Native Hawaiian Organizations (NHOs) that were also contacted for invitation to participate in the consultative process required under Section 106 of the National Historic Preservation Act. The NHO contact information was obtained from the U.S. Department of the Interior's (DOI) NHO list. A follow-up letter was sent via email to the NHOs if email contact information had been provided on the DOI list. The email was also sent to individuals who had attended the October 1, 2015 meeting, as well as individuals/organizations recommended by NHOs either in writing or verbally for those that we had obtained email contact information. Copies of the written comments and responses from both the 2011/2012 and 2015 pre-assessment consultations are reproduced in Appendix B.

Table 8-1: Pre-Assessment Consultation and Draft EA Mailing List

Agencies, Organizations and Individuals Project Information

Agencies, Organizations and Individuals∞	Pre-consultation Packet Received†				Draft EA	
	General	Cultural & Natural Resources	Agency Specific	Comment	Received hard copy, CD or Link	Comment
State of Hawai'i						
Hawai'i Public Library, Hawai'i Documents Center					X	
Hawai'i Public Library, Moloka'i Branch					X	

Agencies, Organizations and Individuals[∞]	Pre-consultation Packet Received[†]				Draft EA	
	General	Cultural & Natural Resources	Agency Specific	Comment	Received hard copy, CD or Link	Comment
State of Hawai'i, Department of Accounting and General Services	X			Yes	X	YES
State of Hawai'i, Department of Agriculture	X			Yes	X	
State of Hawai'i Department of Business, Economic Development and Tourism (DBEDT)	X				X	
State of Hawai'i, DBEDT, Energy Division	X				X	
State of Hawai'i, DBEDT, State Office of Planning	X			Yes	X	Yes
State of Hawai'i, Department of Defense	X				X	
State of Hawai'i, Department of Education	X			Yes	X	
State of Hawai'i, Department of Hawaiian Home Lands, Moloka'i District Office					X	
State of Hawai'i, Department of Health (DOH)			X		X	
State of Hawai'i, DOH, Maui District Health Office	X			Yes	X	Yes
State of Hawai'i, DOH, Maui District Health Office, Clean Water Branch Specialist			X	Yes	X	Yes
State of Hawai'i, DOH, Clean Air Branch	X			Yes	X	
State of Hawai'i, DOH, Environmental Planning Office	X			Yes	X	Yes
State of Hawai'i, DOH, Hazard Evaluation and Emergency Response Office	X					
State of Hawai'i, DOH, Indoor and Radiological Health Branch and Abatement Office	X					
State of Hawai'i, DOH, Clean Water Branch	X			Yes	X	
State of Hawai'i, DOH, Office of Environmental Quality Control	X				X	Yes
State of Hawai'i, DOH, Safe Drinking Water Branch	X			Yes	X	Yes
State of Hawai'i, Department of Human Services	X			Yes	X	

Agencies, Organizations and Individuals[∞]	Pre-consultation Packet Received[†]				Draft EA	
	General	Cultural & Natural Resources	Agency Specific	Comment	Received hard copy, CD or Link	Comment
State of Hawai'i, Department of Labor and Industrial Services	X				X	
State of Hawai'i, Department of Land and Natural Resources (DLNR)		X		Yes	X	Yes
State of Hawai'i, DLNR, State Historic Preservation Division (SHPD)			X		X	
State of Hawai'i, DLNR, SHPD- Maui Lead Archaeologist			X		X	
State of Hawai'i, Land Use Commission	X				X	
State of Hawai'i, Department of Transportation	X			Yes	X	
State of Hawai'i, Department of Transportation, Maui District Office	X				X	
State of Hawai'i, Office of Hawaiian Affairs (OHA)		X		Yes	X	Yes
University of Hawai'i					X	
State of Hawai'i, OHA Trustee Machado		X			X	
State Representative Carroll (13th District)		X				
State Senator English (6th District, 7th District)		X			X	
State Representative DeCoite (13th District)		X			X	
Federal						
National Park Service					X	
U.S. Army Engineer District, Honolulu	X			Yes	X	
U.S. Department of Agriculture, Natural Resources Conservation Service	X				X	
U.S. Department of Agriculture, Natural Resources Conservation Service, Pacific Islands Area State Office	X				X	
U.S. Federal Emergency Management Agency, Regional Administrator			X	Yes	X	
U.S. Fish and Wildlife Service			X		X	

Agencies, Organizations and Individuals∞	Pre-consultation Packet Received†				Draft EA	
	General	Cultural & Natural Resources	Agency Specific	Comment	Received hard copy, CD or Link	Comment
U.S. Environmental Protection Agency, Region IX			X		X	Yes
U.S. Department of the Interior, U.S. Geological Survey, Pacific Islands Water Science Center					X	Yes
U.S. Department of Transportation, Federal Aviation Administration					X	Yes
County of Maui						
County of Maui, Civil Defense Agency	X				X	
County of Maui, Department of Environmental Management	X				X	Yes
County of Maui, Department of Fire and Public Safety	X			Yes	X	Yes
County of Maui, Department of Housing and Human Concerns	X				X	
County of Maui, Department of Parks and Recreation	X			Yes	X	
County of Maui, Planning Department	X			Yes	X	
County of Maui, Police Department	X				X	
County of Maui, Department of Public Works	X			Yes	X	Yes
County of Maui, Department of Transportation	X				X	Yes
County of Maui, Department of Water Supply	X				X	Yes
County of Maui, Mayor Arakawa		X			X	
County of Maui, County Council Chairman Mateo		X				
County of Maui, County Council Chairman White	X				X	
County of Maui, County Council Vice Chair Pontanilla		X				
County of Maui, County Council Vice Chair Guzman	X				X	
County of Maui, County Council – Molokai (Crivello)		X		Yes	X	
Maui/Lanai Islands Burial Council		X				
Moloka'i Burial Council- Central Moloka'i		X			X	

Agencies, Organizations and Individuals[∞]	Pre-consultation Packet Received[†]				Draft EA	
	General	Cultural & Natural Resources	Agency Specific	Comment	Received hard copy, CD or Link	Comment
Moloka'i Burial Council- West Moloka'i		X			X	
Moloka'i Burial Council- East Moloka'i		X			X	
Moloka'i Burial Council- Kalawao		X			X	
Consulted Parties						
Hawaiian Telecommunications	X				X	
Honolulu Star Advertiser					X	
Ka Wai Ola					X	
Maui Electric Company	X				X	
Moloka'i Dispatch					X	
The Maui News					X	
The Nature Conservancy					X	
Sierra Club, Maui Group					X	
Citizen Groups, Native Hawaiian Organizations, Individuals						
'Aha Kāne		X			X	
Aha Kukaniloko Koa Mana mea ola kanaka mauli		X		Yes	X	
Aha Moku O Kahikinui		X			X	
Aha Moku o Maui Inc.		X			X	
Aha Wahine		X			X	
'Ahahui Siwila Hawai'i O Kapōlei		X			X	
Ahupua'a o Moloka'i		X			X	
Aloha First		X			X	
Association of Hawaiian Civic Clubs		X			X	
Association of Hawaiians for Homestead Lands		X			X	
Au Puni O Hawaii		X			X	
Mr. Billy Akutagawa		X		Yes	X	
Brian Kaniela Nae'ole Naauao		X			X	
Charles Pelenui Mahi Ohana		X			X	
Council for Native Hawaiian Advancement		X			X	
Friends of 'Iolani Palace		X			X	
Friends of Moku'ula, Inc.		X			X	
George K. Cypher 'Ohana		X			X	
God's Country Waimanalo		X			X	
Hau'ouiwi Homestead Association on Lāna'i		X			X	
Hawaiian Civic Club of Hilo		X			X	

Agencies, Organizations and Individuals∞	Pre-consultation Packet Received†				Draft EA	
	General	Cultural & Natural Resources	Agency Specific	Comment	Received hard copy, CD or Link	Comment
Hawaiian Civic Club of Wahiawa		X			X	
Hawaiian Community Assets, Inc.		X			X	
Ho Ohana		X			X	
Hoʻokano Family Land Trust		X			X	
Hui Hoʻoniho		X			X	
Hui Huliau		X			X	
Hui Kaleleiki Ohana		X			X	
Hui Mālama Ola Nā ʻŌiwi		X			X	
Kaha I Ka Panoa Kaleponi Hawaiian Civic Club		X			X	
Kākoʻo ʻŌiwi		X			X	
Kalaeloa Heritage and Legacy Foundation		X			X	
Kalamaʻula Mauka Homestead Association		X			X	
Kalihi Palama Hawaiian Civic Club		X			X	
Kamealoha		X			X	
Kamehameha Schools - Community Relations and Communications Group, Government Relations		X			X	
Kamiloloa One Alii Homestead Association		X			X	
Kanu o ka ʻĀina Learning ʻOhana		X			X	
Kapolei Community Development Corporation		X			X	
Kauwahi ʻAnaina Hawaiʻi Hawaiian Civic Club		X			X	
Kawaihapai ʻOhana		X			X	
Kingdom of Hawaiʻi		X		Yes	X	
Koʻolau Foundation		X			X	
Koʻolaupoko Hawaiian Civic Club		X			X	
Koa Ike		X			X	
Laʻi ʻŌpua 2020		X			X	
Lahui Kakaʻikahi		X			X	
Maʻa ʻOhana c/o Lani Maʻa Lapilio		X			X	
Machado-Akana-Aona-Namakaeha Ohana		X		Yes	X	
Mahu Ohana		X			X	
Mainland Council Association of Hawaiian Civic Clubs		X			X	

Agencies, Organizations and Individuals∞	Pre-consultation Packet Received†				Draft EA	
	General	Cultural & Natural Resources	Agency Specific	Comment	Received hard copy, CD or Link	Comment
Mākaha Hawaiian Civic Club		X		Yes	X	
Makuʻu Farmers Association		X			X	
Maluʻōhai Residents Association		X			X	
Marae Haʻa Koa		X			X	
Meleana Kawaiaea, LLC		X			X	
Menehune Foundation		X			X	
Moku o Kaupo		X			X	
Na Aikāne O Maui		X			X	
Na Koa Ikaika Ka Lāhui Hawaiʻi		X			X	
Na Kuʻauhau ʻo Kahiwakaneikopolei		X			X	
Nā Kuleana o Kānaka ʻŌiwi		X			X	
Na ʻOhana o Puaoi a me Hanawahine		X			X	
Nānākuli Housing Corporation		X			X	
Native Hawaiian Church		X			X	
Native Hawaiian Economic Alliance		X			X	
Native Hawaiian Education Council		X			X	
Nekaifes ʻOhana		X			X	
Order of Kamehameha I		X			X	
Pacific Agricultural Land Management Systems		X			X	
Pacific Justice & Reconciliation Center		X			X	
Papa Ola Lōkahi		X			X	
Papakōlea Community Development Corporation		X			X	
Partners in Development Foundation		X			X	
Paukukalo Hawaiian Homes Community Association		X			X	
Peʻahi ʻOhana		X			X	
Piʻihonua Hawaiian Homestead Community Association		X			X	
Royal Hawaiian Academy of Traditional Arts		X			X	
The Friends of Hokuleʻa and Hawaiʻiloa		X			X	
The I Mua Group		X			X	
Waiʻanae Hawaiian Civic Club		X			X	

Agencies, Organizations and Individuals∞	Pre-consultation Packet Received†				Draft EA	
	General	Cultural & Natural Resources	Agency Specific	Comment	Received hard copy, CD or Link	Comment
Waiehu Kou Phase 3 Association		X			X	
Waimānalo Hawaiian Homes Association		X			X	

*Some Agencies routed the information to various offices within their Department. On occasion, those offices provided written comments that are not tracked on this matrix.

†Some Agencies were provided more than one pre-consultation information packet. The most recent type of packet provided is tracked on this matrix.

∞Elected/Appointed Officials were provided informational packets in 2011/12 and also in 2015. Officials in office in 2011/2012 that were not re-elected or vacated the appointment did not received packets in 2015.

8.3 Consultation Meetings

In addition to written correspondence, meetings to satisfy the consultation requirements for Section 106 of the National Historic Preservation Act (NHPA) were held. All DHHL homestead association leadership on Moloka'i were provided an opportunity to meet and discuss cultural resources and the project. On-island meetings were held with homestead leadership on December 1, 2011, and October 1, 2015. A follow-up teleconference meeting was held on December 9, 2011, to continue discussions, and to engage leadership unable to attend the December 1, 2011, meeting. All NHO listed on DOI's September 2015 NHO list were provided an opportunity to schedule a one-on-one meeting on Moloka'i island on October 1-2, 2015, however no requests were made.

8.4 DEA Availability for Review and Comment

Notice of the availability of the Draft Environmental Assessment was published on February 23, 2016, in the *Environmental Notice.* The public and other interested parties were provided 30 days (February 23 through March 24, 2016) for review and comment. Required agencies and NHO were notified of the public comment period via mail and email respectively. NHO that did not provide a valid email address on the DOI's September 2015 NHO list were mailed notification the Draft EA availability.

Table 8-1 identifies agencies and NHOs that received notification of the availability of the Draft EA and well as all parties commenting on the Draft EA.

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Appendix A

FIGURES

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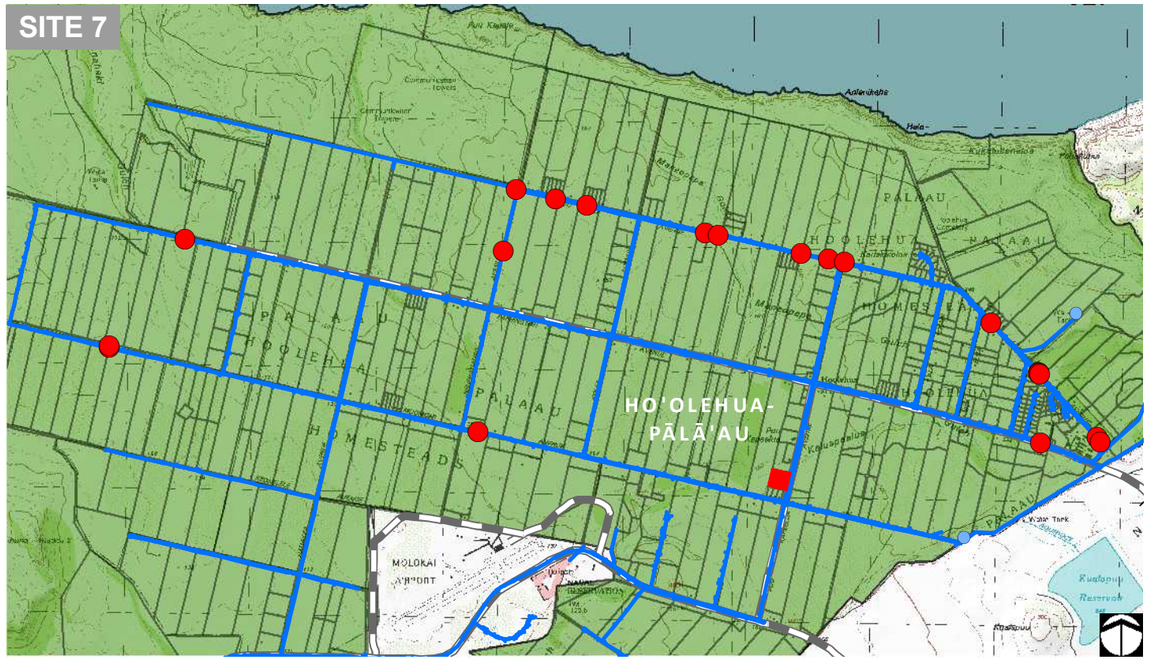

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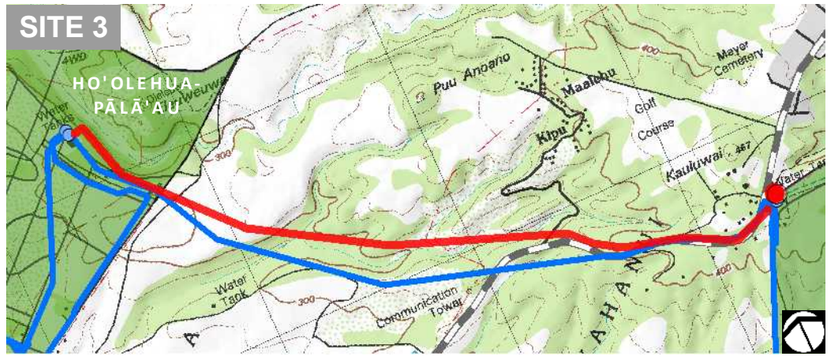

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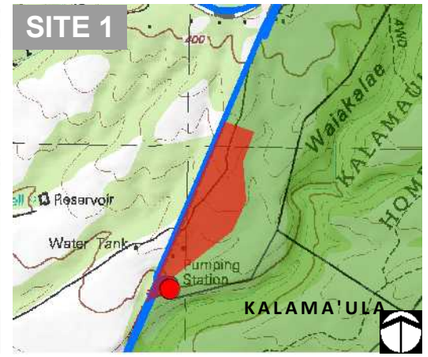

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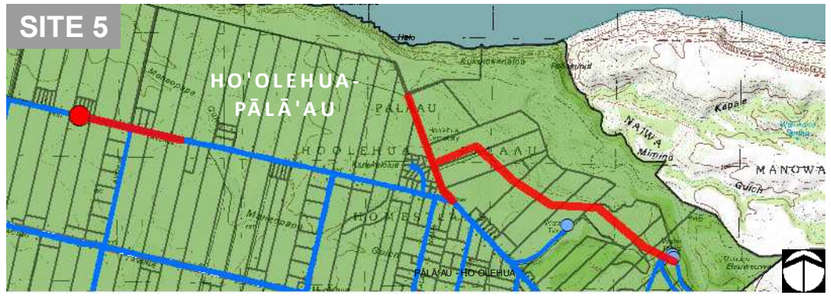

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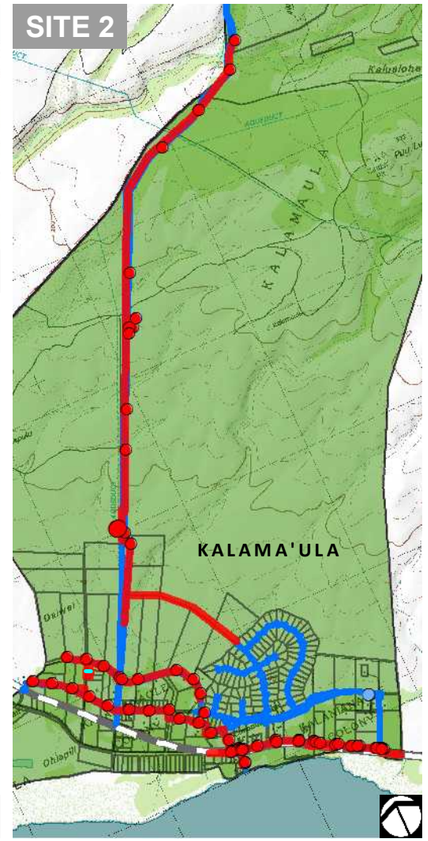

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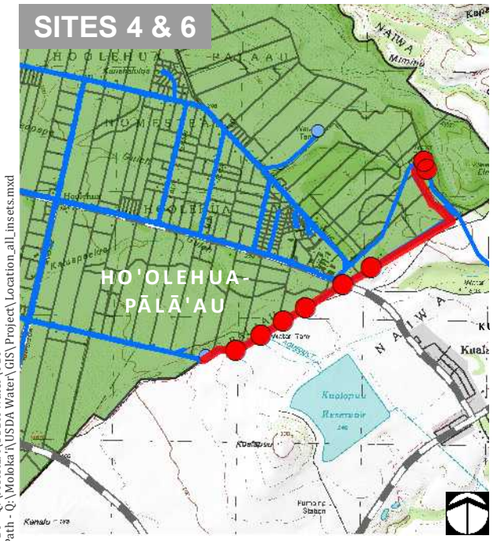

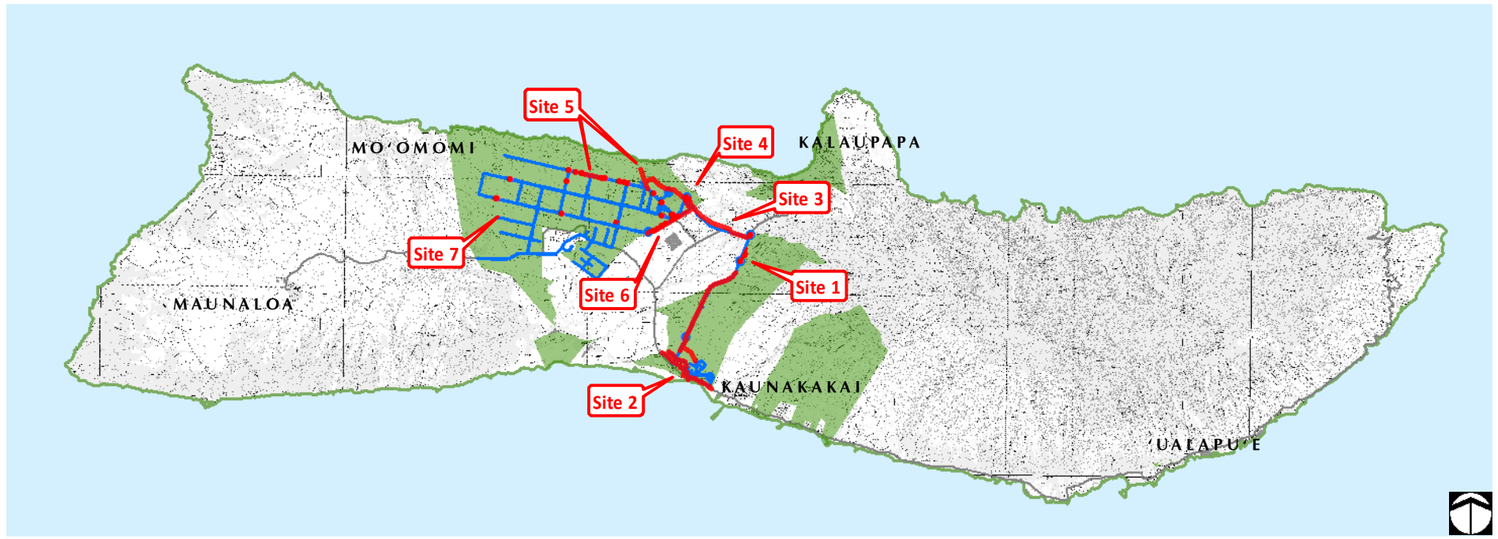

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LEGEND

DATE: 1/8/2016

- Proposed Water System Improvements
- Existing DHHL Water System
- Proposed Water System Improvements
- Existing DHHL Water System
- DHHL Lands

Figure 1
Location Map

MOLOKA'I WATER SYSTEM

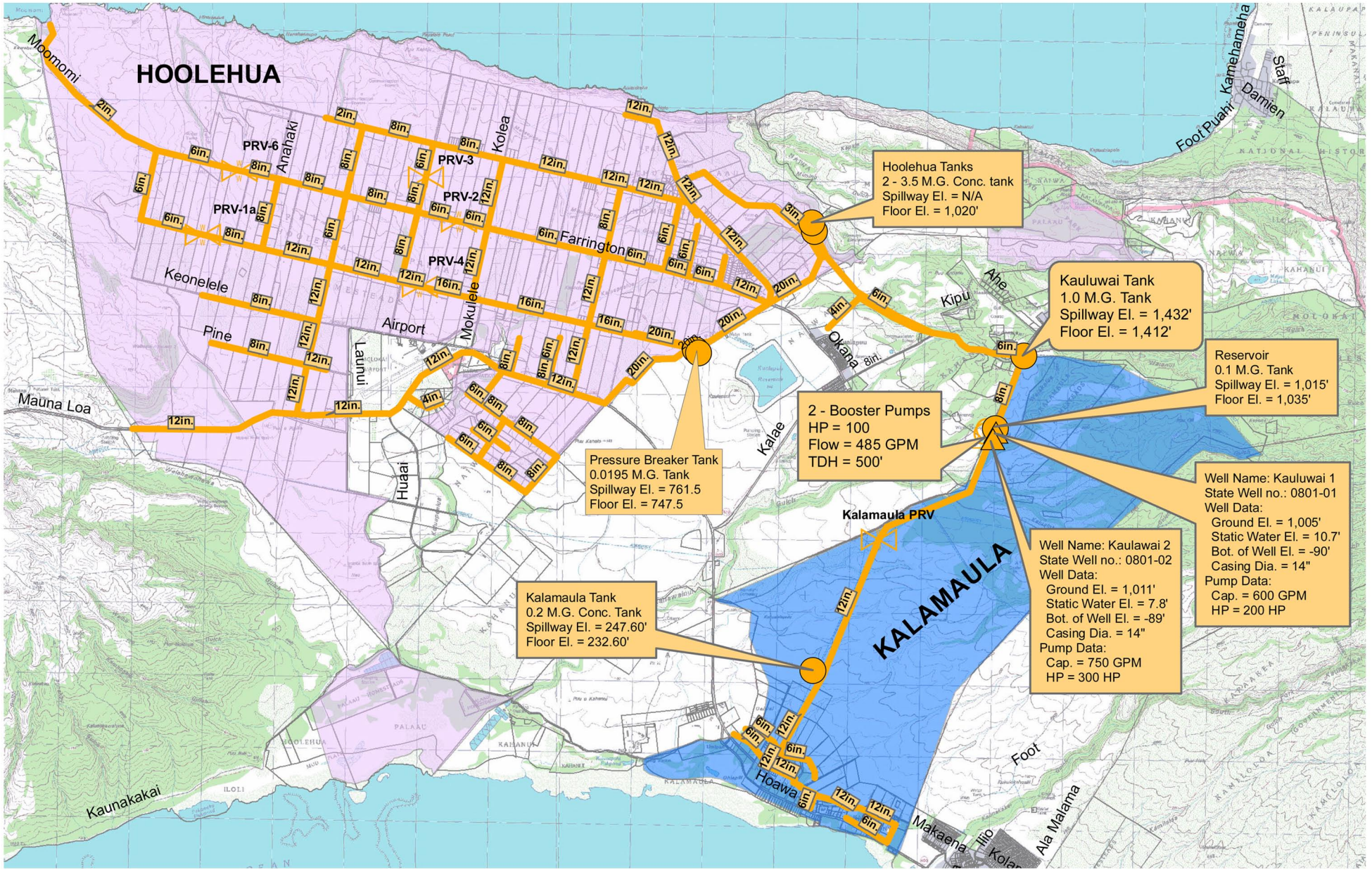
Department of Hawaiian Home Lands

Island of Moloka'i

Source: Department of Hawaiian Home Lands (2015). U.S. Geological Survey.

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

PBR HAWAII & ASSOCIATES, INC.



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LEGEND

DATE: 1/8/2016

- Diversion, DHHL
- Well, DHHL
- DHHL Tank
- PRV
- DHHL Booster Pump
- DHHL Pipe
- Hoolehua-Palaau
- Kalamaula

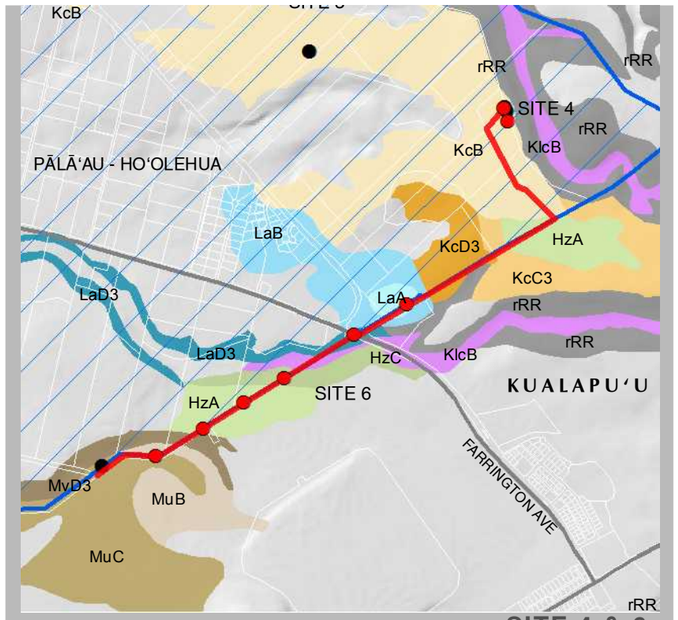
Figure 2
PWS 230-Existing Facilities
MOLOKA'I WATER SYSTEM
Department of Hawaiian Home Lands
Island of Moloka'i

North

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.

Source: Akinaka & Associates, LTD. (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.



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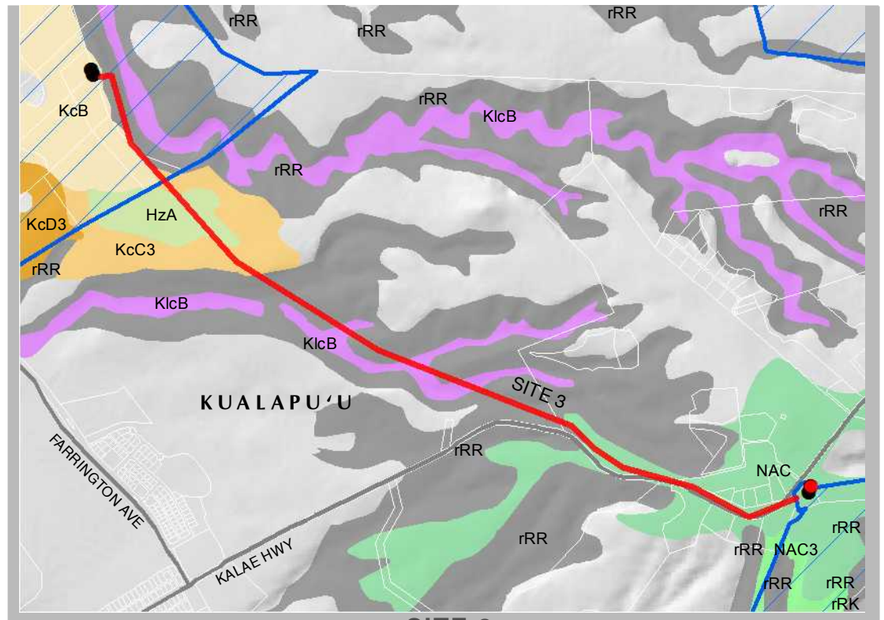

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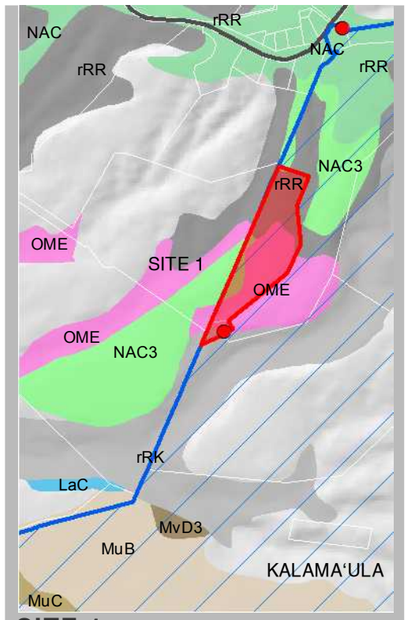

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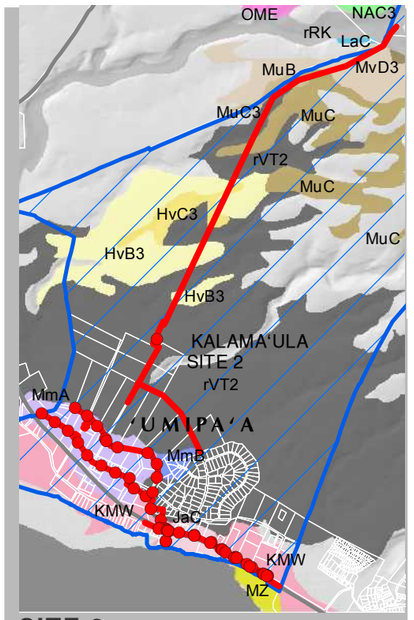

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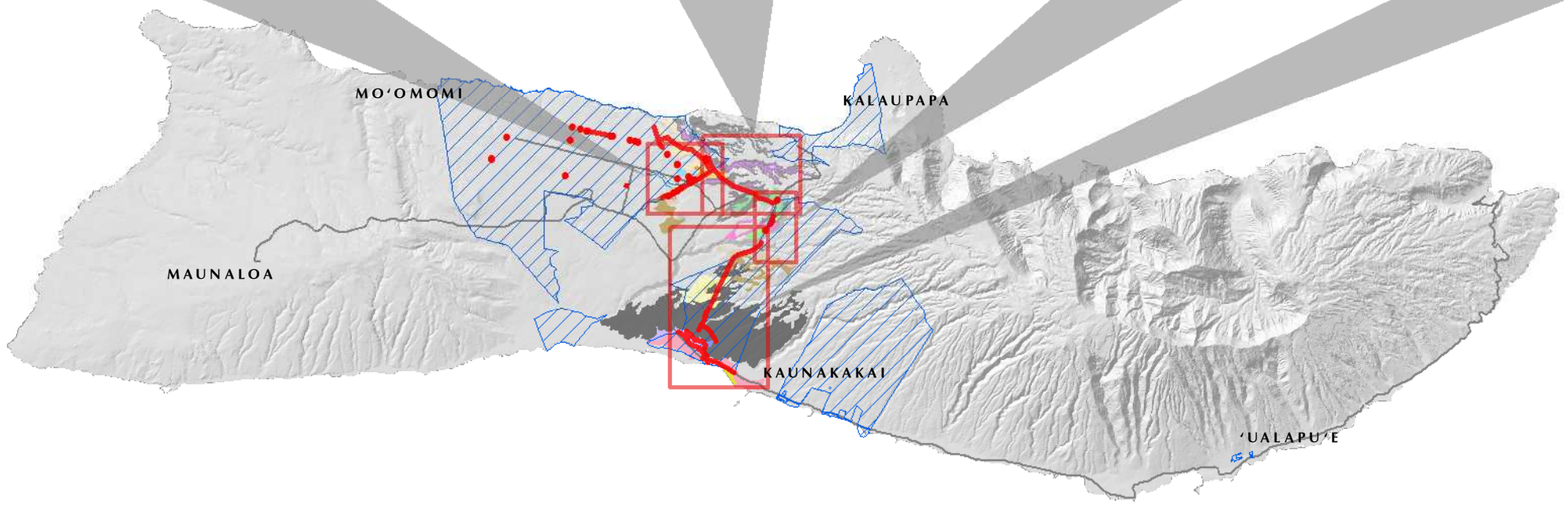

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LEGEND

DATE: 1/8/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

HvB3	Holomua silt loam, 3-7% slopes, eroded	KlcB	Kawaihapai silty clay loam, 2-7% slopes	MuC3	Molokai silty clay loam, 7-15% slopes, eroded
HvC3	Holomua silt loam, 7-15% slopes, eroded	LaA	Lahaina silty clay, 0-3% slopes	MuC	Molokai silty clay loam, 7-15% slopes
HzA	Hoolehua silty clay, 0-3% slopes	LaB	Lahaina silty clay, 3-7% slopes	MvD3	Molokai silty clay loam, shallow variant, 15-25% slopes, eroded
HzC	Hoolehua silty clay, 7-15% slopes	LaC	Lahaina silty clay, 7-15% slopes	NAC3	Naiwa silty clay loam, 7-15% slopes, eroded
JaC	Jaucas sand, 0-15% slopes	LaD3	Lahaina silty clay, 15-25% slopes, eroded	NAC	Naiwa silty clay loam, 3-20% slopes
KMW	Kealia silt loam	MZ	Marsh	OME	Oli silt loam, 10-30% slopes
KcB	Kalae silty clay, 2-7% slopes	MmA	Mala silty clay, 0-3% slopes	rRK	Rock land
KcC3	Kalae silty clay, 5-15% slopes, eroded	MmB	Mala silty clay, 3-7% slopes	rRR	Rough broken land
KcD3	Kalae silty clay, 15-25% slopes, eroded	MuB	Molokai silty clay loam, 3-7% slopes	rVT2	Very stony land, eroded

Source: Soil Survey Geographic (SSURGO) database for Island of Molokai, Hawaii, U.S. Department of Agriculture, Natural Resources Conservation Service (2006). County of Maui. Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008). Moloka'i Quadrangle Map, 1:24,000-scale Digital Raster Graphic, U.S. Geological Survey.

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 3

NRCS Soil Classification (1 of 2)

MOLOKA'I WATER SYSTEM

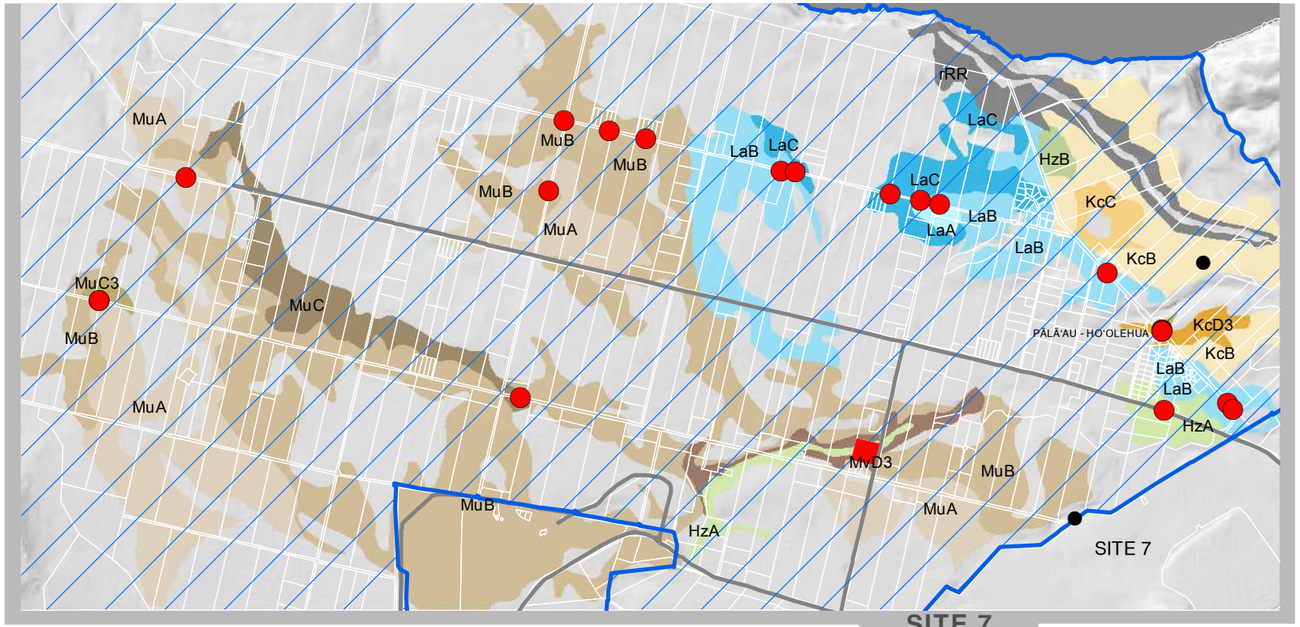
Department of Hawaiian Home Lands

Island of Moloka'i

North

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.



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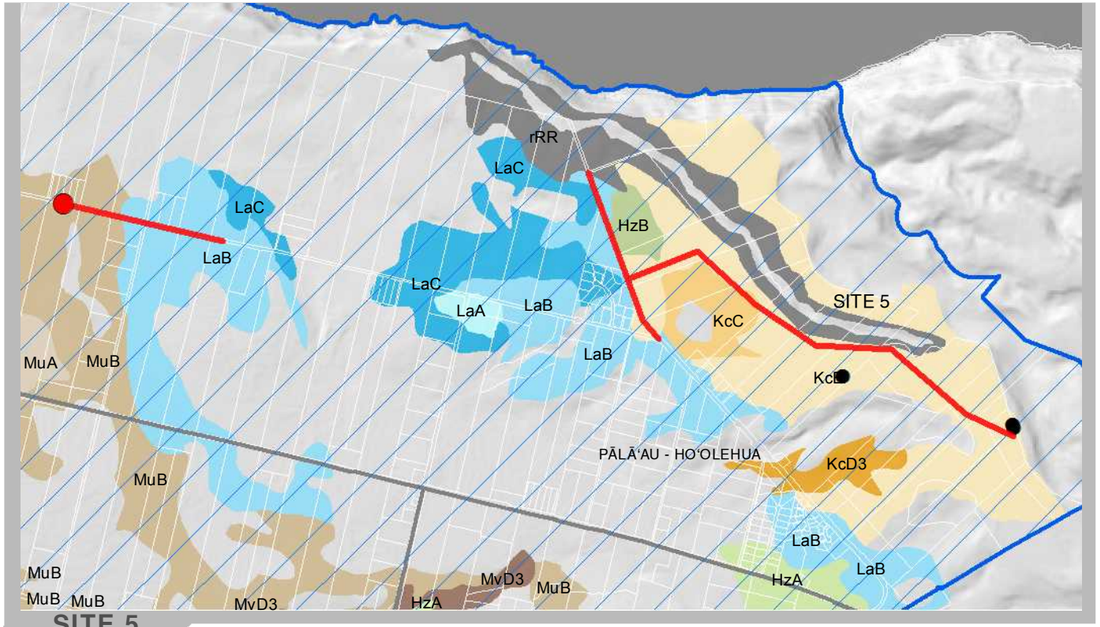

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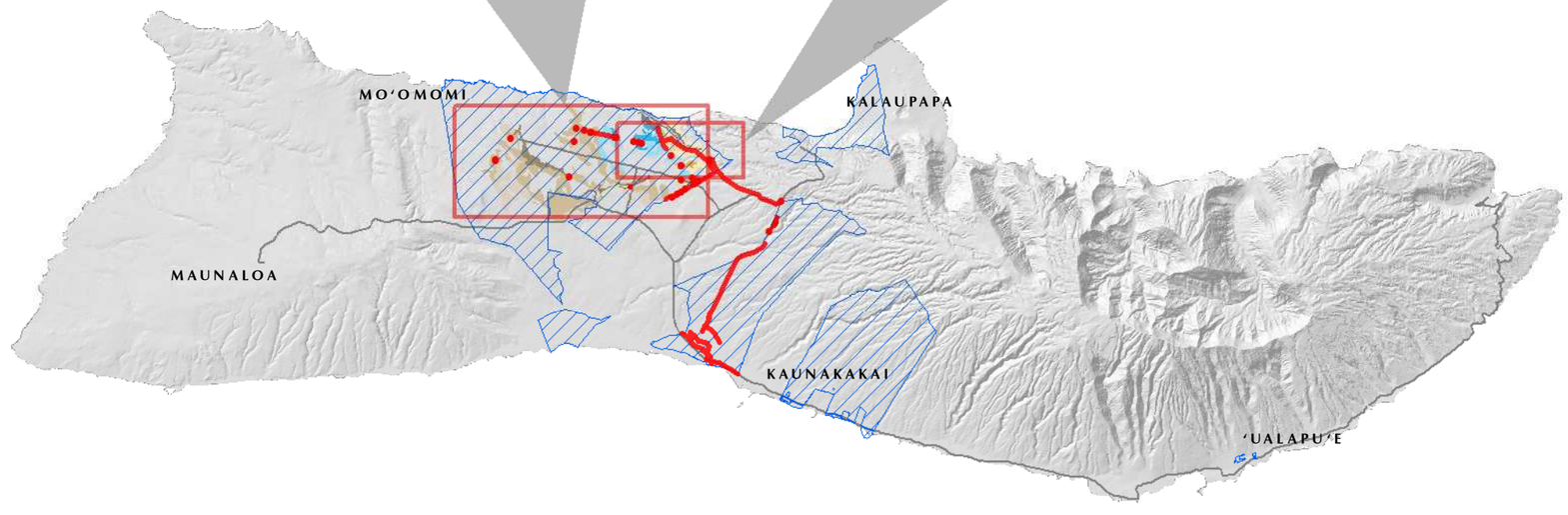


PDF - Q:\Moloka'i\USDA Water\PDF
Path - Q:\Moloka'i\USDA Water\GIS\Project\Soils map2.mxd

LEGEND

DATE: 1/8/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

HzA	Hoolehua silty clay, 0-3% slopes
HzB	Hoolehua silty clay, 3-7% slopes
KcB	Kalae silty clay, 2-7% slopes
KcC	Kalae silty clay, 7-15% slopes
KcD3	Kalae silty clay, 15-25% slopes, eroded
LaA	Lahaina silty clay, 0-3% slopes
LaB	Lahaina silty clay, 3-7% slopes
LaC	Lahaina silty clay, 7-15% slopes
MuA	Molokai silty clay loam, 0-3% slopes
MuB	Molokai silty clay loam, 3-7% slopes
MuC3	Molokai silty clay loam, 7-15% slopes, eroded
MuC	Molokai silty clay loam, 7-15% slopes
MvD3	Molokai silty clay loam, shallow variant, 15-25% slopes, eroded
rRR	Rough broken land

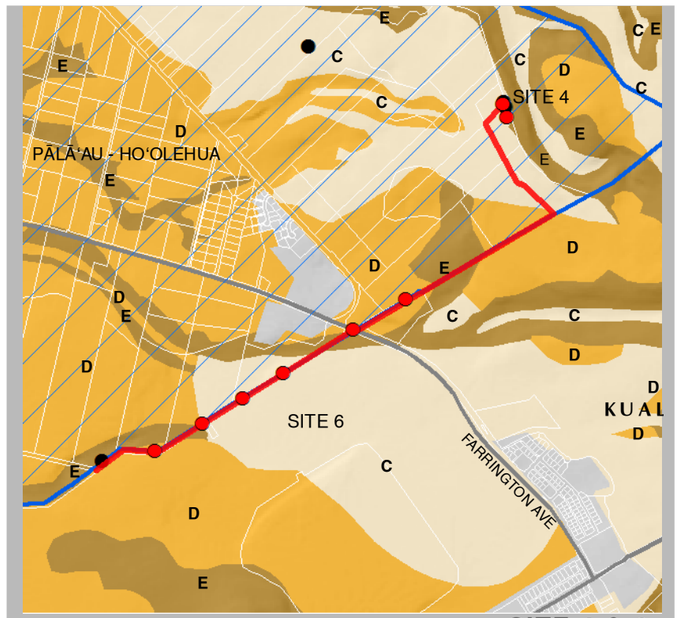
Source: Soil Survey Geographic (SSURGO) database for Island of Molokai, Hawaii, U.S. Department of Agriculture, Natural Resources Conservation Service (2006). County of Maui. Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008). Moloka'i Quadrangle Map, 1:24,000-scale Digital Raster Graphic, U.S. Geological Survey.
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 3
NRCS Soil Classification (2 of 2)
MOLOKA'I WATER SYSTEM
Department of Hawaiian Home Lands
Island of Moloka'i

North

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.



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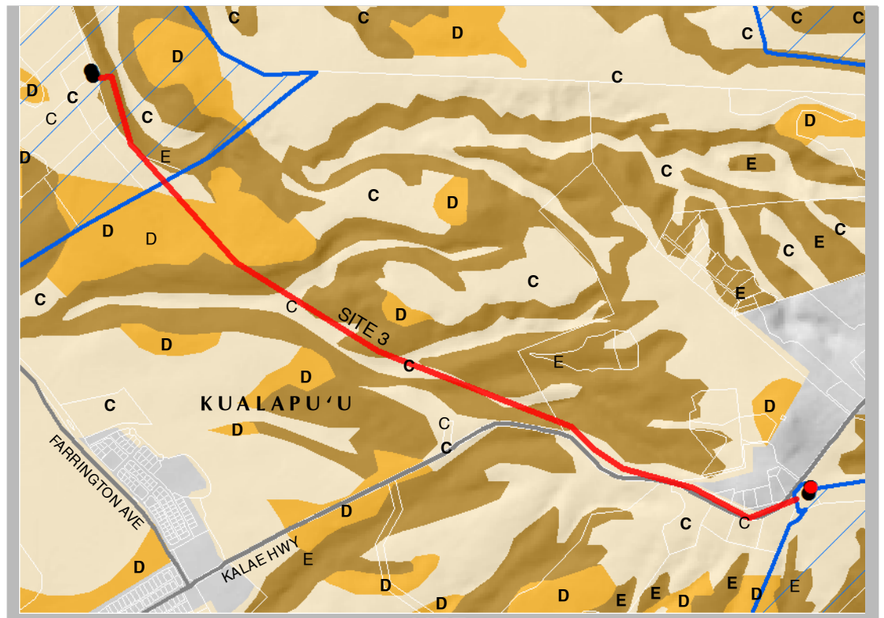

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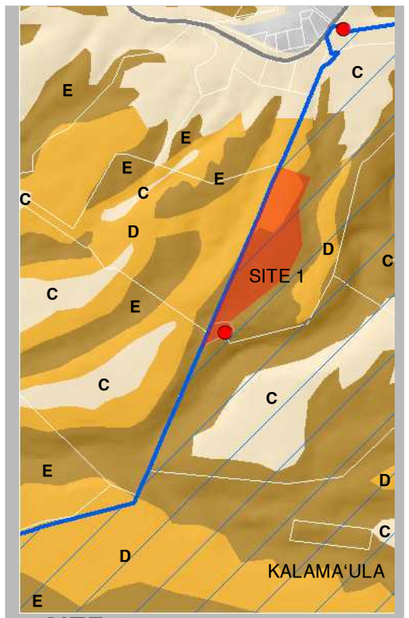

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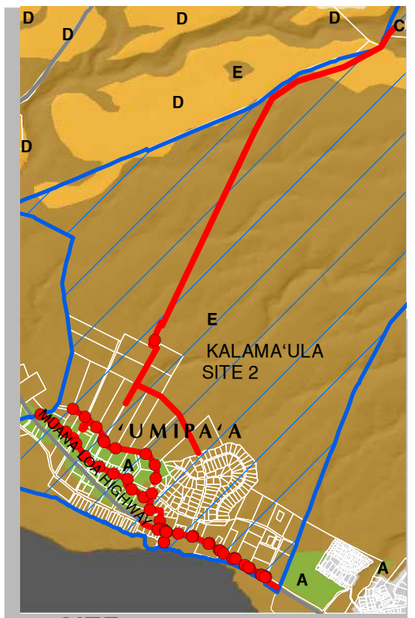

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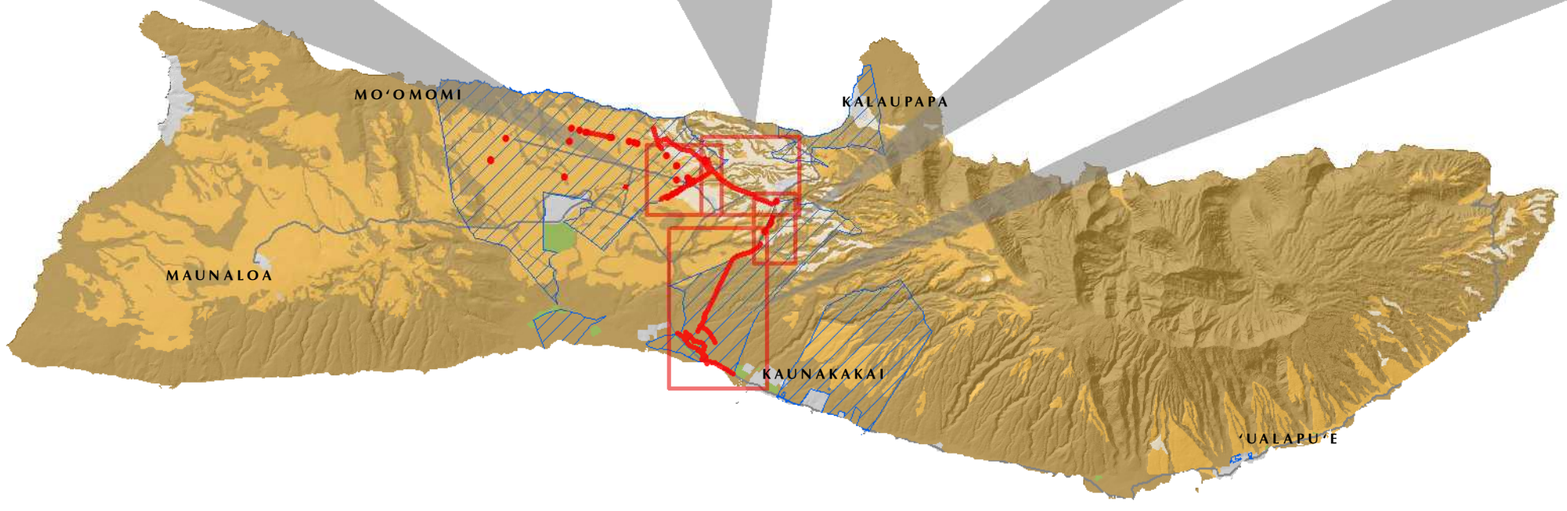

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LEGEND

DATE: 1/8/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

Land Classification

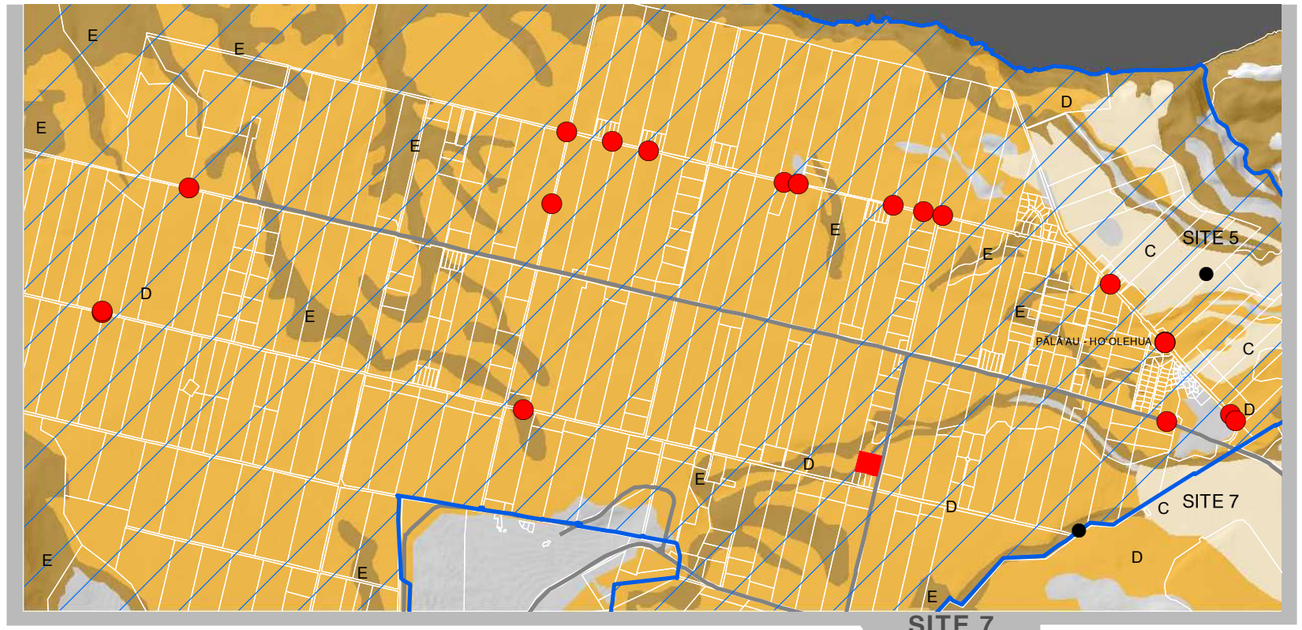
- A Very Good
- B Good
- C Fair
- D Poor
- E Very Poor

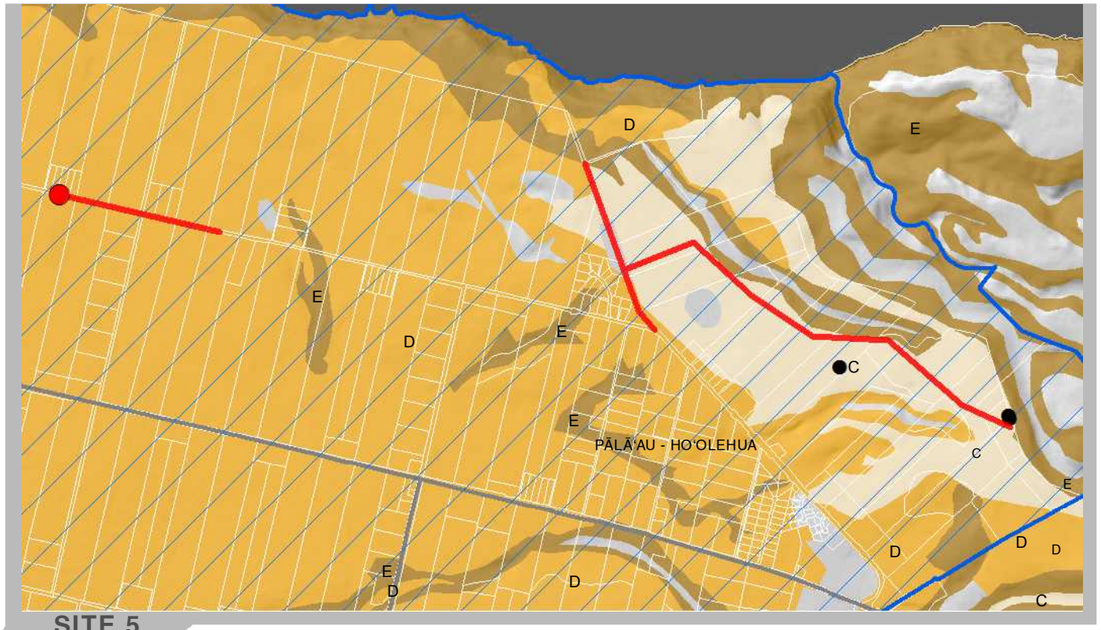
Source: Land Study Bureau's Detailed Land Classification (2012). County of Maui. Hillshade GRIDS created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

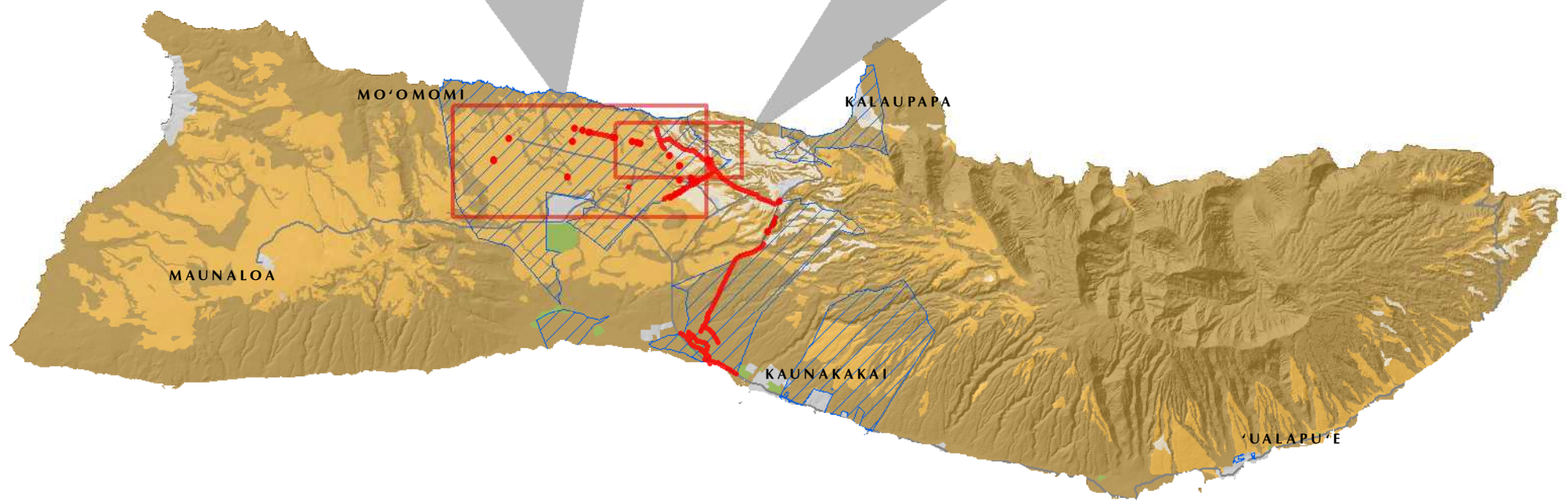
Figure 4
LSB Detailed Land Classification (1 of 2)
MOLOKA'I WATER SYSTEM
Department of Hawaiian Home Lands
Island of Moloka'i
North

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.







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LEGEND

DATE: 1/8/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

Land Classification

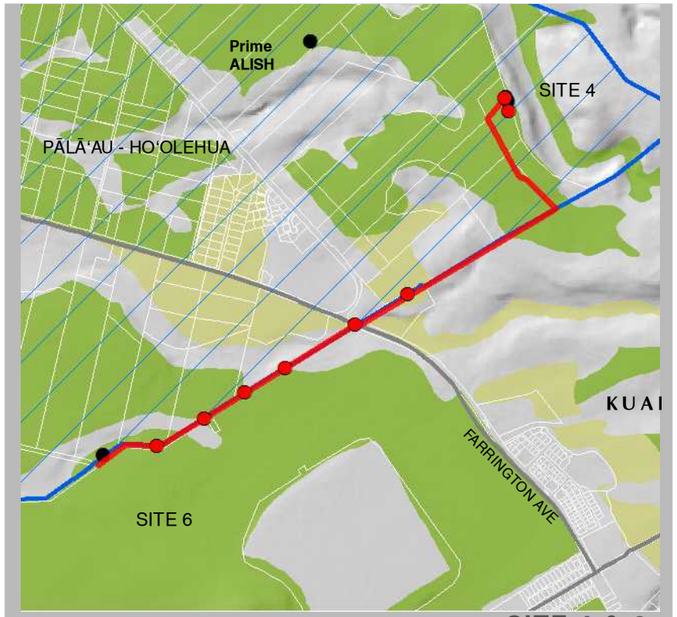
- A Very Good
- B Good
- C Fair
- D Poor
- E Very Poor

Source: Land Study Bureau's Detailed Land Classification (2012). County of Maui. Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 4
LSB Detailed Land Classification (2 of 2)
MOLOKA'I WATER SYSTEM
Department of Hawaiian Home Lands
Island of Moloka'i
North

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.



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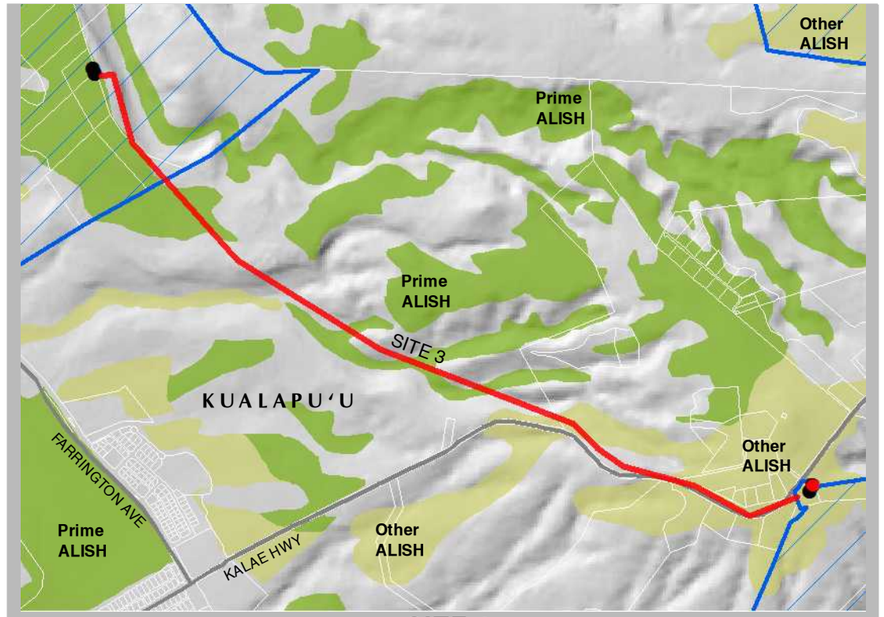

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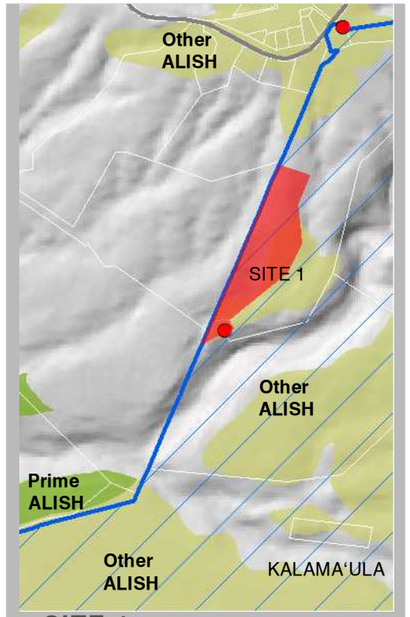

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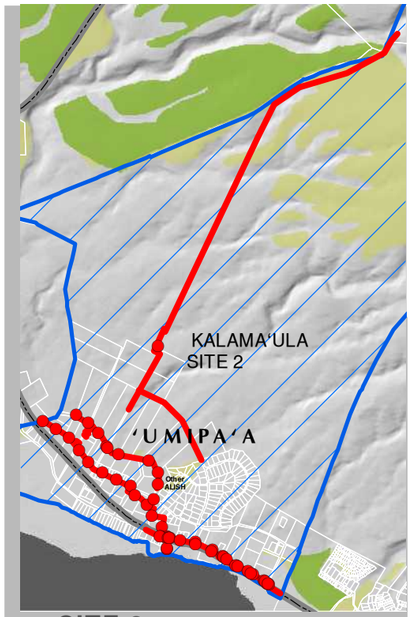

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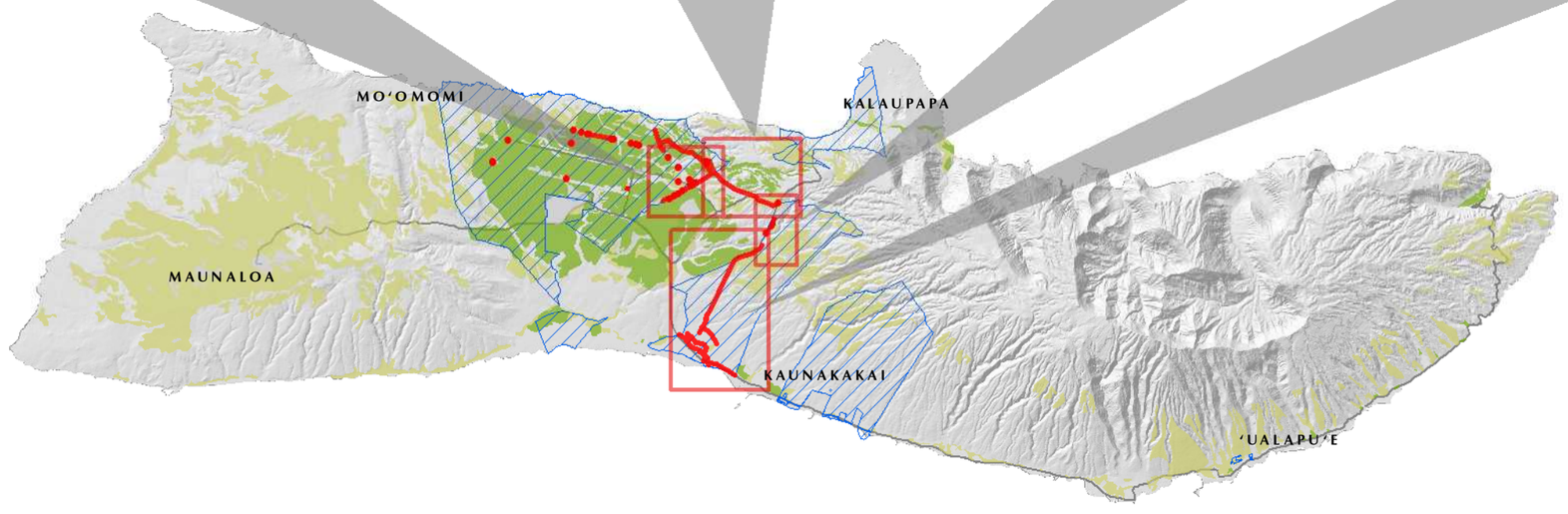

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LEGEND

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- Major Road
- DHHL Lands
- Prime ALISH
- Unique ALISH
- Other ALISH

DATE: 1/11/2016

Source: State Department of Agriculture (1977). County of Maui. Hillshade GRIDS created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 5
Agricultural Lands of Importance to the State of Hawai'i (1 of 2)

MOLOKA'I WATER SYSTEM

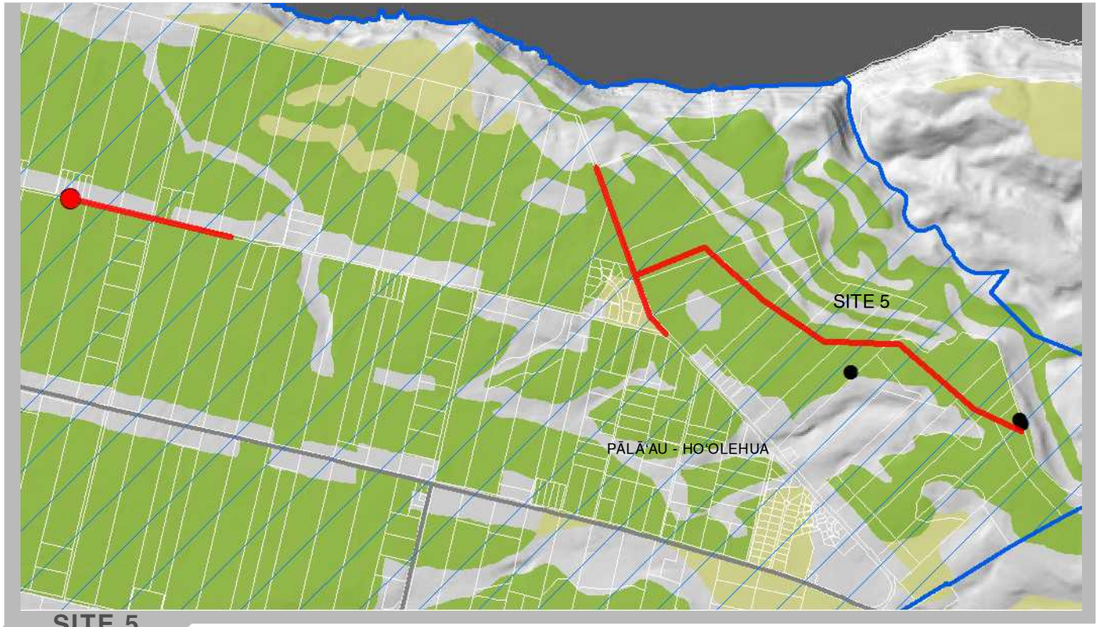
Department of Hawaiian Home Lands
North

Island of Moloka'i

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.

SITE 7



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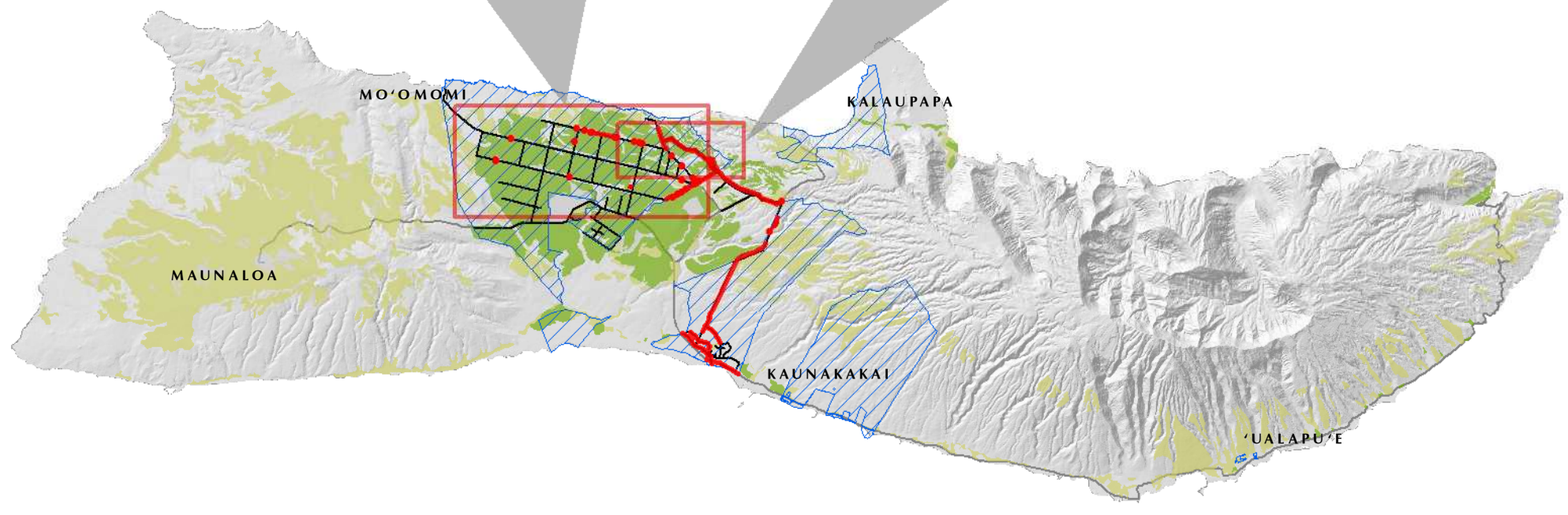

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LEGEND

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- Major Road
- DHHL Lands
- Prime ALISH
- Unique ALISH
- Other ALISH

DATE: 1/11/2016

Source: State Department of Agriculture (1977). County of Maui. Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 5
Agricultural Lands of Importance to the State of Hawai'i (2 of 2)

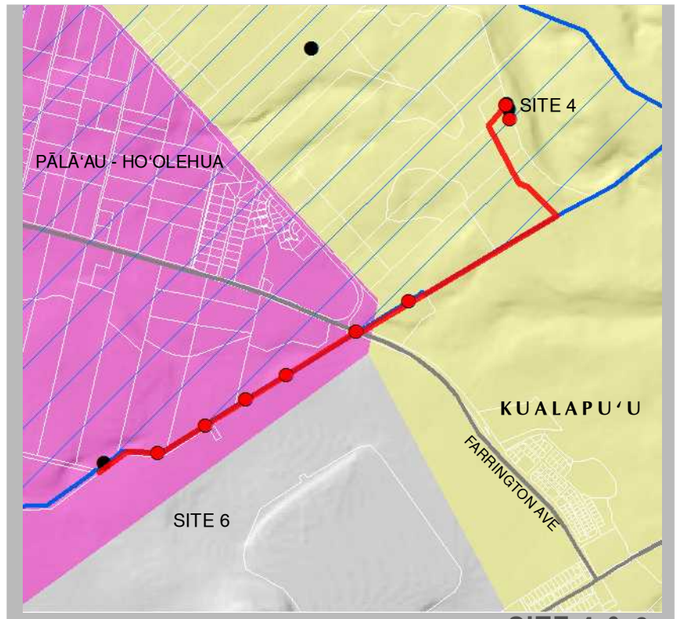
MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
North

Island of Moloka'i

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.



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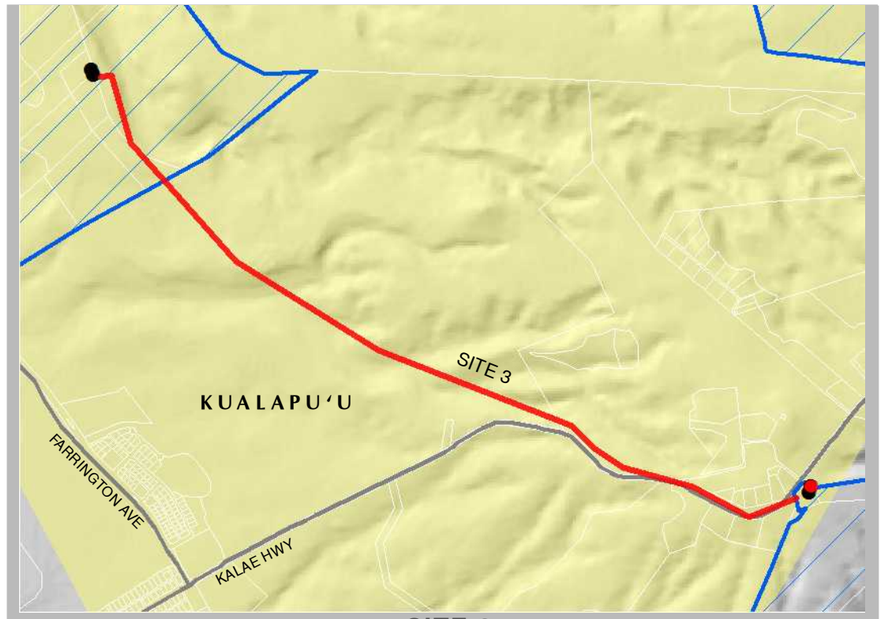

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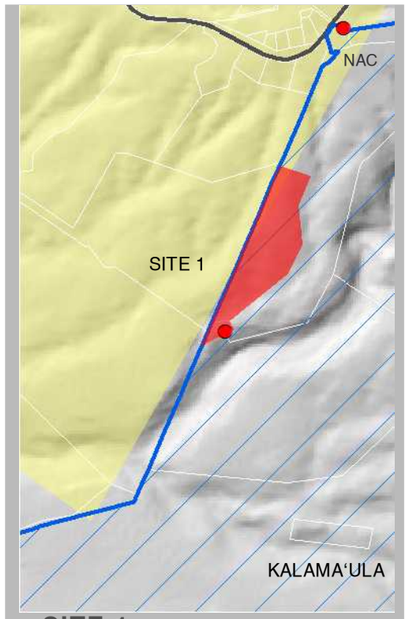

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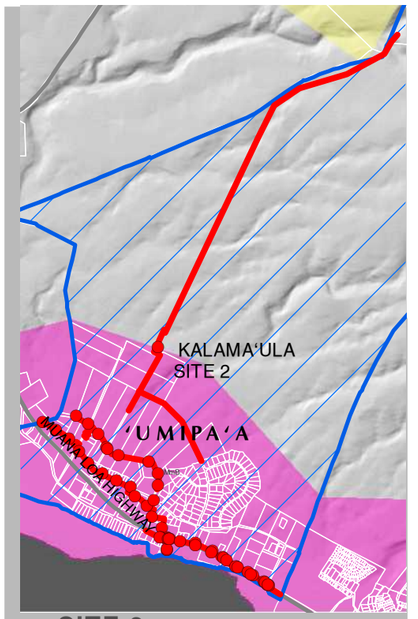

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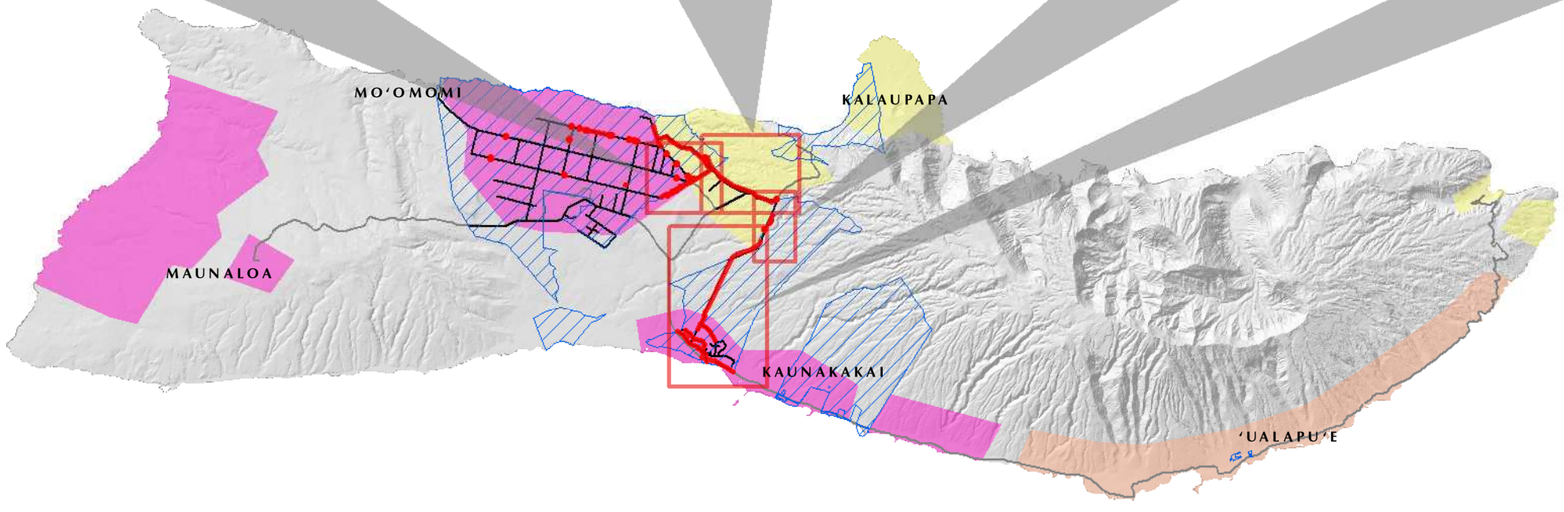

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LEGEND

DATE: 1/11/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

Fire Risk

- High
- Medium
- Low

Source: Department of Land and Natural Resources, Division of Forestry and Wildlife, Fire Management Program (2007). Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 6

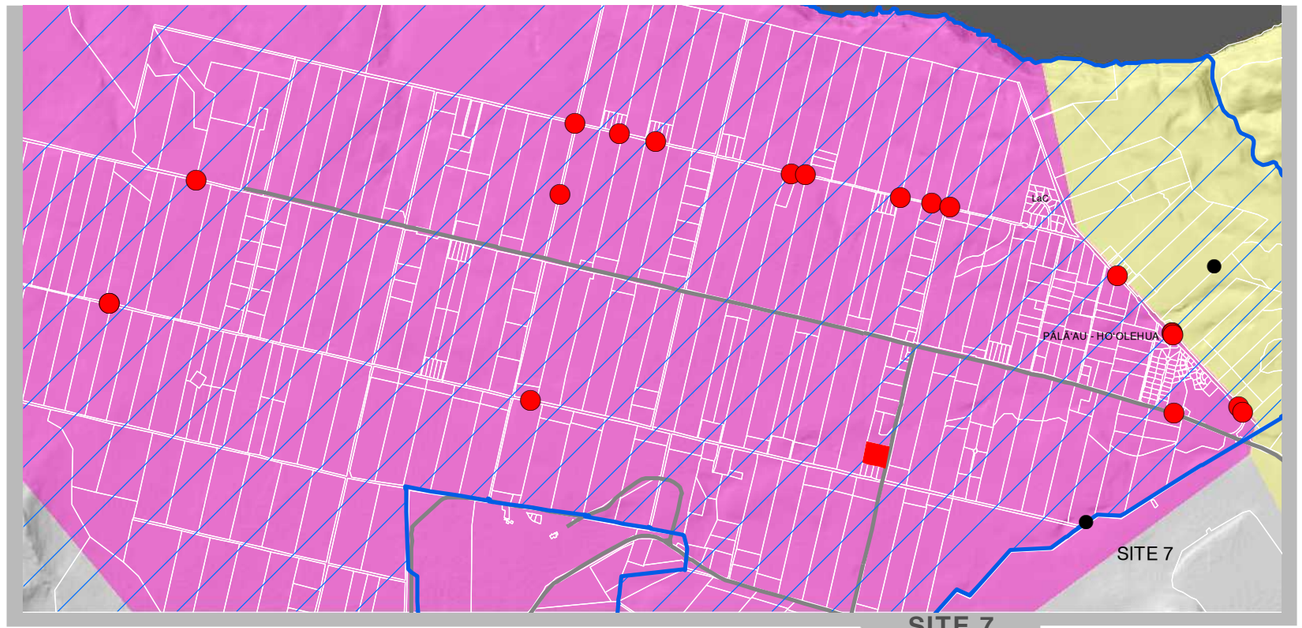
Communities at Risk from Wild-Land Fires (1 of 2)

MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
North

Island of Moloka'i

PBR HAWAII & ASSOCIATES, INC.



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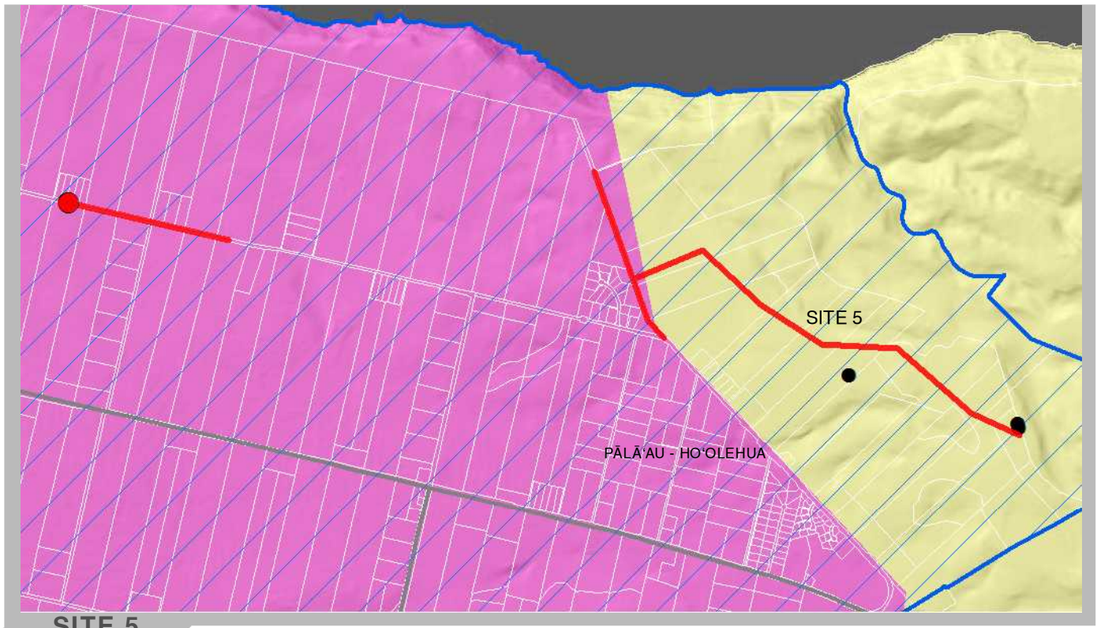

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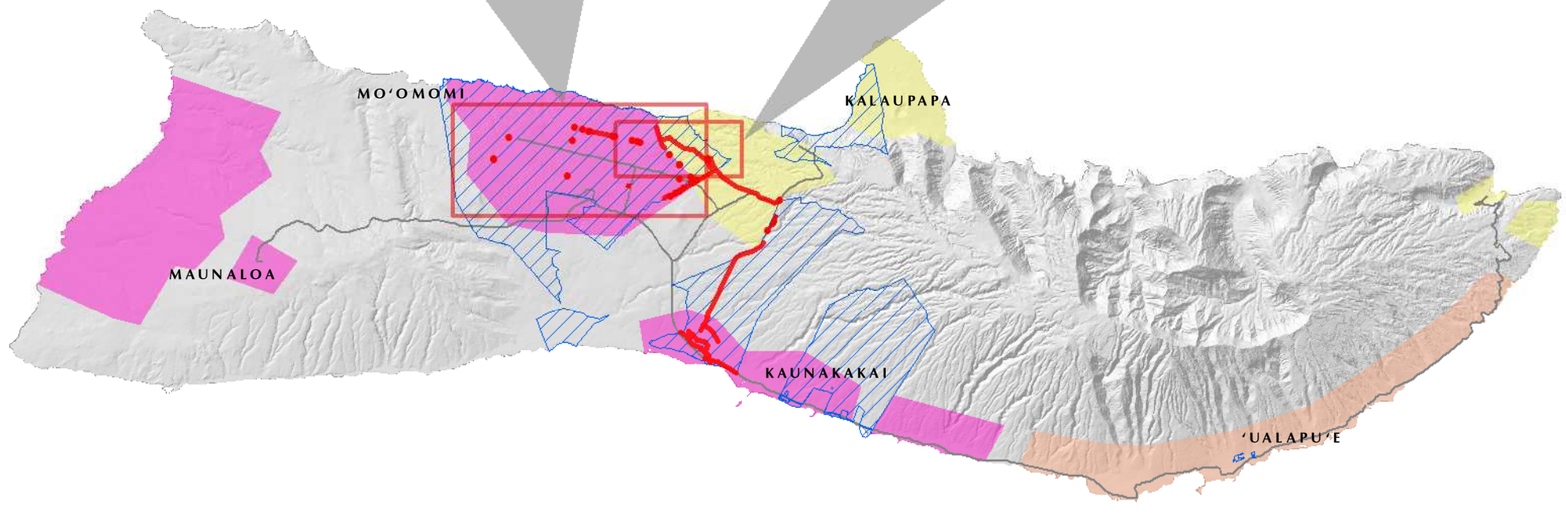

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LEGEND

DATE: 1/11/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

Fire Risk

- High
- Medium
- Low

Source: Department of Land and Natural Resources, Division of Forestry and Wildlife, Fire Management Program (2007). Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 6

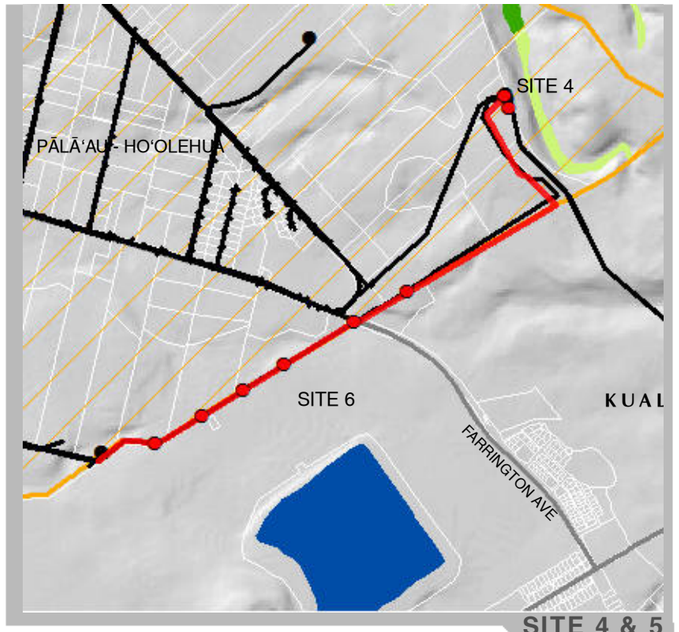
Communities at Risk from Wild-Land Fires (2 of 2)

MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
North

Island of Moloka'i

PBR HAWAII & ASSOCIATES, INC.



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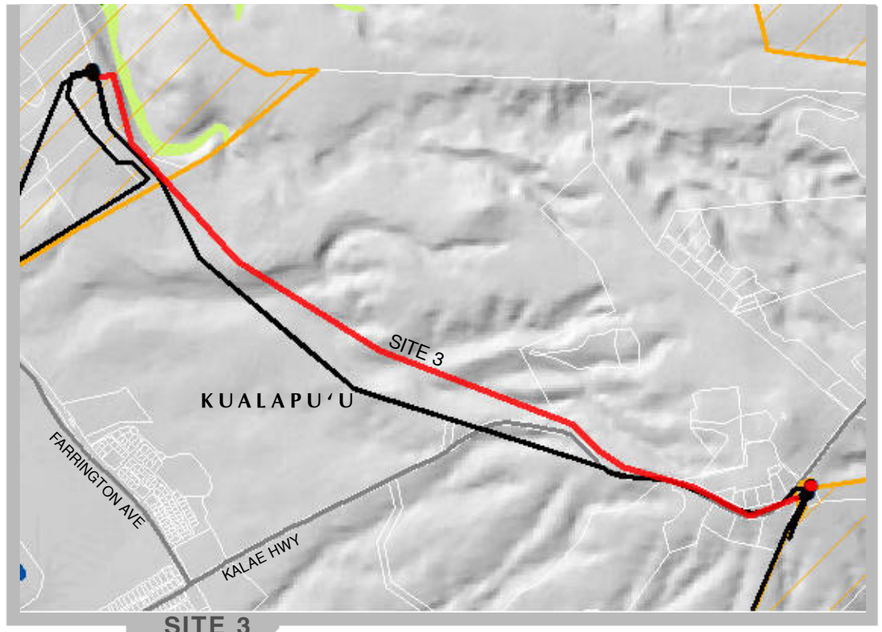

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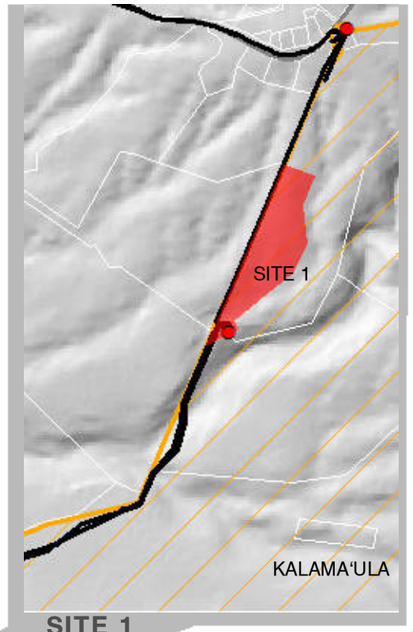

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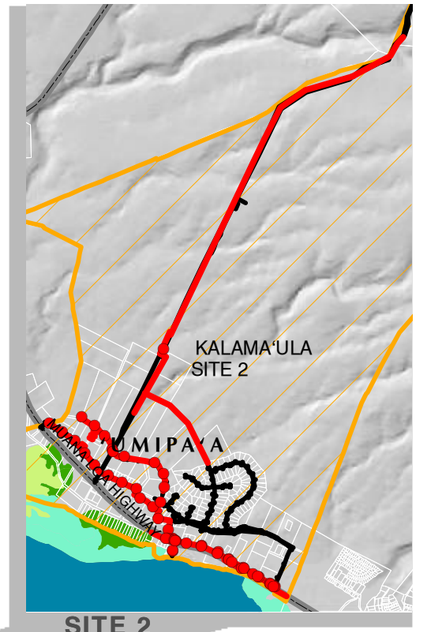

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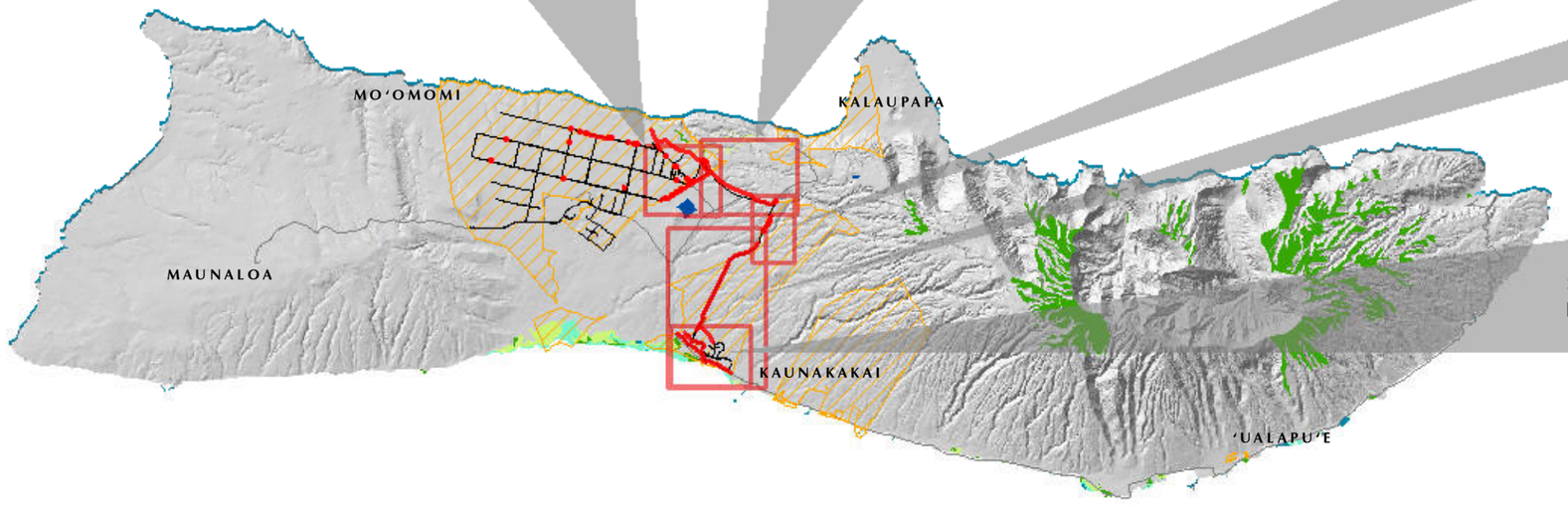

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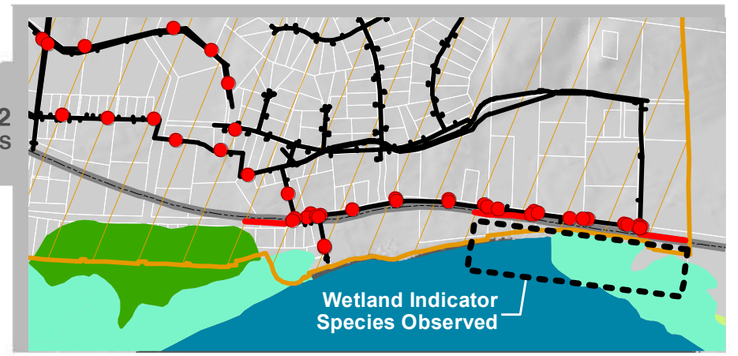

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LEGEND

DATE: 2/9/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Source: U.S. Department of Fish and Wildlife Service National Wetlands Inventory (10/1/2015), County of Maui. Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 7

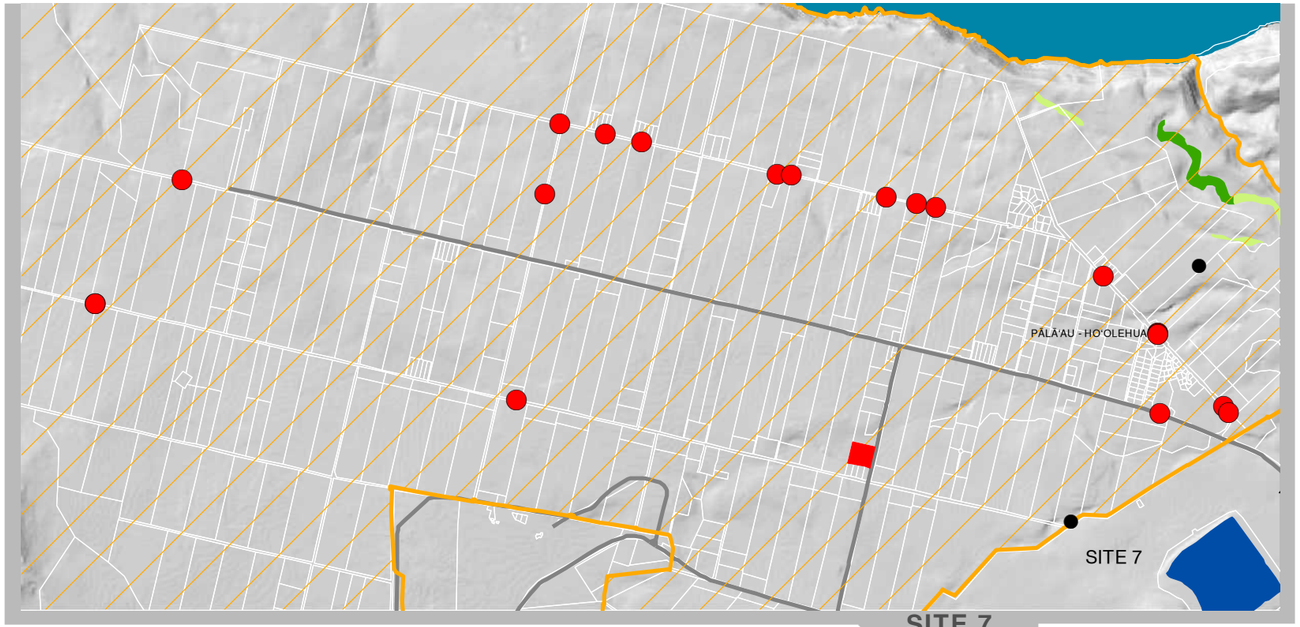
National Wetlands Inventory (1 of 2)
MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
North

Island of Moloka'i

NOT TO SCALE

PBR HAWAII
& ASSOCIATES, INC.



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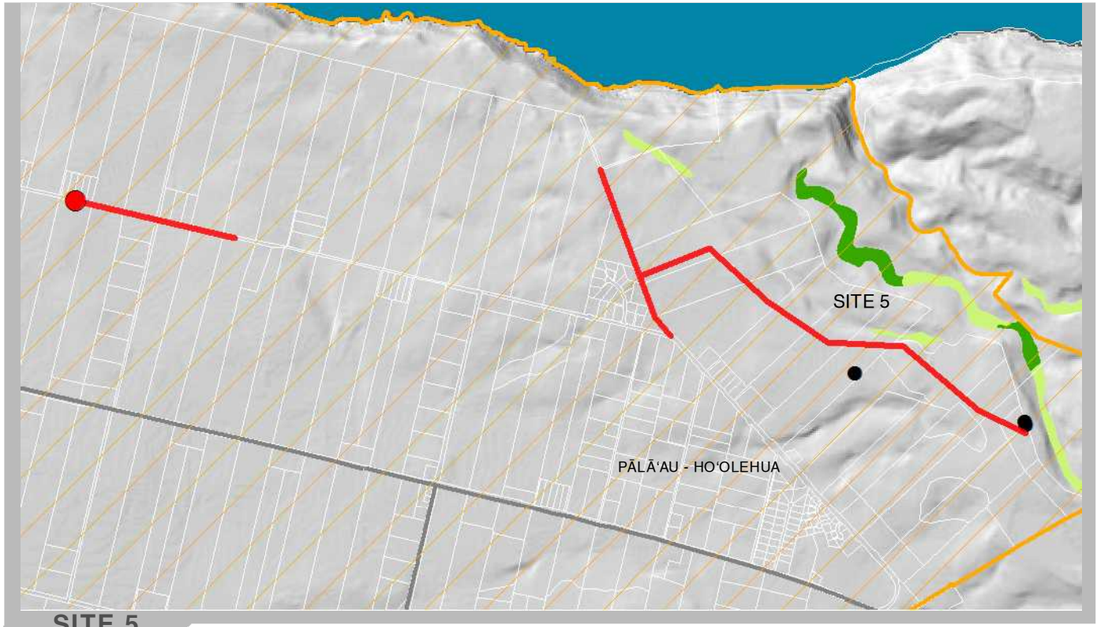

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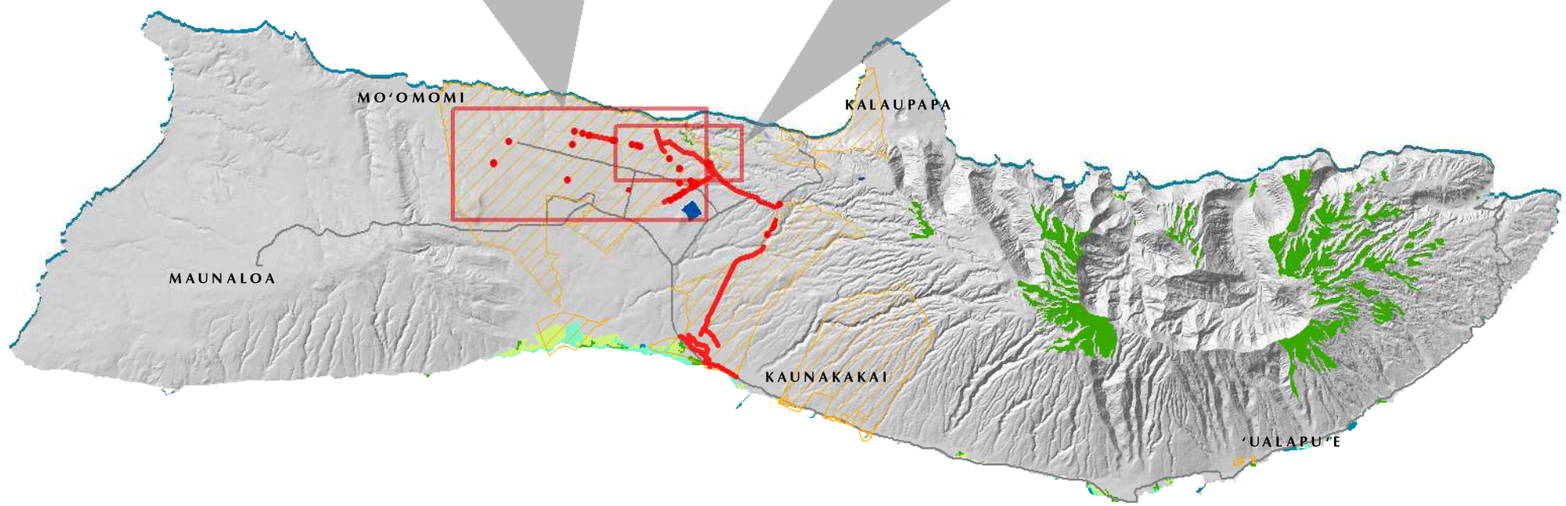

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LEGEND

DATE: 1/11/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Source: U.S. Department of Fish and Wildlife Service National Wetlands Inventory (10/1/2015), County of Maui. Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 7

National Wetlands Inventory (2 of 2)

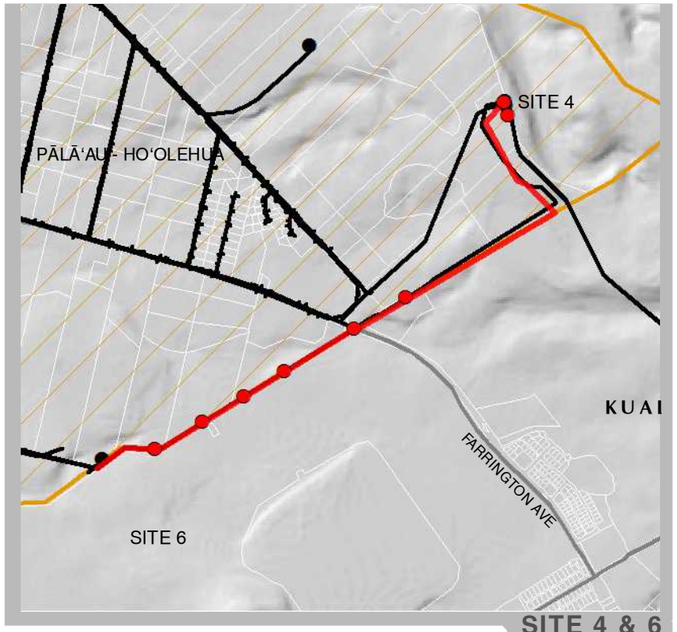
MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
North

Island of Moloka'i

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.



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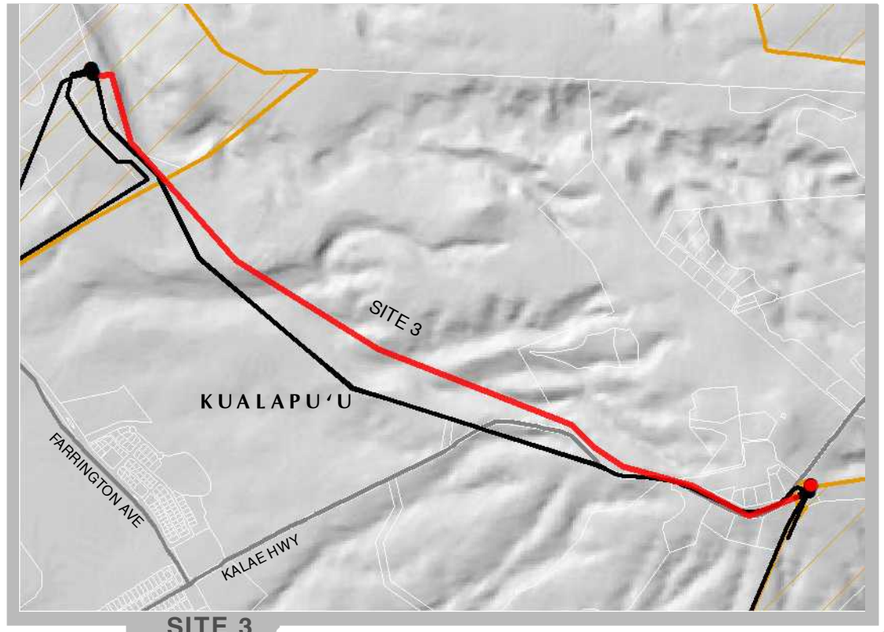

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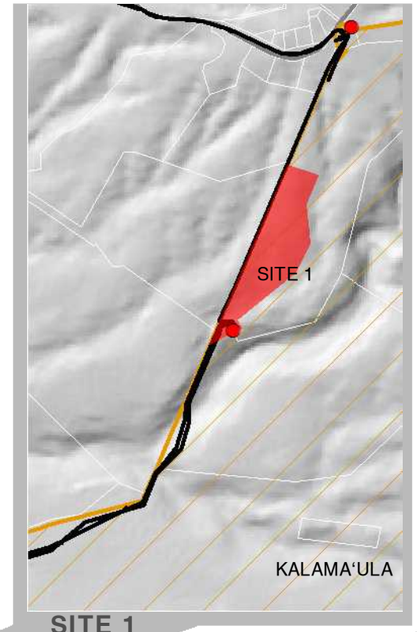

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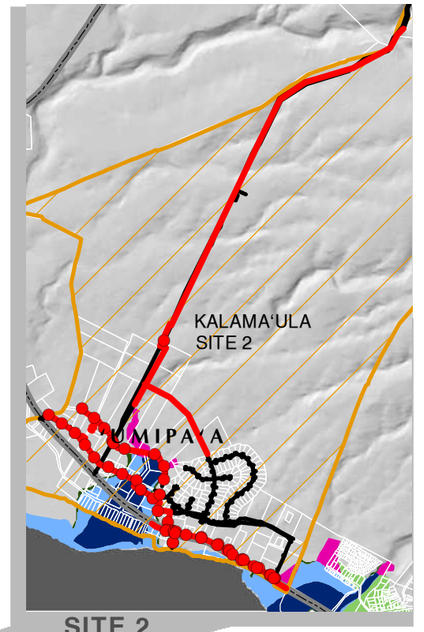

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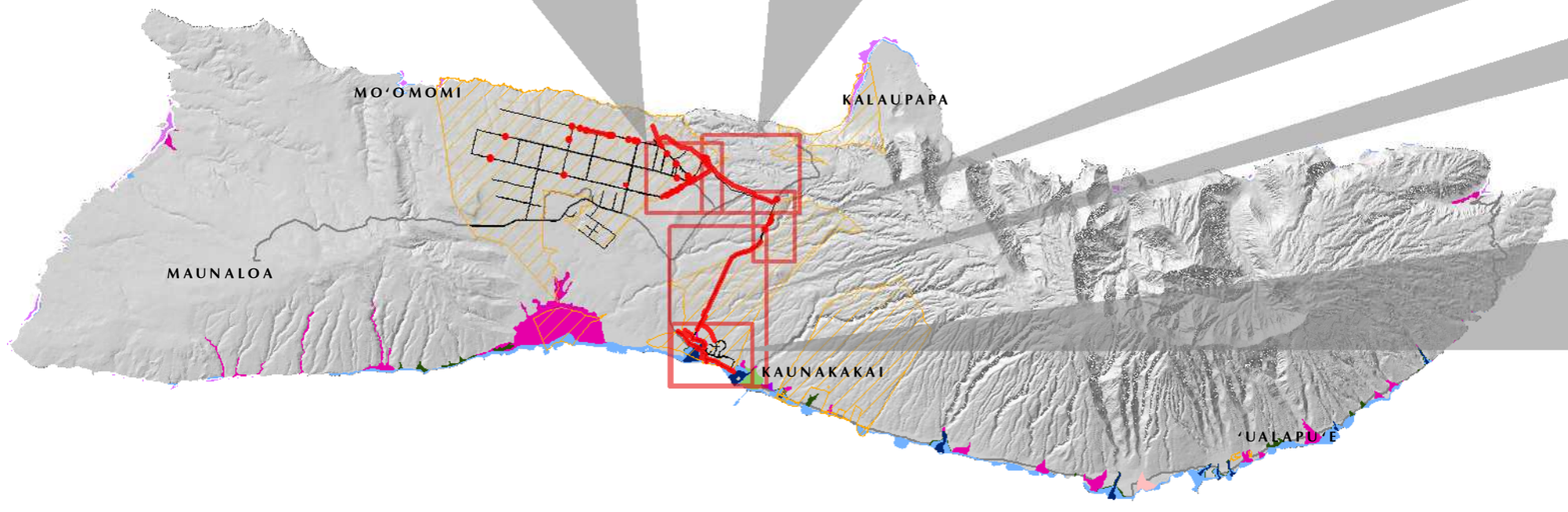

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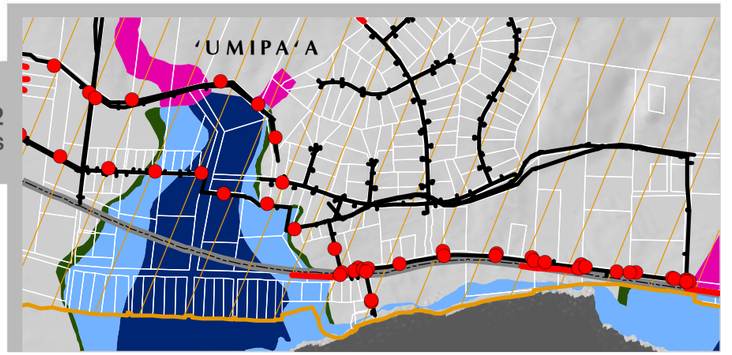

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LEGEND

DATE: 1/11/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

Flood Zones

- A: 100-year Flood, No Base Flood Elevations (BFE)
- AE: 100-year Flood with BFE
- Floodway in AE
- AH: 100-year Flood, Flood Depths 1-3 Ft with BFE
- AO: 100-year Flood, Flood Depths 1-3 Ft, Average Depths determined
- V: 100-year Flood, Coastal Flood Zone, No BFE
- VE: 100-year Flood, Coastal Flood Zone with BFE
- XS (X shaded): 500-year Flood
- X: Protected by Levee from 100-year Flood

Source: Federal Emergency Management Agency Digital Flood Insurance Rate Map Database, Maui County, Hawaii, USA (2012).
County of Maui. Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 8

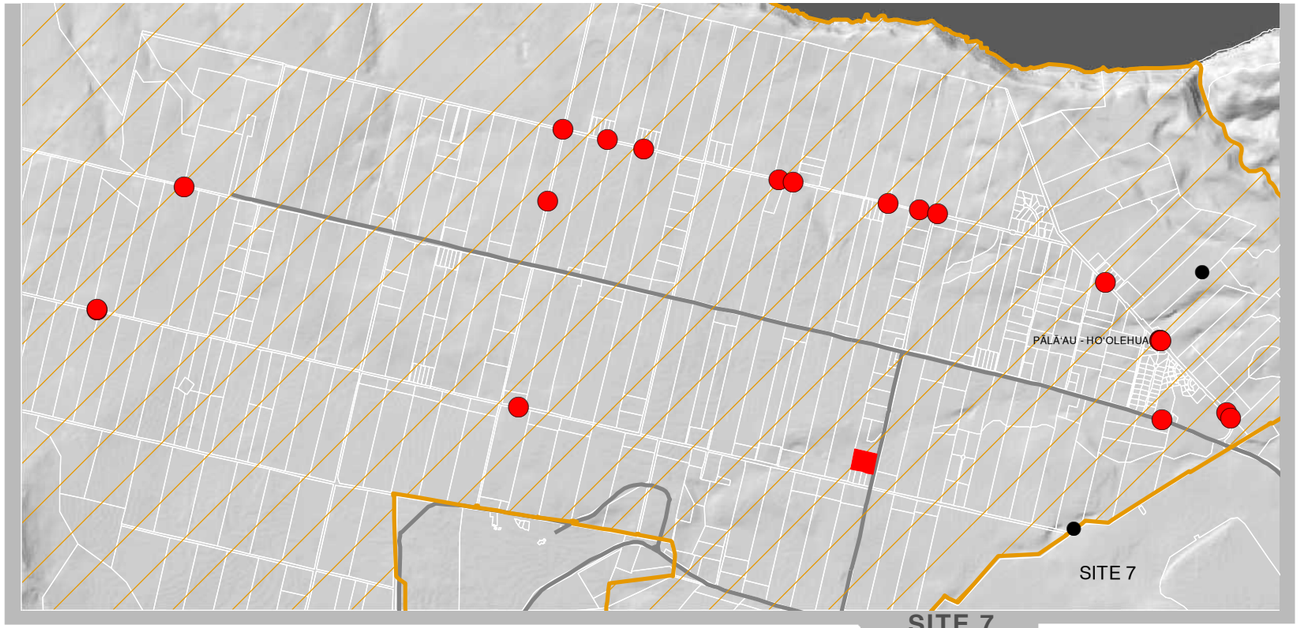
Flood Insurance Rate Map (1 of 2)
MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
North

Island of Moloka'i

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.



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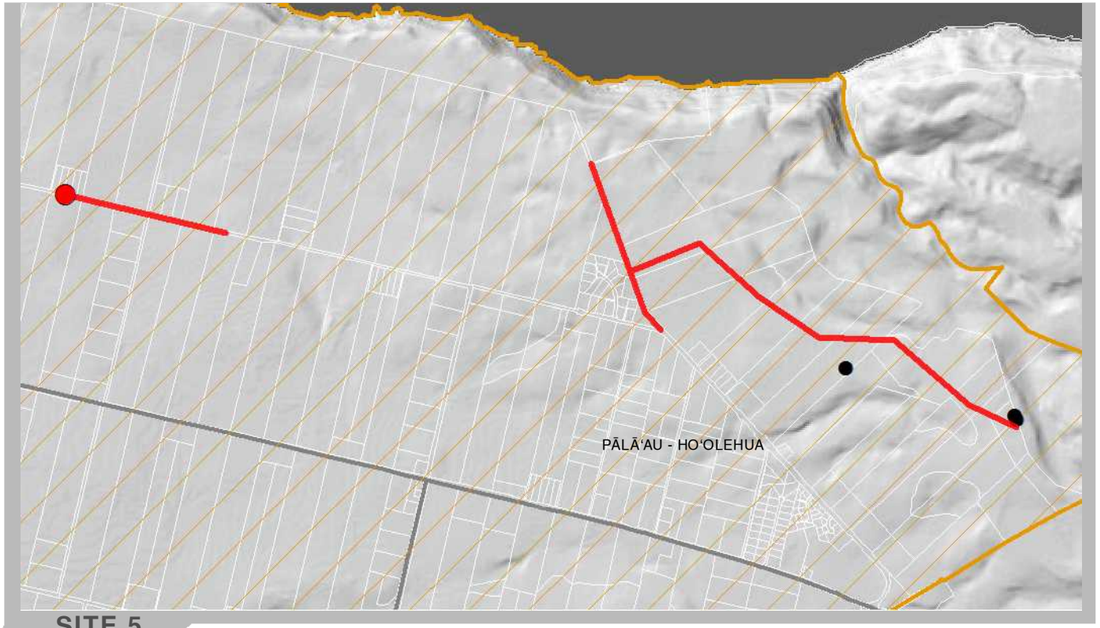

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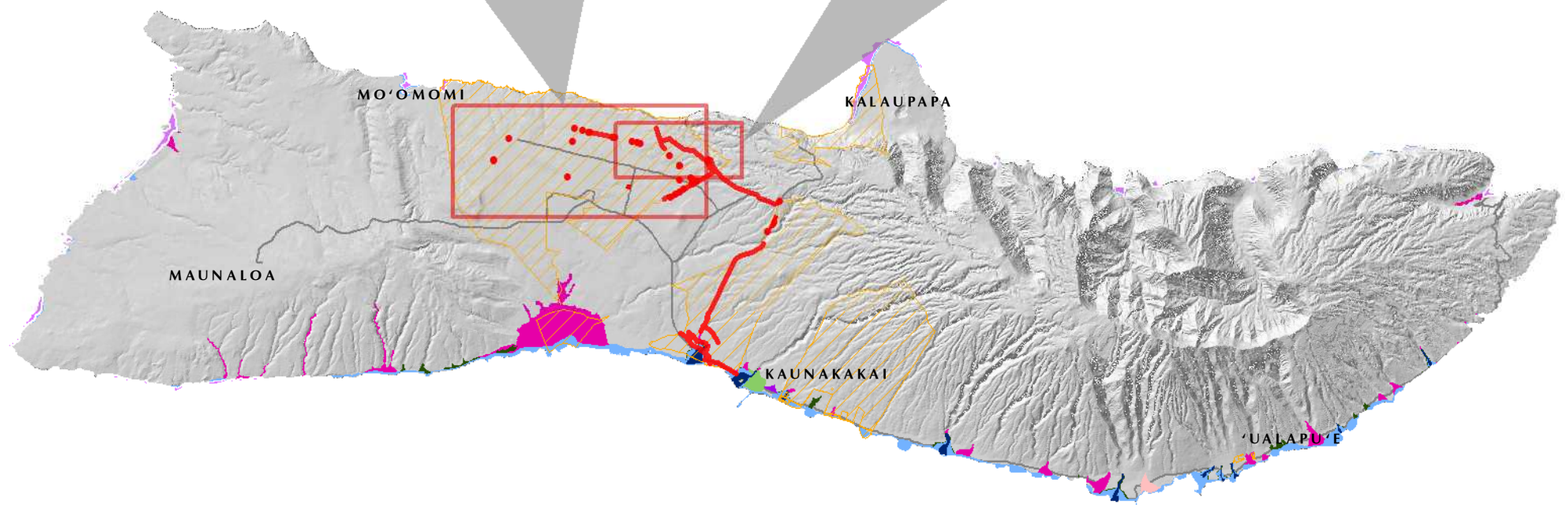

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LEGEND

DATE: 1/11/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

Flood Zones

- A: 100-year Flood, No Base Flood Elevations (BFE)
- AE: 100-year Flood with BFE
- Floodway in AE
- AH: 100-year Flood, Flood Depths 1-3 Ft with BFE
- AO: 100-year Flood, Flood Depths 1-3 Ft, Average Depths determined
- V: 100-year Flood, Coastal Flood Zone, No BFE
- VE: 100-year Flood, Coastal Flood Zone with BFE
- XS (X shaded): 500-year Flood
- X: Protected by Levee from 100-year Flood

Source: Federal Emergency Management Agency Digital Flood Insurance Rate Map Database, Maui County, Hawaii, USA (2012).
County of Maui. Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 8

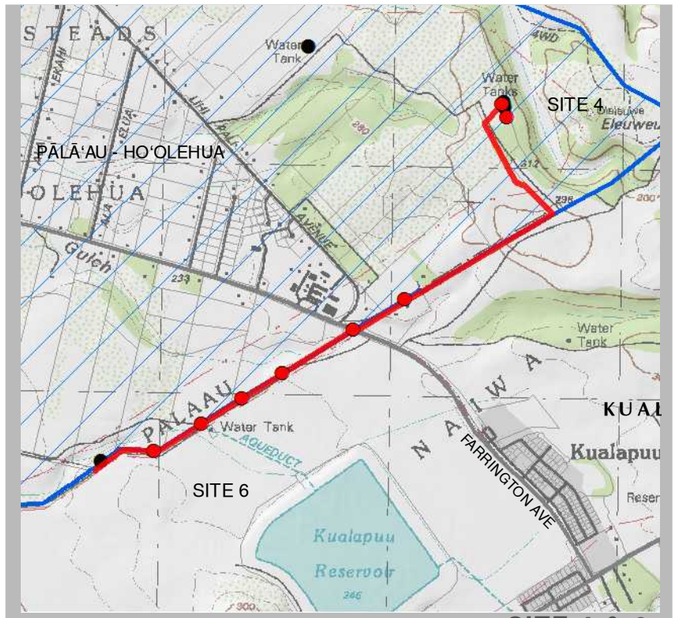
Flood Insurance Rate Map (2 of 2)
MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
North

Island of Moloka'i

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.



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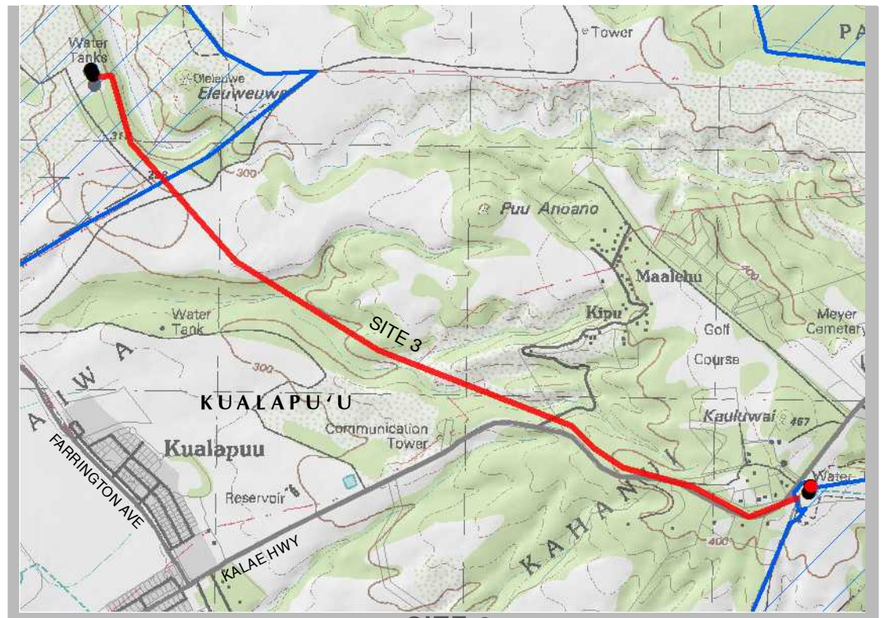

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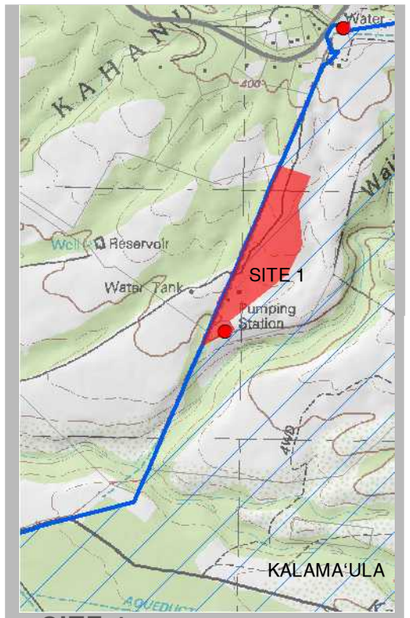

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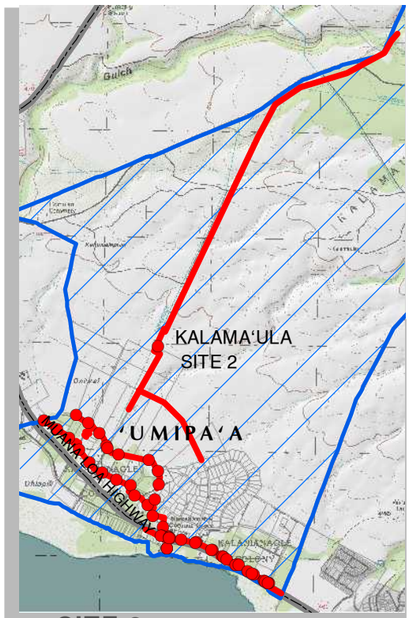

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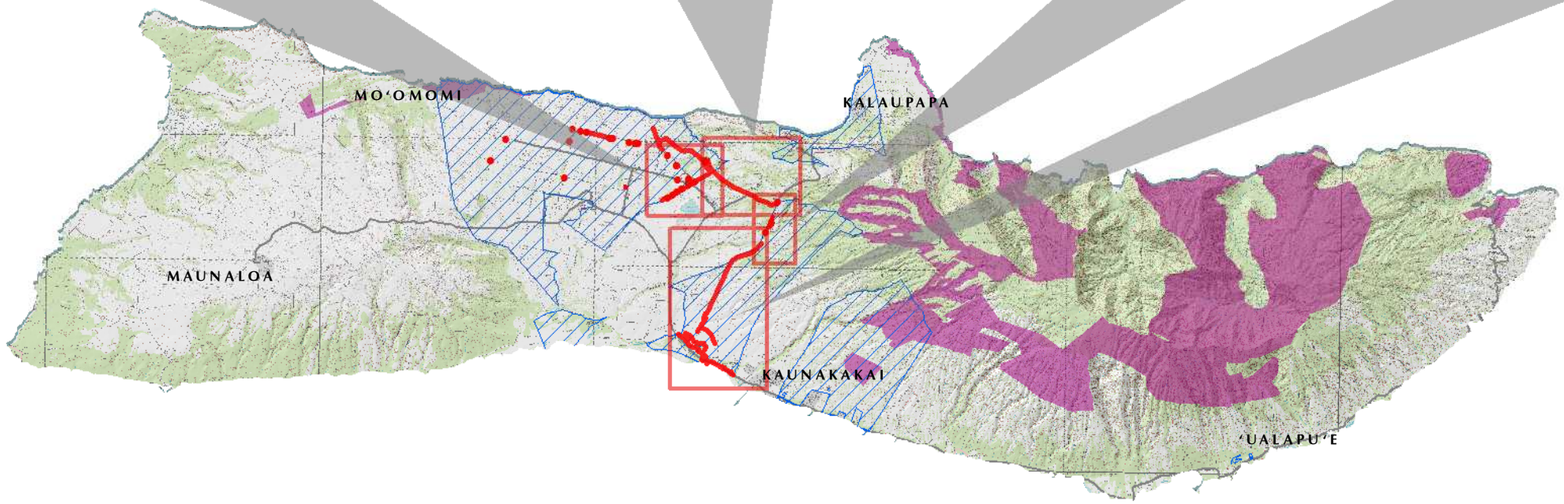

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LEGEND

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands
- Critical Habitat

List of Endangered or Threatened Species with Designated Critical Habit

- Adenophorus periens
- Alectryon macrococcus
- Bidens wiebkei
- Brighamia rockii
- Canavalia molokaiensis
- Centaurium sebaeoides
- Clermontia oblongifolia ssp. brevipes
- Ctenitis squamigera
- Cyanea dunbarii
- Cyanea grimesiana ssp. grimesiana
- Cyanea mannii
- Cyanea procera
- Diellia erecta
- Diplazium molokaiense
- Eugenia koolauensis
- Flueggea neowawraea
- Hesperomannia arborescens
- Hibiscadelphus hualalaiensis
- Hibiscus arnottianus ssp. immaculatus
- Hibiscus brackenridgei
- Ischaemum byrone
- Isodendrion pyrifolium
- Labordia triflora
- Lysimachia maxima
- Manduca blackburni
- Mariscus fauriei
- Melicope mucronulata
- Melicope reflexa
- Neraudia sericea
- Peucedanum sandwicense
- Phyllostegia mannii
- Plantago princeps
- Pteris lidgatei
- Schiedea lydgatei
- Schiedea nuttallii
- Schiedea sarmentosa
- Sesbania tomentosa
- Silene alexandri
- Silene lanceolata
- Spermolepis hawaiiensis
- Stenogyne bifida
- Tetramolopium rockii
- Zanthoxylum hawaiiense

DATE: 1/11/2016

Figure 9

Critical Habitats (1 of 2)

MOLOKA'I WATER SYSTEM

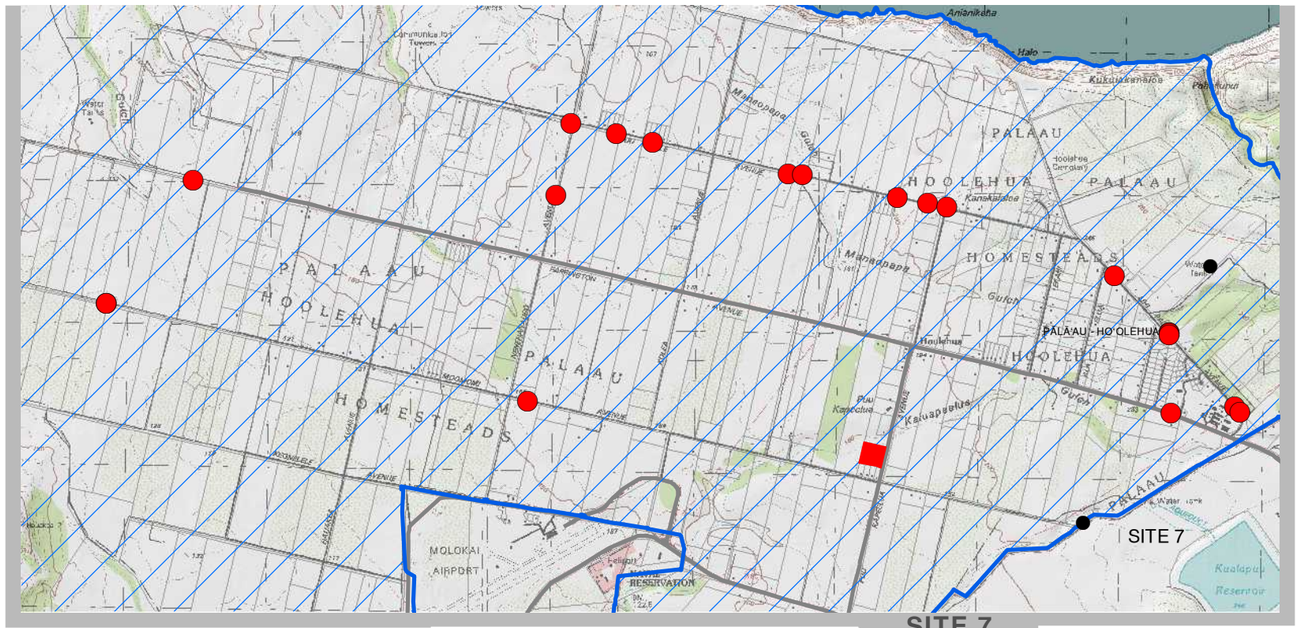
Department of Hawaiian Home Lands
Island of Moloka'i

North

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.

Source: Critical Habitat, Unites States Fish and Wildlife Service (2009). Accessible at http://criticalhabitat.fws.gov/crithab/. County of Maui. Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008). Moloka'i Quadrangle Map, 1:24,000-scale Digital Raster Graphic, U.S. Geological Survey.
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.



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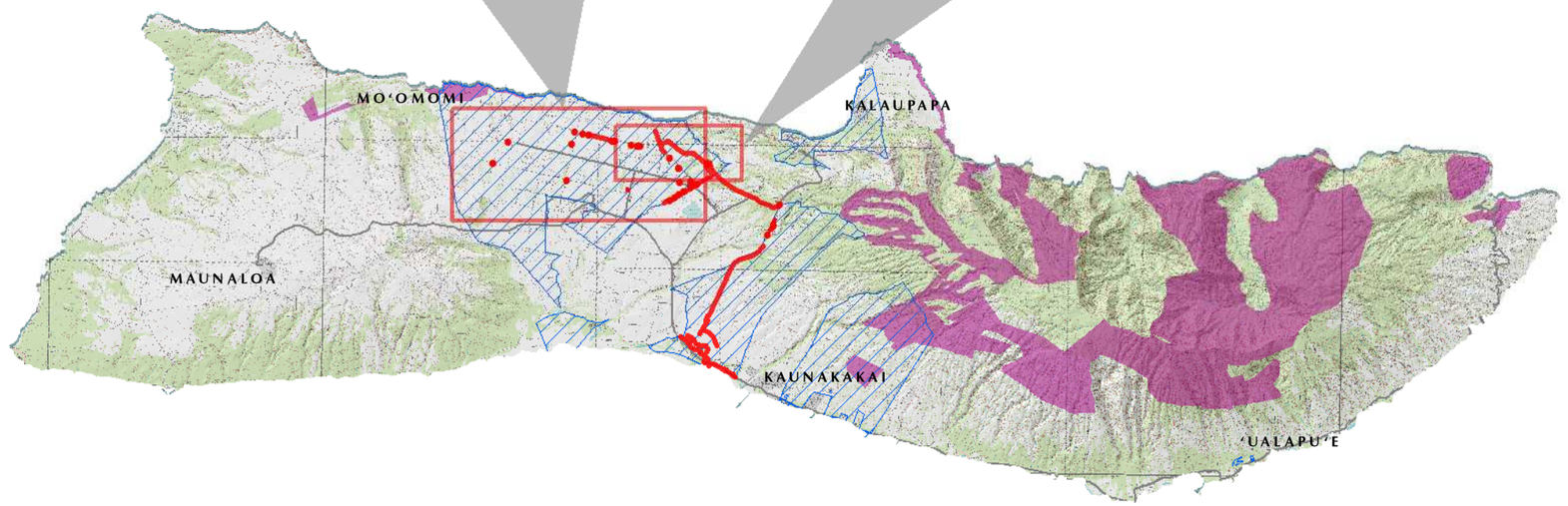

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LEGEND

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands
- Critical Habitat

List of Endangered or Threatened Species with Designated Critical Habit

Adenophorus periens
Alectryon macrococcus
Bidens wiebkei
Brighamia rockii
Canavalia molokaiensis
Centaurium sebaeoides
Clermontia oblongifolia ssp. brevipes
Ctenitis squamigera
Cyanea dunbarii
Cyanea grimesiana ssp. grimesiana
Cyanea mannii
Cyanea procera
Diellia erecta
Diplazium molokaiense
Eugenia koolauensis
Flueggea neowawraea
Hesperomannia arborescens
Hibiscadelphus hualalaiensis
Hibiscus arnottianus ssp. immaculatus
Hibiscus brackenridgei
Ischaemum byrone
Isodendrion pyrifolium
Labordia triflora
Lysimachia maxima
Manduca blackburni
Mariscus fauriei
Melicope mucronulata
Melicope reflexa
Neraudia sericea
Peucedanum sandwicense
Phyllostegia mannii
Plantago princeps
Pteris lidgatei
Schiedea lydgatei
Schiedea nuttallii
Schiedea sarmentosa
Sesbania tomentosa
Silene alexandri
Silene lanceolata
Spermolepis hawaiiensis
Stenogyne bifida
Tetramolopium rockii
Zanthoxylum hawaiiense

DATE: 1/11/2016

Figure 9

Critical Habitats (2 of 2)

MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
North

Island of Moloka'i

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.

Source: Critical Habitat, Unites States Fish and Wildlife Service (2009). Accessible at http://criticalhabitat.fws.gov/crithab/. County of Maui. Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008). Moloka'i Quadrangle Map, 1:24,000-scale Digital Raster Graphic, U.S. Geological Survey.
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

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10 miles
7.5 miles
5 miles
2.5 miles

Kalaupapa Airpot

4.8 miles

KALAUPAPA

PĀLĀ'AU

PĀLĀ'AU - HO'OLEHUA

FARRINGTON AVE

KUALAPU'U

Moloka'i Airport

5.1 miles

2,500 feet from end of runways

2.5 miles

KALAE HWY

5 miles

7.5 miles

10 miles

MUANA LOA HWY

'UMIPA'A

KALAMA'ULA

KAPAAKEA

KAMILOLOA

MAKAKUPAIA

LEGEND

DATE: 3/9/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Maintenance Yard Building (±1.4 miles from Moloka'i Airport)
- Distance to Proposed Solar Field
- 2,500 feet from End of Runways 5/23 and 17/35
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

Source: U.S. Geological Survey Geographic Place Names (2012). Hillshade GRIDs created by ESRI Honolulu staff isomg USGS 0 meter DEMs (2008). Moloka'i Quadrangle Map, 1:24,000-scale Digital Raster Graphic, U.S. Geological Survey.

Disclaimer: This Graphic has been prepared for general Planning purposes only and should not be used for boundary Interpretations or other spatial analysis.

Figure 10

Distance from Airport
MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
Island of Moloka'i

North

Linear Scale (miles)
0 1/2 1 2

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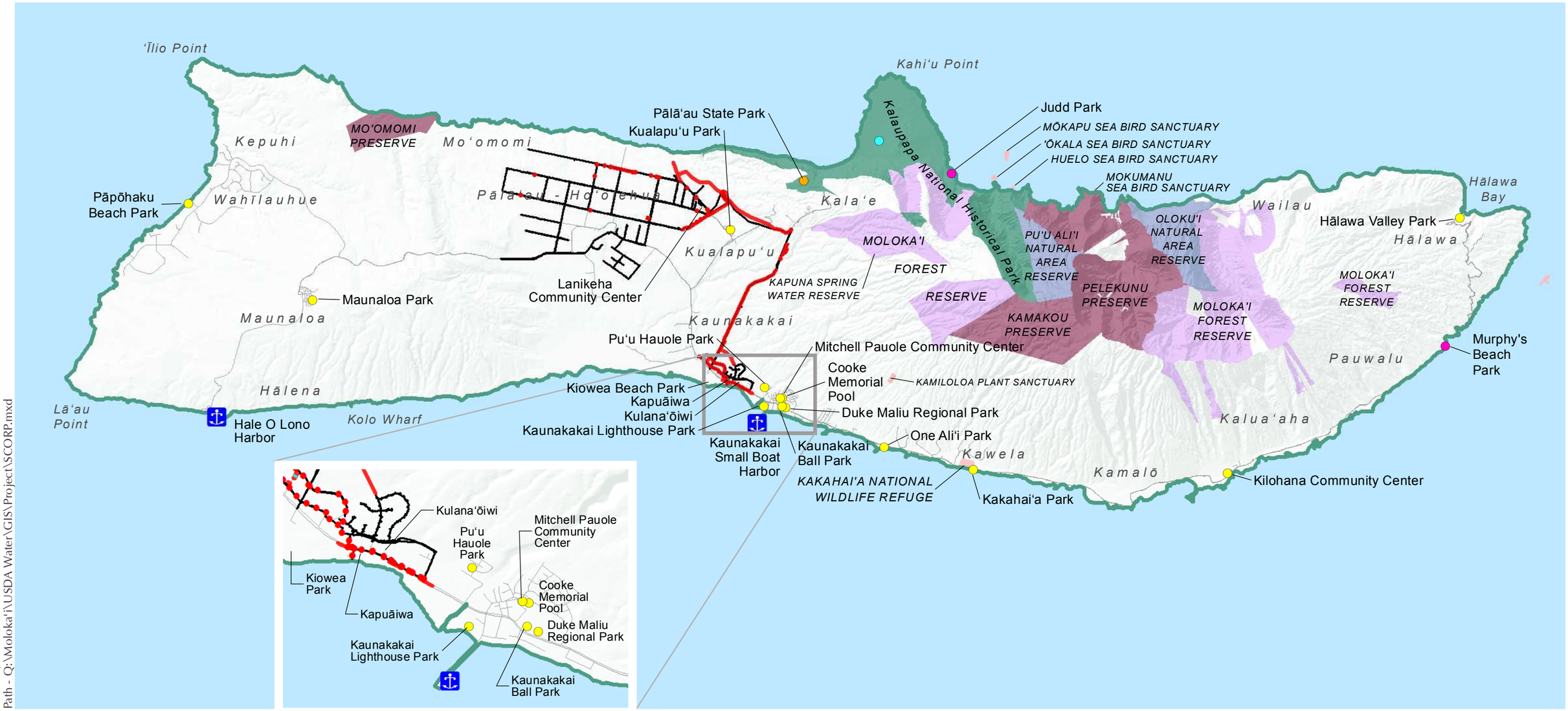

LEGEND

DATE: 1/11/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope

RECREATIONAL FACILITIES
- Park Boundary
- Private Park
- County Park
- StatePark*
- Federal Park
- Boating Facility

* owned or managed by a state agency

MANAGED AREAS
- Forest Reserve
- Preserve
- Natural Area Reserve
- Wildlife Refuge/ Sanctuary

Source: State Department of Land & Natural Resources, Division of State Parks, Hawai'i Statewide Comprehensive Outdoor Recreation Plan 2015
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 11

Recreational Facilities and Managed Areas

MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
Island of Moloka'i

North

Linear Scale (miles)
0 1.3 2.6 5.2

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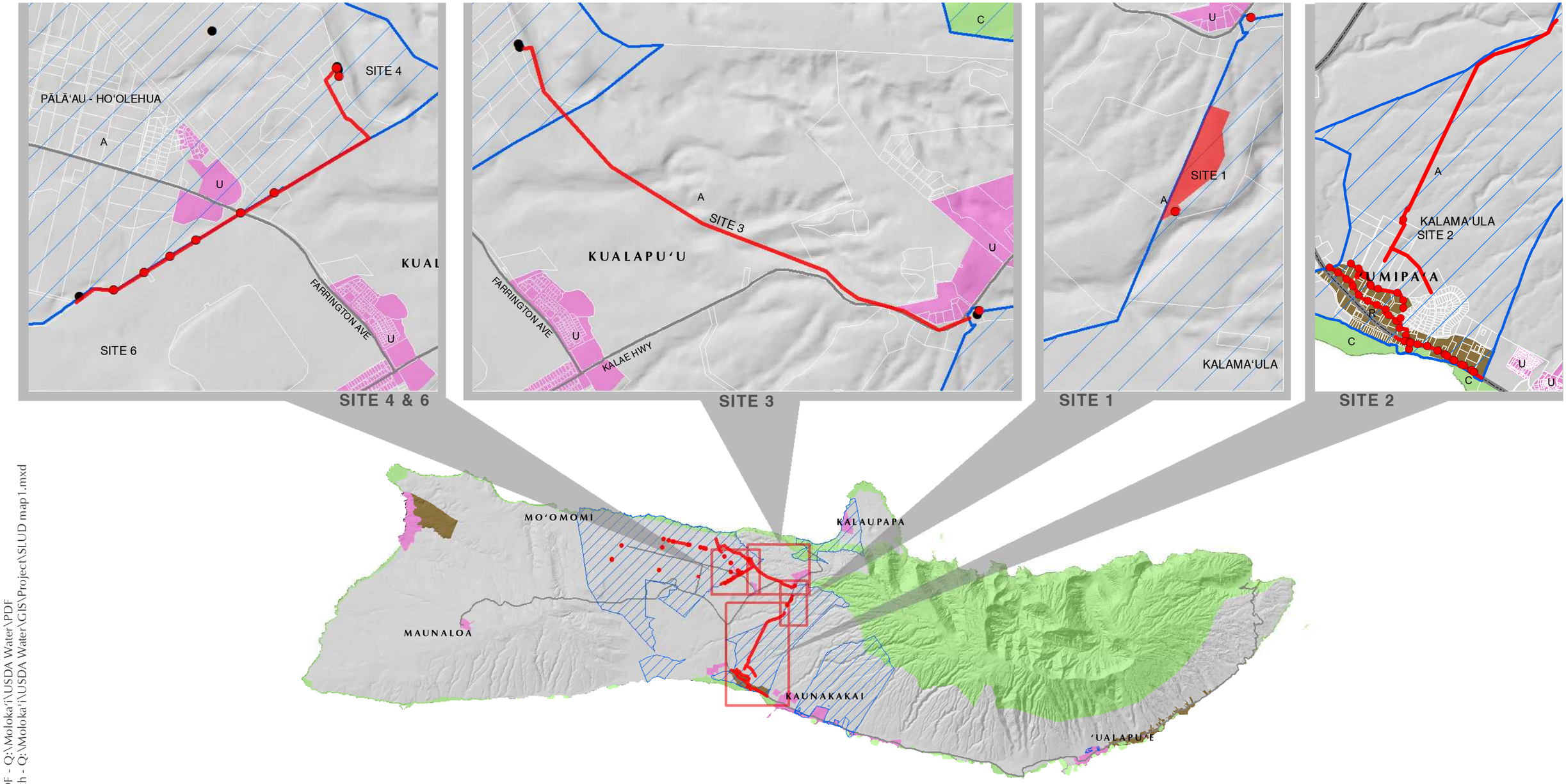

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LEGEND

DATE: 1/11/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

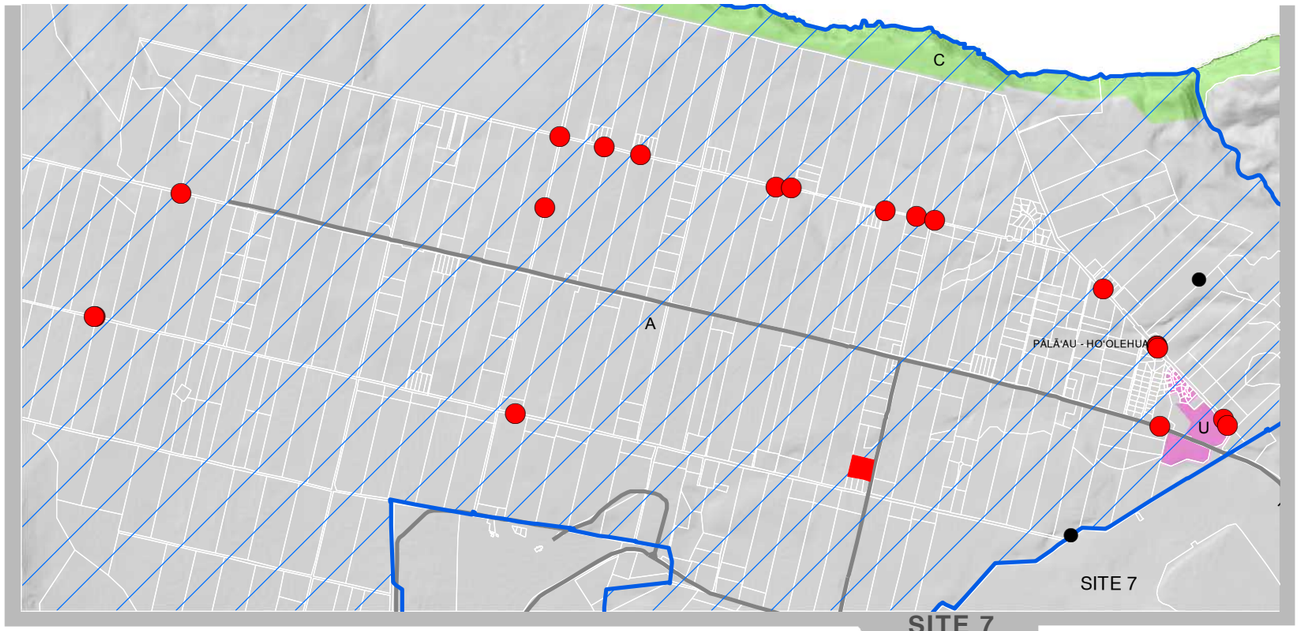
- A Agricultural
- C Conservation
- R Rural
- U Urban

Source: SLUD, Land Use Commission, State of Hawai`i (2014). Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 12
State Land Use Districts (1 of 2)
MOLOKA'I WATER SYSTEM
Department of Hawaiian Home Lands
Island of Moloka'i
North

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.



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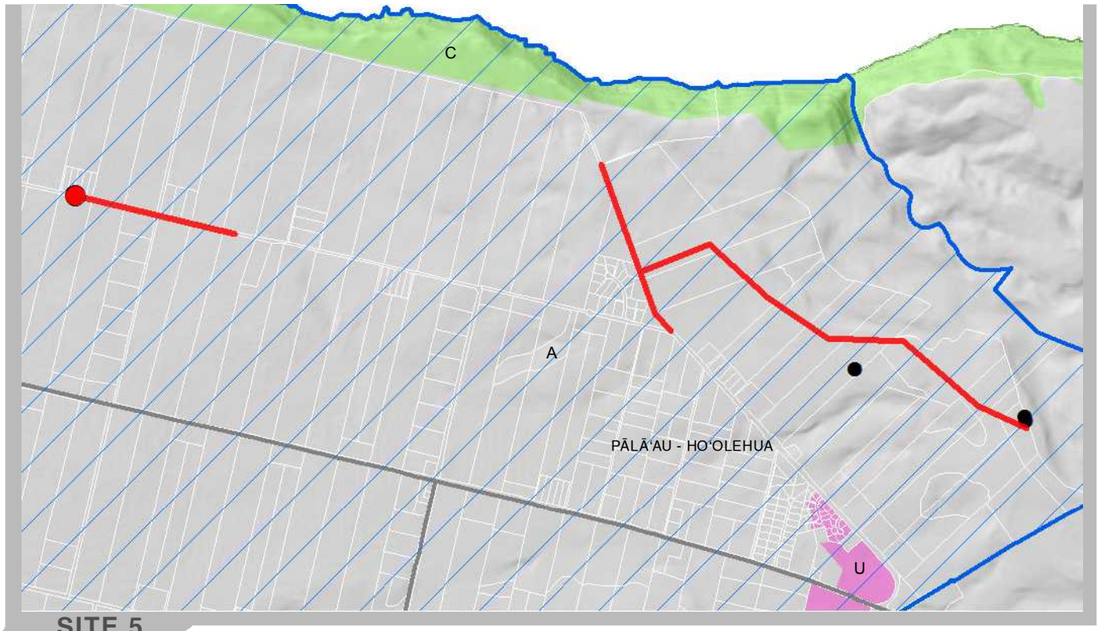

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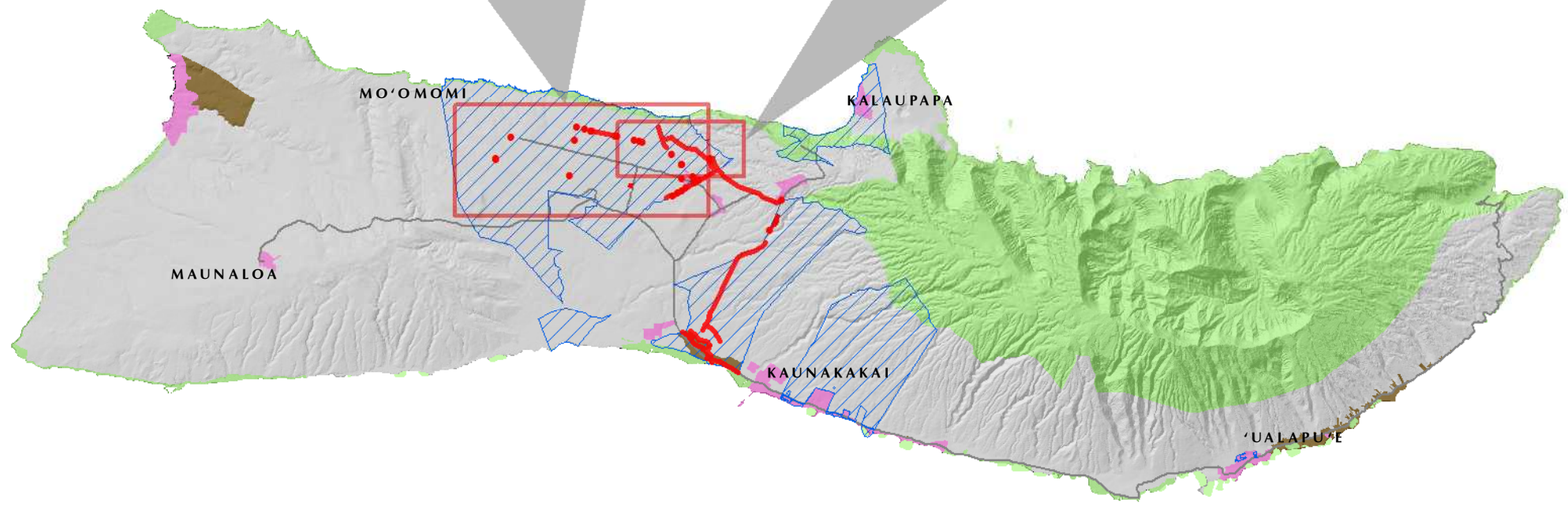

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LEGEND

DATE: 1/11/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

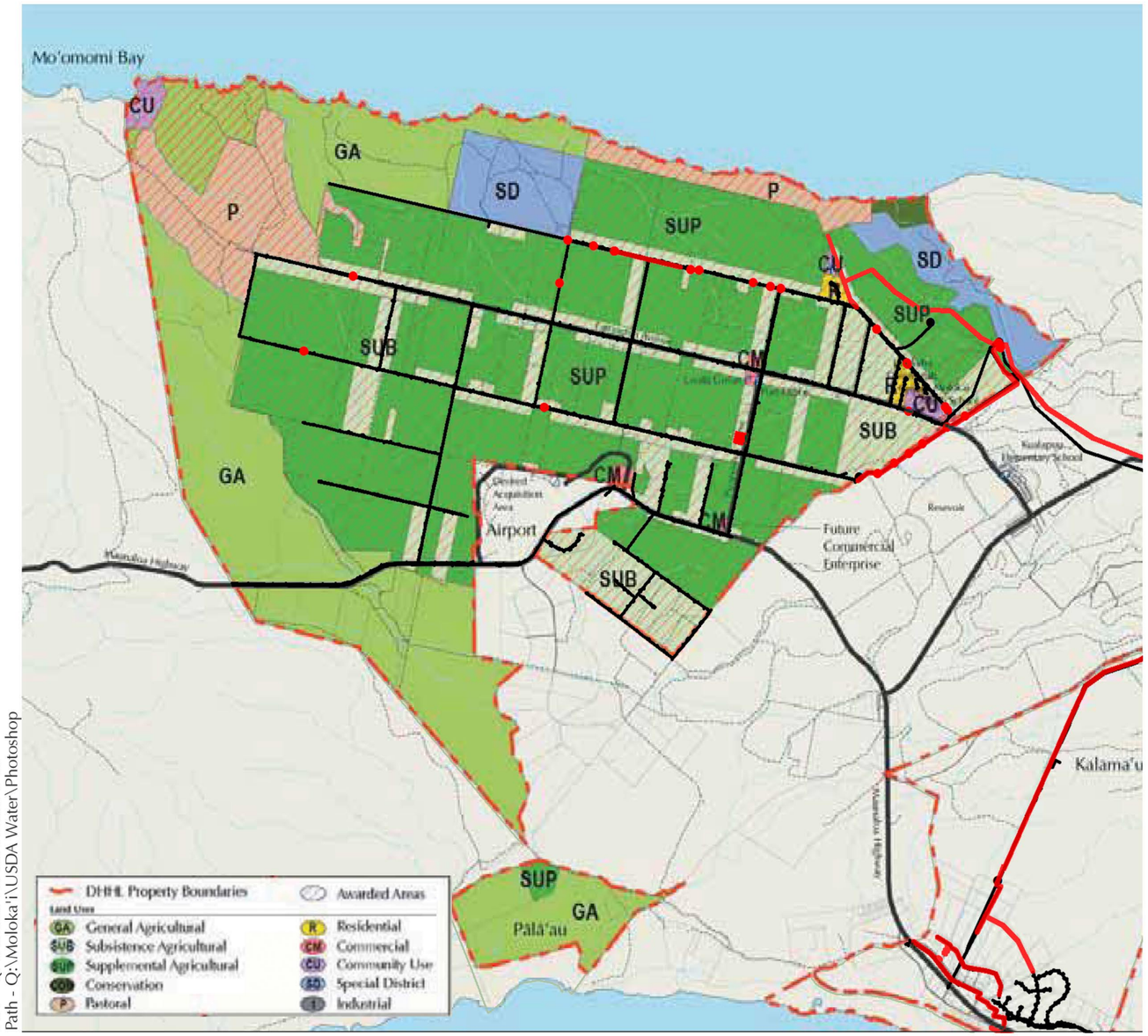
- A Agricultural
- C Conservation
- R Rural
- U Urban

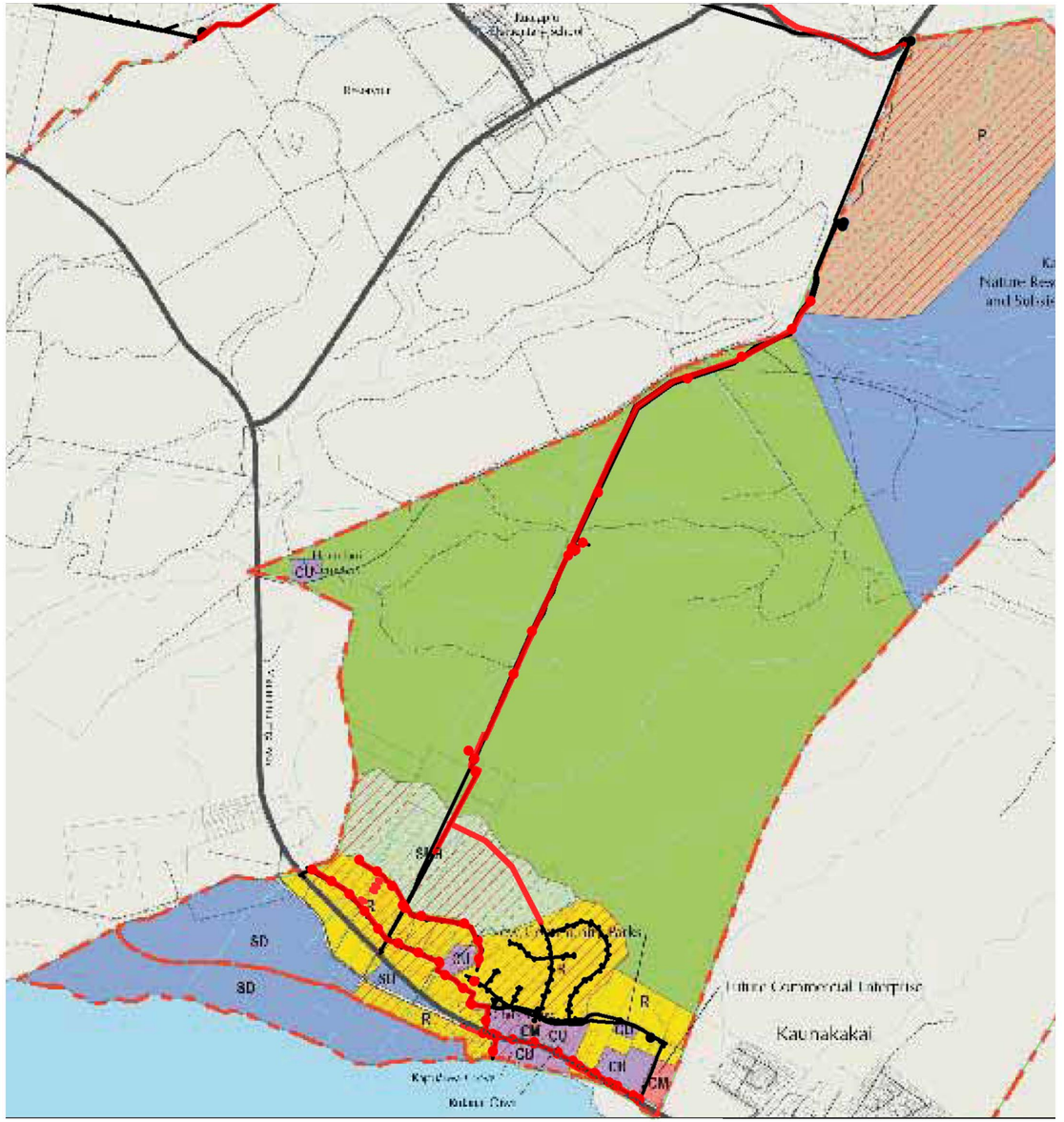
Source: SLUD, Land Use Commission, State of Hawai`i (2014). Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 12
State Land Use Districts (2 of 2)
MOLOKA'I WATER SYSTEM
Department of Hawaiian Home Lands
Island of Moloka'i
North

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.





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LEGEND

DATE: 11/10/2015

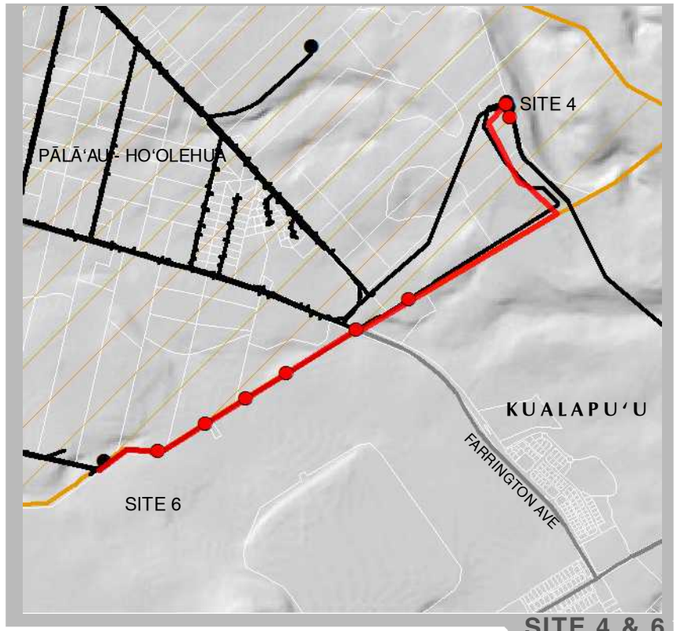
- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope

Source: Moloka'i Island Plan, Department of Hawaiian Home Lands
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 13
DHHL Land Use Designations
MOLOKA'I WATER SYSTEM
Department of Hawaiian Home Lands
Island of Moloka'i
North

NOT TO SCALE

PBR HAWAII
& ASSOCIATES, INC.



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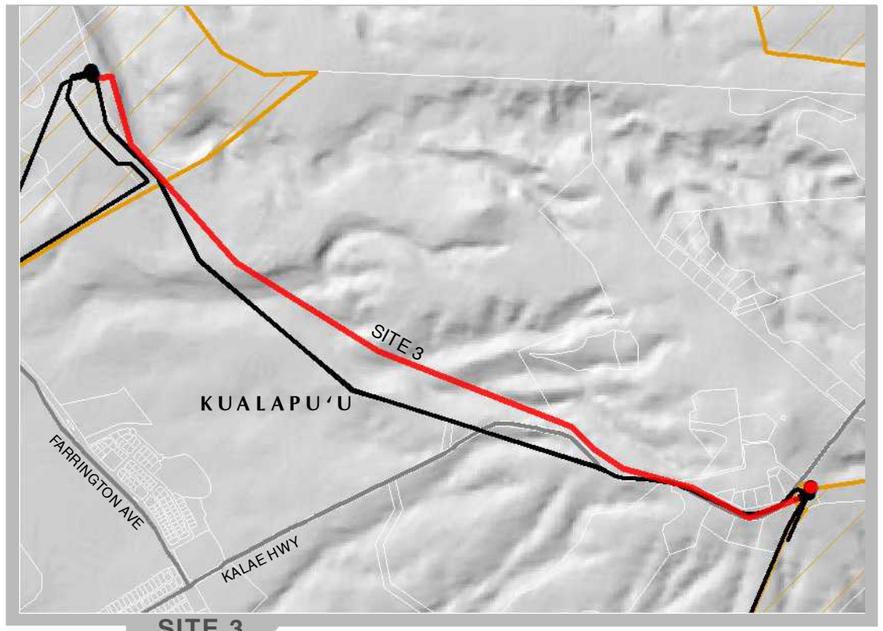

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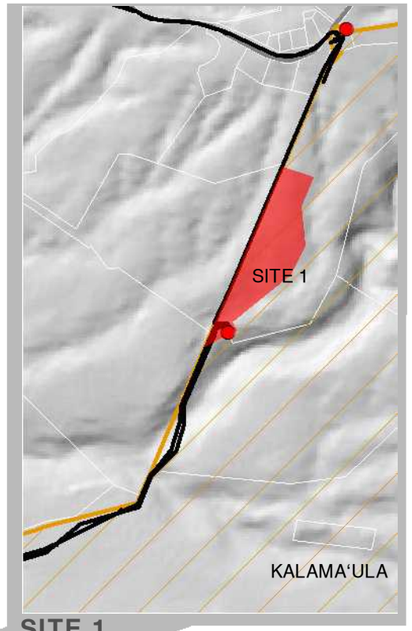

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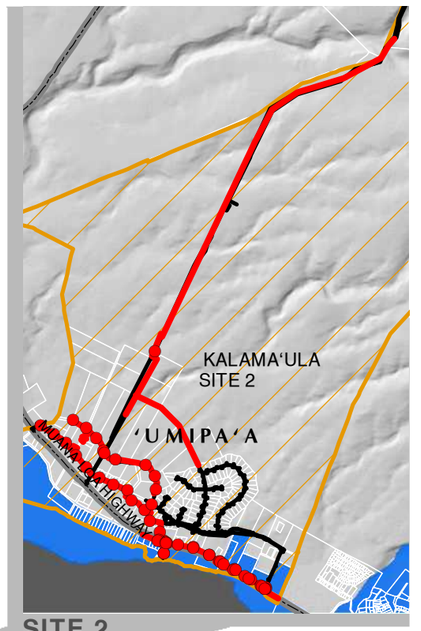

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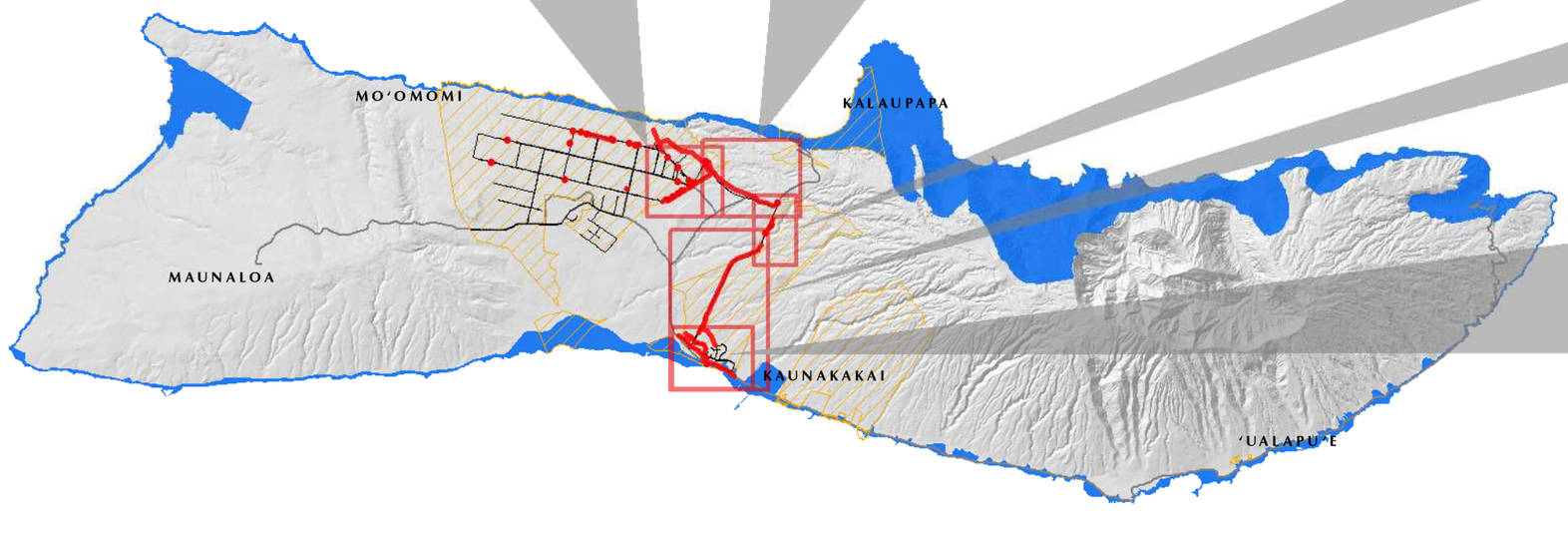

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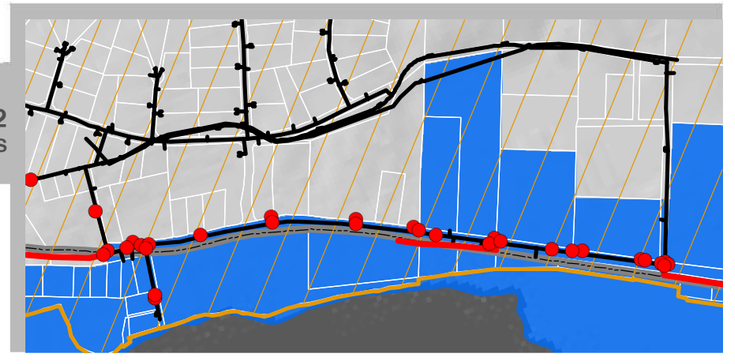

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LEGEND

DATE: 1/11/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands
- Special Management Area

Source: Special Management Area for the Islands of Moloka'i, County of Maui (2007). Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 14

Special Management Area (1 of 2)

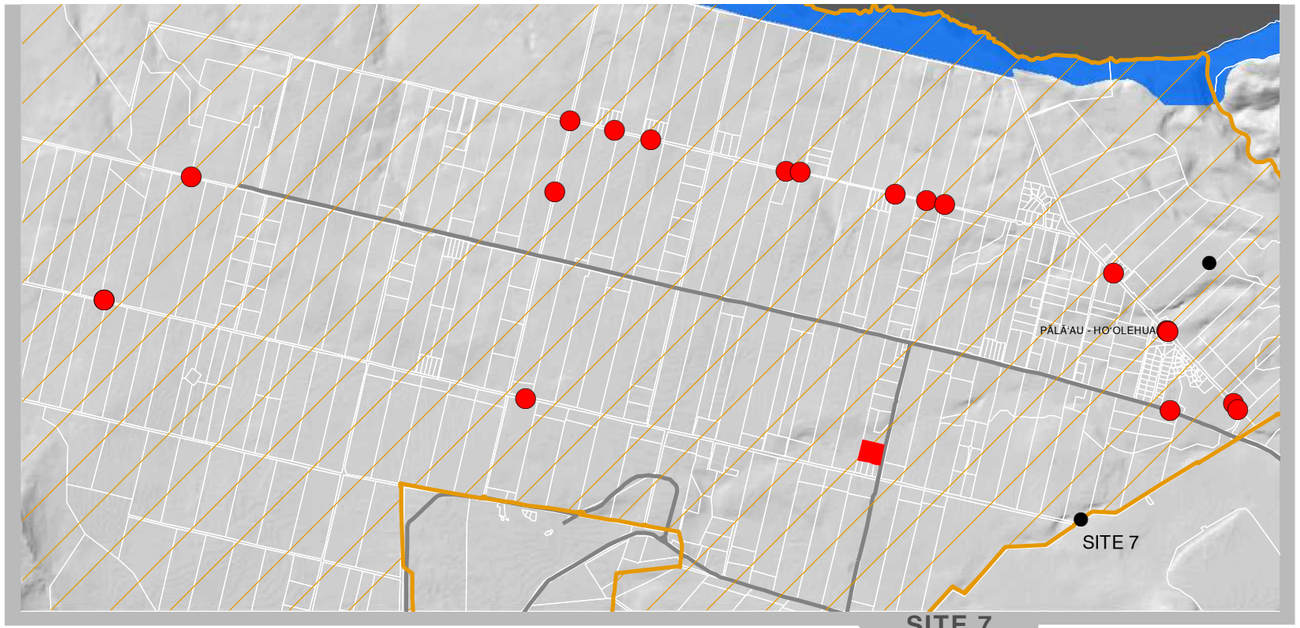
MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
North

Island of Moloka'i

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.



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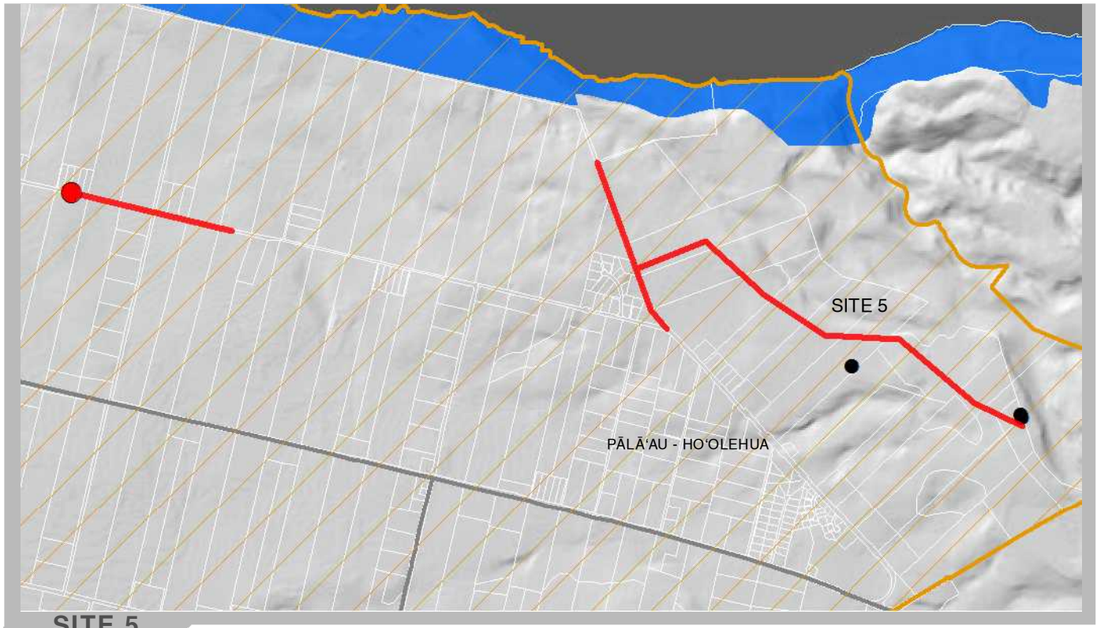

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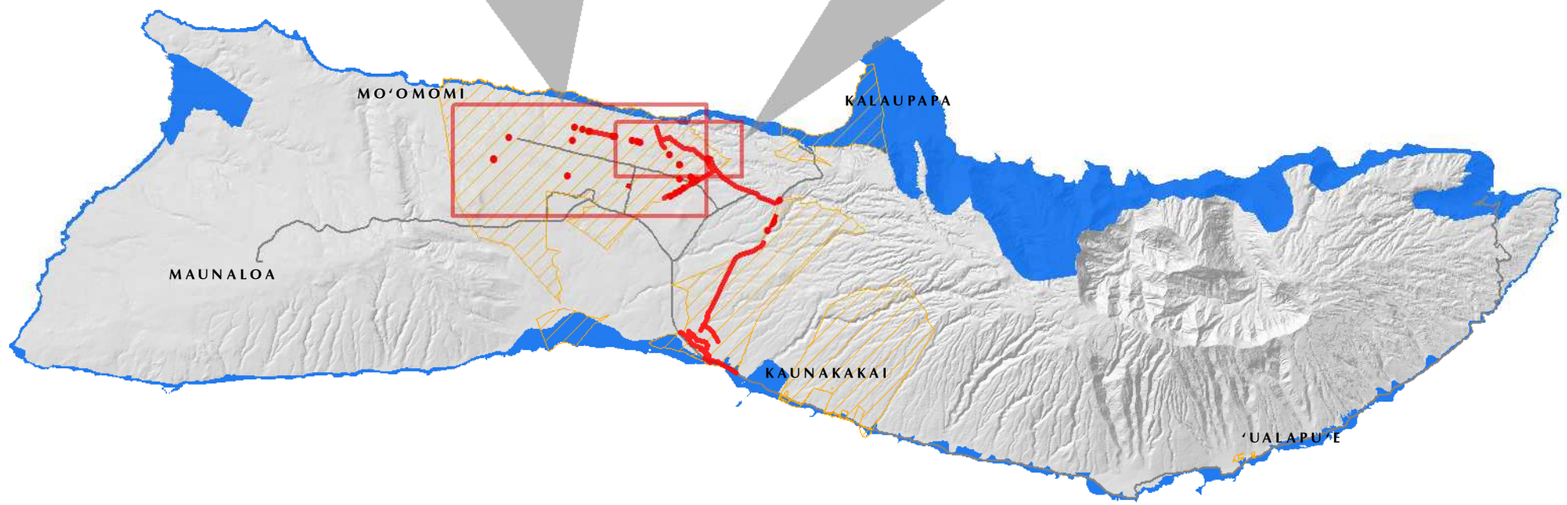


PDF - Q:\Moloka'i\USDA Water\PDF
Path - Q:\Moloka'i\USDA Water\GIS\Project\SMA map2.mxd

LEGEND

DATE: 1/11/2016

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands
- Special Management Area

Source: Special Management Area for the Islands of Moloka'i, County of Maui (2007). Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 14

Special Management Area (2 of 2)

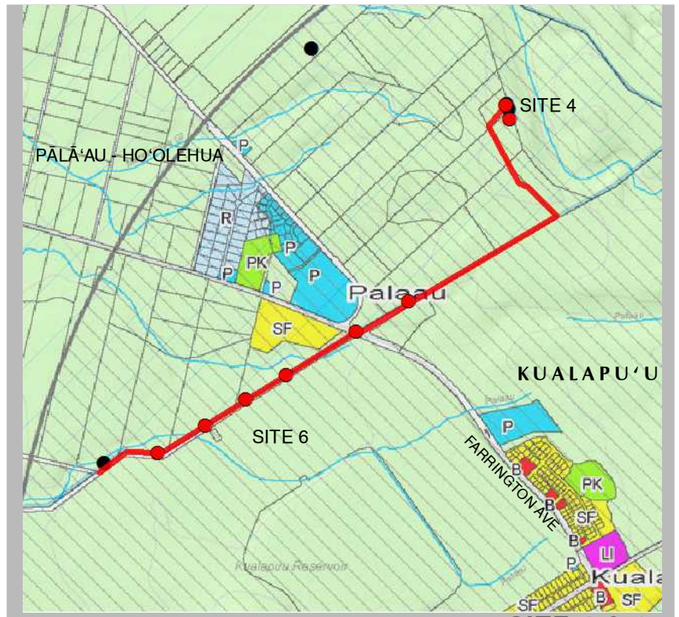
MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
Island of Moloka'i

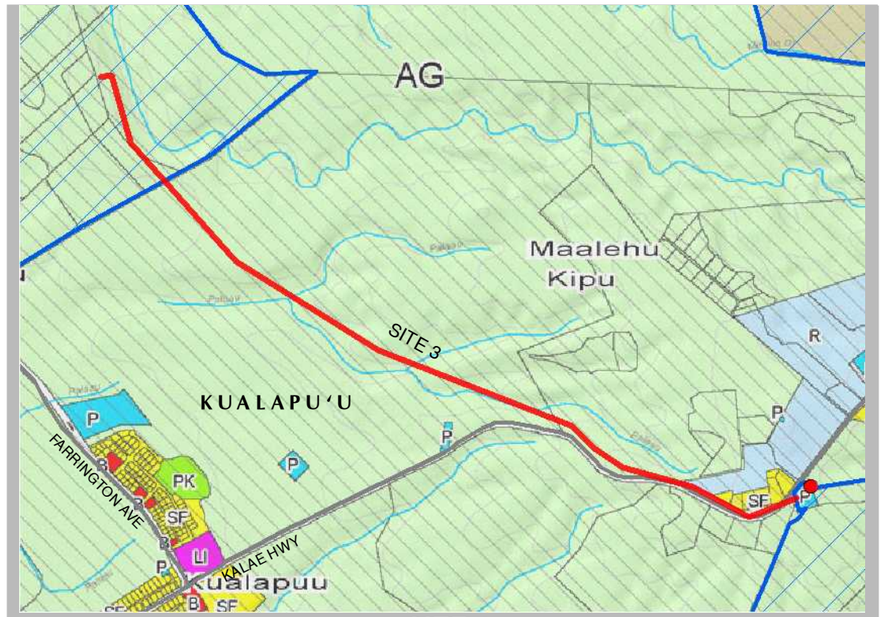
North

NOT TO SCALE

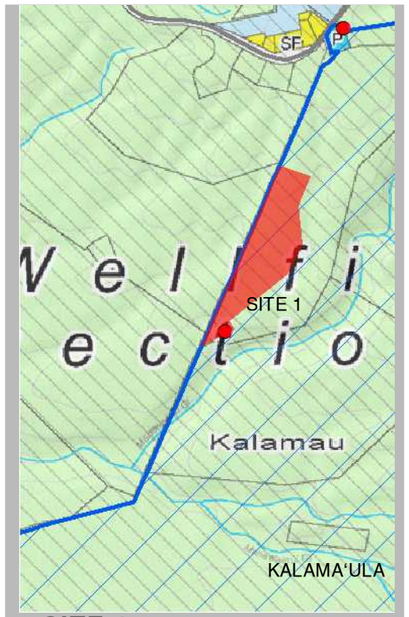
PBR HAWAII & ASSOCIATES, INC.



SITE 4 & 6



SITE 3



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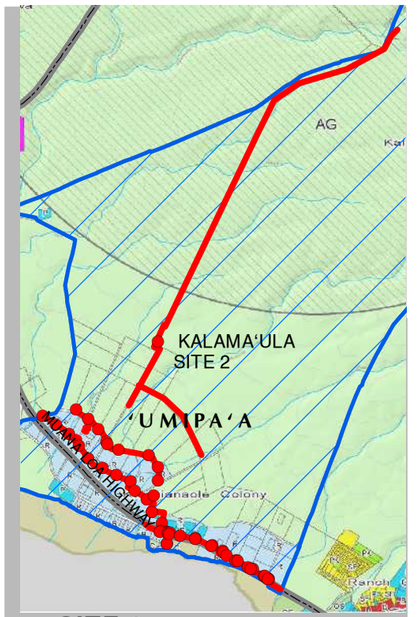

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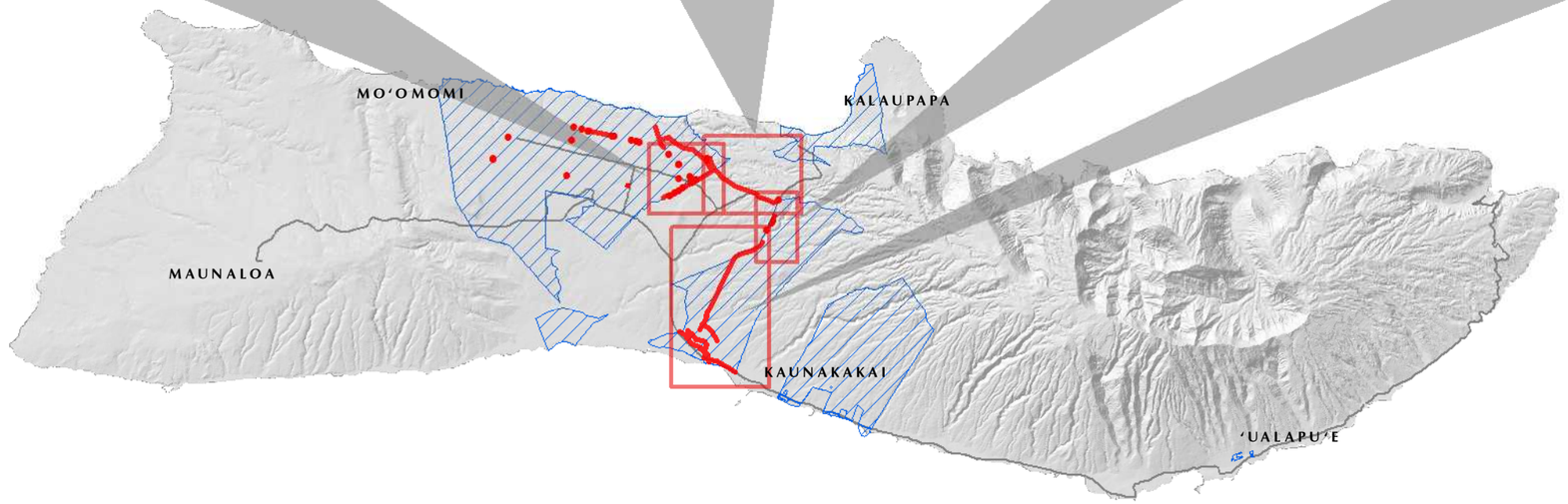


PDF - Q:\Moloka'i\USDA Water\PDF
Path - Q:\Moloka'i\USDA Water\GIS\Project\Community Plan map1.mxd

LEGEND

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

- SF Single Family
- AG Agriculture
- R Rural
- P Public/Quasi-public
- Wellhead Protection Buffer

Source: Moloka'i Community Plan, County of Maui (2001). County of Maui. Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

DATE: 1/11/2016

Figure 15

Community Plan (1 of 2)

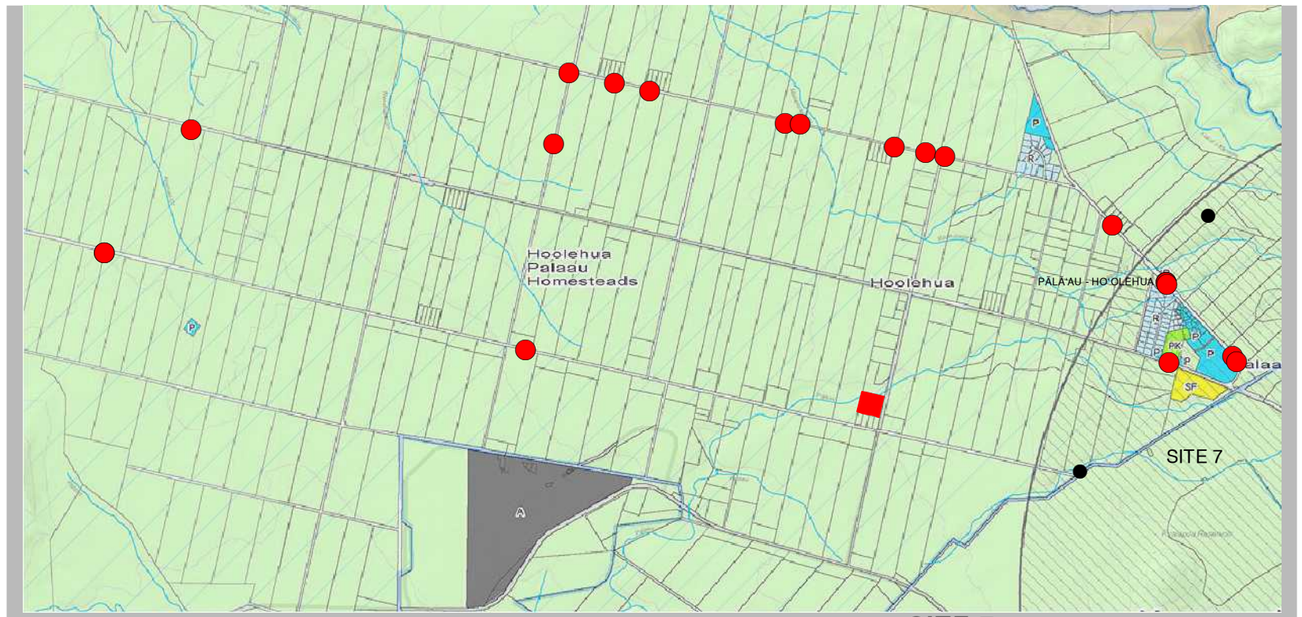
MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
Island of Moloka'i

North

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.



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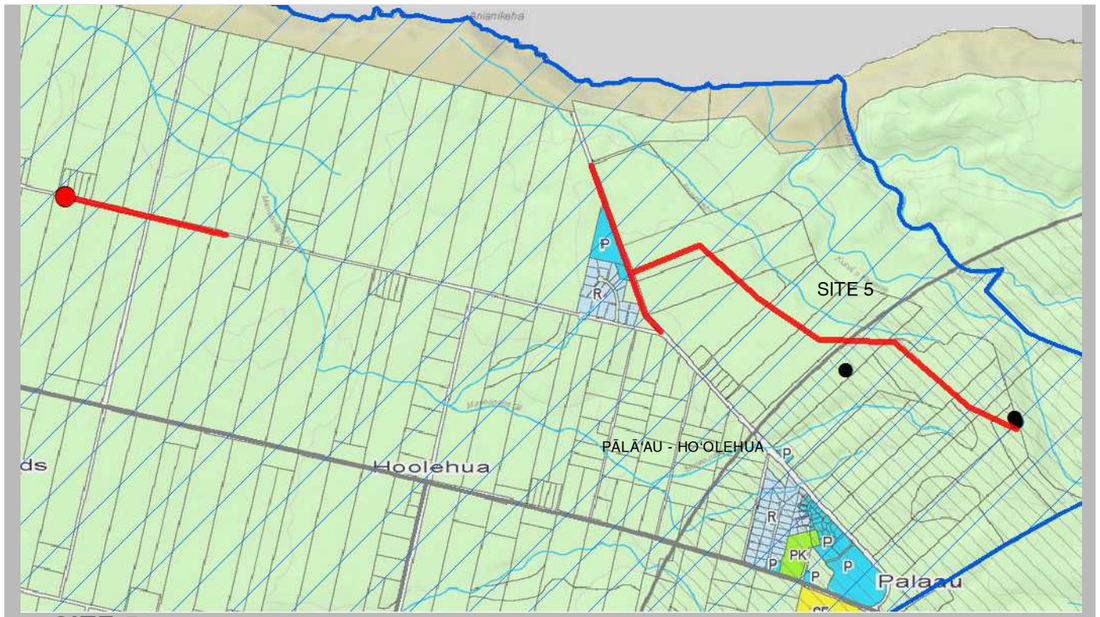

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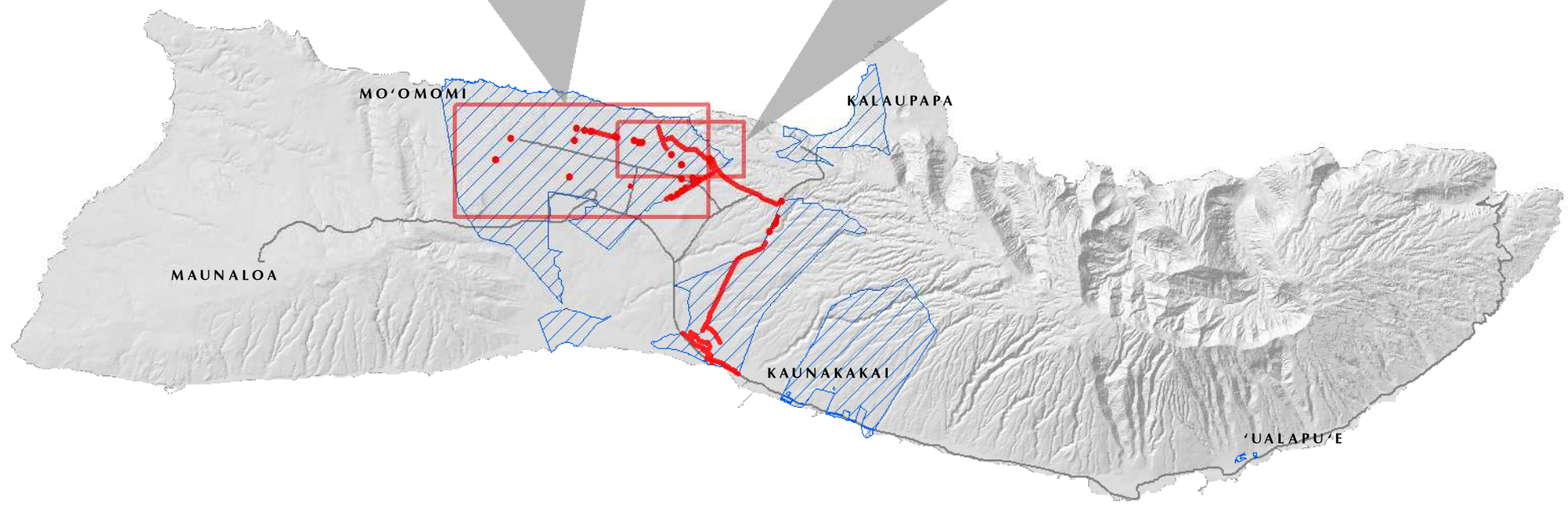

PDF - Q:\Moloka'i\USDA Water\PDF
Path - Q:\Moloka'i\USDA Water\GIS\Project\Community Plan map2.mxd

LEGEND

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

- SF Single Family
- AG Agriculture
- R Rural
- P Public/Quasi-public
- Wellhead Protection Buffer

Source: Moloka'i Community Plan, County of Maui (2001). County of Maui. Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

DATE: 1/11/2016

Figure 15
Community Plan (2 of 2)
MOLOKA'I WATER SYSTEM
Department of Hawaiian Home Lands
Island of Moloka'i
North
NOT TO SCALE
PBR HAWAII & ASSOCIATES, INC.

Appendix B

PRE-ASSESSMENT CONSULTATION

2012 Pre-Consultation Responses

2015 Pre-Consultation Request and Responses

Comments to 2012 Pre-Assessment Consultation Request

PBR HAWAII
& ASSOCIATES, INC.

HONOLULU OFFICE
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813-3484
Tel: (808) 521-5631
Fax: (808) 523-1402
E-mail: sysadmin@pbrhawaii.com

KAPOLEI OFFICE
1001 Kamokila Boulevard
Kapolei Building, Suite 313
Kapolei, Hawai'i 96707-2005
Tel: (808) 521-5631
Fax: (808) 535-3163

MEMORANDUM TO FILE

May 30, 2012

ORGANIZATION: Department of Health, Indoor and Radiological Health Branch, Asbestos Abatement Office

Mr. Thomas Lileikis, (808)586-4700

SUBJECT: Project Involves Removal/Abandonment of Transite Piping

BY: Malia Cox, Project Manager

At the request of Stuart Yamada, Department of Health, Chief of the Environmental Management Division, the Asbestos Abatement Office was contacted to determine when their office should be engaged regarding DHHL's water improvements project on Moloka'i.

Mr. Leleikis indicated that as the project moves forward, a certified asbestos project designer, certified asbestos inspector, and asbestos abatement licensed contractor would need to be involved in the project. Certification is received through the Department of Health.

In discussing the project with Mr. Lileikis, I informed him that the project is still in the early planning phases and that the option to abandon in-place as well as remove the transite piping would be explored during the design phase of the project. He indicated that in-place abandonment is an available option provided the pipes are marked on plans to protect those working in the area in the future.

No further coordination is necessary at this time.

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

NEIL ABERCROMBIE
GOVERNOR
RICHARD C. LIM
DIRECTOR
MARY ALICE EVANS
DEPUTY DIRECTOR
JESSE K. SOUKI
DIRECTOR
OFFICE OF PLANNING

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

Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No. P-13565

April 10, 2012

2012 APR 12 AM 9:45
DEPT OF HAWAIIAN HOME LANDS

Mr. Albert "Alapaki" Nahale-a
Chairman
Hawaiian Homes Commission
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawaii 96805

Dear Mr. Nahale-a:

Subject: Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System, PWS No. 230, Molokai, Hawaii

Thank you for the opportunity to review and comment on the Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System. The Office of Planning has no comments at this time. In so stating, the Office offers no judgment of either the adequacy of the document/application itself or the merits of the proposed project.

If you have any questions, please contact me at 587-2846.

2012 APR 12 PM 1:02
LAND DEVELOPMENT DIVISION

Sincerely,

Jesse K. Souki
Director

NEIL ABERCROMBIE
Governor

COPY

RUSSELL S. KOKUBUN
Chairperson, Board of Agriculture

SCOTT E. ENRIGHT
Deputy to the Chairperson

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 South King Street
Honolulu, Hawaii 96814-2512
Phone: (808) 973-9600 FAX: (808) 973-9613

April 9, 2012

Mr. Albert "Alapaki" Nahale'a
Chairman
Hawaiian Homes Commission
P. O. Box 1879
Honolulu, Hawai'i 96805

Dear Mr. Nahale'a: Aloha Pakiʻi

Re: Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System, PWS No. 230, Molokai, Hawaii

Thank you for the opportunity to comment on the above project. As the scope of this project is not in the proximity of the Department of Agriculture's irrigation system, we have no comments at this time. We would appreciate being kept abreast of this project as water is a very important issue on Molokai and we frequently receive questions regarding other agencies' projects.

Sincerely,

Russell

Russell S. Kokubun
Chairperson, Board of Agriculture

C: Sandy Pfund, Administrator, DHHL-Land Development Division
Bob Freitas, Planner, DHHL-Planning Office
✓Malia Cox, PBR Hawaii

Island Fresh

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

RECEIVED
LAND DEVELOPMENT
DIVISION
2012 MAY 16 AM 10: 07

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:
12-389A CAB

May 10, 2012

Ms. Sandy Pfund
Administrator
Land Development Division
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawaii 96805

Dear Ms. Pfund:

SUBJECT: Consultation on Proposed Improvements to Department of Hawaiian Home Lands
Hoolehua Water System, Molokai, Hawaii
PWS No. 230

Since the proposed project would include replacing transite pipes which may involve asbestos, the applicant should contact the Asbestos Abatement Office in the Indoor and Radiological Health Branch at 586-5800.

The project should address the potential dust nuisance concerns which may arise from the construction of structures, roadways, and fencing; installation or replacement of tanks and water mains; and other site improvements. The activities must comply with the provisions of Hawaii Administrative Rules, §11-60.1-33 on Fugitive Dust. In addition, for cases involving mixed land use, we strongly recommend that buffer zones be established, wherever possible, in order to alleviate potential dust and odor nuisance problems.

We encourage the contractor to implement a dust control plan, which does not require approval by the Department of Health, to comply with the fugitive dust regulations. Dust control measures include, but are not limited to, the following:

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

If you have any questions, please contact Mr. Barry Ching of the Clean Air Branch at 586-4200.

Sincerely,

STUART YAMADA, P.E., CHIEF
Environmental Management Division

BC:rg

c: Thomas Lileikis, Asbestos and Lead Section, Indoor and Radiological Health Branch

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:

April 25, 2012

Ms. Malia Cox
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, HI 96813-3484

Dear Ms. Cox:

This correspondence is in response to the Department of Hawaiian Home Land's request for comments to the DHHL Hoolehua Water System Project (Tax Map Key: (1) 9-1-13: 045), Kalaeloa, Oahu.

Project activities shall comply with the following Administrative Rules of the Department of Health:

- Chapter 11-46 Community Noise Control
- Chapter 11-501 Asbestos Requirements
- Chapter 11-503 Fees for Asbestos Removal & Certification
- Chapter 11-504 Asbestos Abatement Certification Program

Should you have any questions, please contact me at (808) 586-4701.

Sincerely,

Jeffrey M. Eckerd
Program Manager
Indoor and Radiological Health Branch

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
SAFE DRINKING WATER BRANCH
919 ALA MOANA BLVD., ROOM 308
HONOLULU, HI 96814-4920

In reply, please refer to:
File: SDWB
230B0412.Doc

April 10, 2012

Ms. Malia Cox
PBR Hawaii & Associates
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Ms. Cox:

SUBJECT: PUBLIC WATER SYSTEM NO. 230, HOOLEHUA
PROPOSED IMPROVEMENTS TO DEPARTMENT OF HAWAIIAN HOME LANDS HOOLEHUA WATER SYSTEM
MOLOKAI, HAWAII

The Safe Drinking Water Branch (SDWB) has reviewed the subject document and has the following comment:

This project proposes substantial modifications to the existing Hoolehua public water system and must receive approval by the Director of Health prior to construction of the proposed system or modification in accordance with HAR Section 11-20-30, "New and modified public water systems." These projects include treatment, storage and distribution systems of public water systems. Please submit construction plans for review and approval by the SDWB.

If there are any questions, please call Jennifer Nikaido of the Engineering Section at 586-4258.

Sincerely,

JOANNA L. SETO, P.E., CHIEF
Safe Drinking Water Branch
Environmental Management Division

JN:cb

c: EPO No. 12-059 (via email)

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

LORRIN W. PANG, M.D., M.P.H.
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, HAWAII 96793

April 24, 2012

Ms. Malia Cox
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, HI 96813

Dear Ms. Cox:

Subject: Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System, PWS No. 230, Molokai, Hawaii

Thank you for the opportunity to review this project. We have the following comments to offer:

National Pollutant Discharge Elimination System (NPDES) permit coverage maybe required for this project. The Clean Water Branch should be contacted at 808 586-4309.

It is strongly recommended that the Standard Comments found at the Department's website: http://hawaii.gov/health/environmental/env-planning/landuse/landuse.html be reviewed, and any comments specifically applicable to this project should be adhered to.

Should you have any questions, please call me at 808 984-8230 or E-mail me at patricia.kitkowski@doh.hawaii.gov.

Sincerely,

Patti Kitkowski

Patti Kitkowski
District Environmental Health Program Chief

c EPO

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:

12-059
DHHL Hoolehua

April 3, 2012

Mr. Albert Nahale`a, Chairman
Hawaiian Homes Commission
Dept. of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawaii 96805

Dear Mr. Nahale`a:

SUBJECT: Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System, PWS No. 230, Molokai, Hawaii

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your letter, dated March 30, 2012. Thank you for allowing us to review and comment on the subject document. The document was routed to the various branches of the Environmental Health Administration. We have no comments at this time, but reserve the right to future comments. We strongly recommend that you review all of the Standard Comments on our website: www.hawaii.gov/health/environmental/env-planning/landuse/landuse.html. Any comments specifically applicable to this application should be adhered to.

The United States Environmental Protection Agency (EPA) provides a wealth of information on their website including strategies to help protect our natural environment and build sustainable communities at: www.epa.gov/sustainability. The DOH encourages State and county planning departments, developers, planners, engineers and other interested parties to apply these strategies and environment principles whenever they plan or review new developments or redevelopments projects. We also ask you to share this information with others to increase community awareness on healthy, sustainable community design. If there are any questions about these comments please contact me.

Sincerely,

Laura Leialoha Phillips McIntyre, AICP
Environmental Planning Office Manager
Department of Heath
919 Ala Moana Blvd., Ste. 312
Honolulu, Hawaii 96814
Phone: 586-4337
Fax: 586-4370
Email: laura.mcintyre@doh.hawaii.gov
Website: www.hawaii.gov/health/environmental

c: ✓ Malia Cox, PBR HAWAII

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LAND DEVELOPMENT DIVISION

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

2012 APR 19 AM 7:56

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

In reply, please refer to:
File:

LUD – 2 Molokai Hoolehua
Water System – ID 953

2012 APR 18 PM 2:00

April 12, 2012

Mr. Albert "Alapaki" Nahalea, Chairman
Hawaiian Homes Commission
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawaii 96805

Dear Mr. Nahalea:

Subject: Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System, PWS No. 230, Molokai, Maui, Hawaii

Thank you for the opportunity to review and comment on the proposed improvements to the Department of Hawaiian Home Lands Hoolehua Water System. We have no comments to provide at this time since the project scope does not involve the design and construction of a domestic wastewater treatment system.

Should you have any questions, please contact the Planning & Design Section of the Wastewater Branch at 586-4294 or fax to 586-4300.

Sincerely,

MARSHALL LUM, P.E., ACTING CHIEF
Wastewater Branch

LM:cle

c: DOH's Environmental Planning Office (12-059)
DOH-WWB's Maui Staff – Mr. Roland Tejano

PBR HAWAII
& ASSOCIATES, INC.

HONOLULU OFFICE
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813-3484
Tel: (808) 521-5631
Fax: (808) 523-1402
E-mail: sysadmin@pbrhawaii.com

KAPOLEI OFFICE
1001 Kamokila Boulevard
Kapolei Building, Suite 313
Kapolei, Hawai'i 96707-2005
Tel: (808) 521-5631
Fax: (808) 535-3163

MEMORANDUM TO FILE

June 12, 2012

ORGANIZATION: Department of Transportation, Statewide Transportation Planning Office

Mr. Garrett Smith, (808)831-7976

SUBJECT: Project Involves Actions along Kalae Highway

BY: Malia Cox, Project Manager

DOT stated in their letter dated May 17, 2012 (STP 8.0845), "DOT has an interest in the subject project. DOT Highways Division is still conducting its review of the subject project and will provide additional comments as necessary."

Ms. Cox contacted Mr. Smith to find out if any additional information was available regarding the DOT review.

Mr. Smith opined that he would check with the Highways division to determine if they have any additional comments and will follow up via email or phone.

June 15, 2012

BY: Malia Cox

To date not additional information has been provided by Mr. Smith or DOT highways Division.

O:\JOB16\1684.29 Molokai USDA water\USDA Application\Correspondence\responses\MTF-02 1684.29. DOT-follow up to interest comment. date 6.12.12.docx

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

STP 8.0845

May 17, 2012

TO: MS. JOBIE MASAGATANI, INTERIM CHAIRPERSON
HAWAIIAN HOMES COMMISSION
DEPARTMENT OF HAWAIIAN HOME LANDS

ATTN: MS. SANDY PFUND, ADMINISTRATOR
LAND DEVELOPMENT DIVISION

FROM: GLENN M. OKIMOTO, PH.D.
DIRECTOR OF TRANSPORTATION

SUBJECT: PROPOSED IMPROVEMENTS TO THE HOOLEHUA WATER SYSTEM, MOLOKAI

Thank you for requesting the State Department of Transportation's (DOT) review of the subject project. DOT understands the Department of Hawaiian Home Lands (DHHL) proposes improvements to the DHHL Hoolehua Water System on Molokai. The project proposes improvements to the disinfection, storage and distribution system, and will be integrated into the existing potable water system.

Given that portions of the water system appear to run along State highway facilities (Kalae Highway and Mauna Loa Highway), the DOT has an interest in the subject project. DOT Highways Division is still conducting its review of the subject project and will provide additional comments as necessary. However, the applicant should be informed that a permit is required from the DOT Highways Division, Maui District to transport oversized and/or overweight equipment/loads on the State highway facilities.

DOT appreciates the opportunity to provide comments. If there are any questions, including the need to meet with DOT staff, please contact Mr. Garrett Smith of the DOT Statewide Transportation Planning Office at 831-7976.

c: Ms. Malia Cox, PBR Hawaii

ALAN M. ARAKAWA
Mayor

DAVID C. GOODE
Director

ROWENA M. DAGDAG-ANDAYA
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

RALPH NAGAMINE, L.S., P.E.
Development Services Administration

CARY YAMASHITA, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
200 SOUTH HIGH STREET, ROOM NO. 434
WAILUKU, MAUI, HAWAII 96793

April 17, 2012

Ms. Malia Cox
PBR HAWAII
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

SUBJECT: CONSULTATION ON THE PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HOOLEHUA WATER SYSTEM; PWS NO. 230

We reviewed the subject submittal and have the following comments:

1. We are happy to see the provision for water service to the County of Maui's Molokai Veterans Cemetery.

2. Would recommend that work on the water system be coordinated with any work that the Department of Water Supply may be doing as one system can temporarily support the other system when that system is down or under repair.

Please call Rowena M. Dagdag-Andaya at (808) 270-7845 if you have any questions regarding this letter.

Sincerely,

DAVID C. GOODE
Director of Public Works

DCG:ls
xc: Highways Division
Engineering Division
S:\LUCA\CZM\dhhl_hoolehua_water_system_improv_ec_ls.wpd

ALAN M. ARAKAWA
MAYOR

JEFFREY A. MURRAY
CHIEF

ROBERT M. SHIMADA
DEPUTY CHIEF

COUNTY OF MAUI
DEPARTMENT OF FIRE AND PUBLIC SAFETY
FIRE PREVENTION BUREAU

313 MANEA PLACE • WAILUKU, HAWAII 96793
(808) 244-9161 • FAX (808) 244-1363

May 8, 2012

Ms. Malia Cox
PBR Hawaii
1001 Bishop Street
Suite 650
Honolulu, HI 96813-3484

Re : Proposed Improvements to DHHL Hoolehua Water System;
PWS No. 230, Molokai, Hawaii

Dear Malia,

The Maui Fire Department would like to provide the following comments in regards to the proposed improvements for the Hoolehua Water System:

The aboveground fuel tank mentioned in section 1-C will require a fuel tank permit and subsequent approval from our office. The permit can be downloaded from the Maui County website or requested from our office. The installation shall be per Article 79 of the 1997 Uniform Fire Code.

In regards to section 5-B Fire Protection, please be advised that fire-flow, hydrant spacing, and minimum amount of water storage for fire protection shall be designed to meet the requirements as prescribed by the land-use designation. On the last page is the attached code section stating the fire protection requirements. Because this is a private water system, a plan of the water system must be routed to our office for approval. This plan must show details of piping and hydrant spacing. Our office also does site inspections during the installation of the system once plans have been approved. There is a fire inspector stationed on Molokai to handle these inspections.

Thank you for allowing us the opportunity to provide comments for these proposed improvements. If there are any questions or comments, please feel free to contact me at 244-9161 ext. 23. We look forward to working with you on improving the fire protection for the island of Molokai.

Sincerely,

Paul Haake
Captain, Fire Prevention Bureau
Department of Fire & Public Safety, County of Maui
313 Manea Place
Wailuku, HI 96793

Attached: Section 16.04B.140

16.04B.140 - Subsection 903.4.2 amended.

Section 903 of the Uniform Fire Code, as amended by the State Fire Code, is amended by amending subsection 903.4.2 to read as follows:

903.4.2 Required installations. The location, number and type of fire hydrants connected to a water supply capable of delivering the required fire flow shall be provided on the public street or on the site of the premises or both to be protected as required and approved. Fire flow, hydrant spacing and duration shall be determined by land use as follows: Agriculture, 500 GPM, and 500 feet spacing between hydrants. Rural, 1,000 GPM, and 500 feet spacing between hydrants. Single family, 1,000 GPM, and 350 feet spacing between hydrants. Duplex, 1,250 GPM, and 350 feet between hydrants. Townhouse and low rise apartments, 1,500 GPM, and 250 feet spacing between hydrants. Businesses, high rise apartments, and light industry, 2,000 GPM and 250 feet spacing between hydrants. Heavy industry and hotels, 2,500 GPM and 250 feet hydrant spacing. The duration for all required fire flow shall be 2 hours. On dead-end streets, the last fire hydrant shall be located at one-half the spacing distance from the dead-end. Spacing of fire hydrants shall be measured along the roadway.

Fire hydrants shall be accessible to the fire department apparatus by roads meeting the requirements of Section 902.2

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 1, 2012

Department of Hawaiian Home Lands
Attention: Mr. Alapaki Nahale-a, Chairman
91-5420 Kapolei Parkway
Kapolei, Hawaii 96707

Dear Mr. Nahale-a:

SUBJECT: Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System

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

At this time, enclosed are comments from Land Division – Maui District on the subject matter. Should you have any questions, please feel free to call Lydia Morikawa at 587-0410. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure

cc: Central Files

ALAN M. ARAKAWA
Mayor
KYLE K. GINOZA, P.E.
Director
MICHAEL M. MIYAMOTO
Deputy Director

TRACY TAKAMINE, P.E.
Solid Waste Division
ERIC NAKAGAWA, P.E.
Wastewater Reclamation Division

COUNTY OF MAUI
DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
2200 MAIN STREET, SUITE 100
WAILUKU, MAUI, HAWAII 96793

July 3, 2012

Ms. Malia Cox
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

SUBJECT: **DEPARTMENT OF HAWAIIAN HOME LANDS**
HOOLEHUA WATER SYSTEM
EARLY CONSULTATION

We reviewed the subject application and have the following comments:

1. Solid Waste Division comments:

   a. None.

2. Wastewater Reclamation Division (WWRD) comments:

   a. None.

If you have any questions regarding this memorandum, please contact Michael Miyamoto at 270-8230.

Sincerely,

KYLE K. GINOZA, P.E.
Director of Environmental Management

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

2012 APR 12 PM 12:36

April 11, 2012

MEMORANDUM

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

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System
LOCATION: Island of Molokai
APPLICANT: Department of Hawaiian Home Lands

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by April 26, 2012.

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

Attachments

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

Signed:
Date: 4/12/12

cc: Central Files

Malia Cox

From: Ian_Bordenave@fws.gov
Sent: Wednesday, May 02, 2012 4:47 PM
To: Malia Cox
Subject: Hoolehua Water System Improvements
Attachments: 2012-TA-0250 Department of Hawaiian Home Lands Hoolehua Water System Improvements, Molokai.docx

Attached are the comments to the proposed improvement package for the Hoolehua Water System.

Aloha,

Ian Bordenave
Biologist
U.S. Fish and Wildlife Service
Pacific Islands Field Office
Ecological Services, Consultations & HCP
300 Ala Moana Blvd., Suite 3-122
Honolulu, HI. 96850
Phone: (808) 792-9453
E-Mail: ian_bordenave@fws.gov

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
2012-TA-0250

Mr. Albert Nahalea
Chairman, Hawaiian Homes Commission
Hawaii Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawaii 96805

Subject: Technical Assistance for Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System, Molokai

Dear Mr. Nahalea:

The U.S. Fish and Wildlife Service (Service) received your letter on April 2, 2012, soliciting comment on the proposed improvements to the Department of Hawaiian Home Lands (DHHL) Hoolehua Water System on Molokai. Proposed improvements to the existing water system are to be funded, pending approval, through a U.S. Department of Agriculture, Rural Development grant.

Project Description
The DHHL has prepared a proposal to improve the current Hoolehua potable water distribution system. The work envisioned includes installation of new disinfection, storage, and water conveyance equipment throughout the central Molokai region. Tasks associated with the action will occur at five discontiguous sites, and are intended to improve upon the reliability and functionality of the existing system.

Affected Species
Based on information you provided and pertinent information in our files, including data compiled by the Hawaii Biodiversity and Mapping Program, there is no designated critical habitat protected by the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.) within the proposed action area. However, four species protected by the ESA are known to utilize portions the action area for foraging, sheltering, and/or breeding, and may therefore be negatively affected by actions proposed in the Master Plan.

- The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) roosts in both exotic and native woody vegetation and, while foraging, leaves young unattended in

"nursery" trees and shrubs. If trees or shrubs suitable for bat roosting are cleared during the breeding season (June 1 through September 15), there is a risk that young bats could inadvertently be harmed or killed. Under the current improvements proposal, no woody plants more than 15 feet tall will be removed or trimmed during the Hawaiian hoary bat breeding season to avoid potential impacts to the Hawaiian hoary bat. Additionally, Hawaiian hoary bats forage for insects from as low as 3 feet to higher than 500 feet above the ground. When barbed wire is used in the fencing Hawaiian hoary bats can become entangled. Moreover, there is also evidence that barbed wire fences in open areas pose a greater risk to bats than barbed wire fences in forested areas. The Service therefore recommends that barbed wire not be used for any fencing which may be part of the proposed action.

- The threatened Newell's shearwater (*Puffinus auricularis newelli*) and the endangered Hawaiian petrel (*Pterodroma phaeopygia sandwichensis*); collectively known as seabirds, may traverse the project area when flying between the ocean and nesting sites in the mountains during their breeding season (March through December). Artificial lighting, such as street lighting and flood lighting for site security, can adversely impact seabirds by causing disorientation which may result in collision with utility lines, buildings, fences, and vehicles. Furthermore, fledging seabirds attracted to artificial lighting have a tendency to exhaust themselves while circling the light source and become grounded. Too weak to fly, these birds become vulnerable to depredation by feral predators, such as dogs, cats, and mongoose. The Service recommends that measures to minimize the amount of glare from outdoor lighting installations be incorporated into the proposed action. Outdoor lighting should be constructed in a manner that fully shields lighting sources and directs light downwards. If night work is proposed for this project please contact the Service for additional minimization measures regarding seabirds and lights.

- Due to its range and foraging behavior, the Hawaiian goose (*Branta sandvicensis*) may be present in the vicinity of the proposed action at any time of the year. If any number of Hawaiian geese are observed loafing and/or foraging within the area of the proposed action during the Hawaiian goose breeding season (December through April) a biologist familiar with the nesting behavior of the Hawaiian goose should survey the area around proposed construction sites prior to the initiation of any work, or after any subsequent delay of work of three or more days (during which the birds may attempt to nest). If a nest is discovered within a radius of 100 feet of proposed construction activity, or a previously undiscovered nest is found within said radius after work begins, all work should cease immediately and the Service contacted for further guidance.

If you have any questions concerning the recommendations included in this letter, please contact Ian Bordenave, Fish and Wildlife Biologist, at (808) 792-9400 for additional assistance.

Comments and Responses to 2015 Pre-Assessment Consultation

DAVID Y. IGE
GOVERNOR

DOUGLAS MURDOCK
Comptroller

AUDREY HIDANO
Deputy Comptroller

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

(P)1256.5

SEP 2 9 2015

Ms. Malia Cox
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, HI 96813

Dear Ms. Cox:

Subject: Proposed Improvements to the Department of Hawaiian Home Lands
Hoolehua Water System, PWS No. 230, Molokai, Hawai'i

Thank you for the opportunity to comment on the subject project. The proposed project does not impact any of the Department of Accounting and General Services' projects or existing facilities, and we have no comments to offer at this time.

If you have any questions, your staff may call Ms. Dora Choy of the Public Works Division at 586-0488.

Sincerely,

FOR DOUGLAS MURDOCK
Comptroller

c: Mr. Wade Shimabukuro, DAGS Maui District Office

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Mr. Douglas Murdock, Comptroller
State Hawai'i
Department of Accounting and General Services
PO Box 119
Honolulu, HI 96810-0119

Attn: Ms. Dora Choy, Public Works Division

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I

Aloha mai Mr. Murdock;

Thank you for your letter dated September 29, 2015 [Reference Number (P)1256.5]. We appreciate you taking the time to review the information provided. We acknowledge that the proposed project does not impact your projects and facilities and that you have no comments at this time.

Prior to the start of construction, construction plans for the proposed water system improvements will be provided to your office for review and approval as required by Hawai'i Administrative Rules Chapter 11-20-30.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL - Administrator-Land Development Division
Gigi Cairel, Planner, DHHL - Planning Office
Niniau Simmons, DHHL - Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure: Regional Location

DAVID Y. IGE
GOVERNOR

RACHAEL WONG, DrPH
DIRECTOR

PANKAJ BHANOT
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF HUMAN SERVICES
Benefit, Employment & Support Services Division
820 Mililani Street, Suite 606
Honolulu, Hawaii 96813

October 1, 2015

Re: 15-0558

PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813
Attn: Ms. Malia Cox

Dear Ms. Cox:

Subject: National Environmental Policy Act and Chapter 343, Hawaii Revised Statutes Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System, PWS No. 230, Molokai, Hawaii

This is in response to your letter dated September 16, 2015 requesting the Department of Human Services' (DHS) comment on the proposed improvements to the Hoolehua Water System on the island of Molokai, Hawaii.

Your eight paged letter mentions seven sites designated as needing improvements:

1. Well Site Improvements in which the current 100,000 gallon tank will be replaced by a 200,000 tank to ensure an uninterrupted supply of water to residents. Along with the tank will be Chlorination and Storage facilities, Fuel Storage Tank, Well Site Modifications, Booster Pump Replacement and Energy System Modifications.

2. Kalamaula Improvements which includes paving the unpaved, eroded roadway to the existing 200,000 gallon tank, Transmission Main and Lateral Replacements which includes connecting to the existing water mains, Valves Replacement, and Deer Deterrent Fencing to prevent deer feces compromising water stored in the tank and the replacement of 30 Fire Hydrants.

3. Kauluwai Tank and Transmission Improvements to redesign and replace the lower main as currently water stored at the base of the tank cannot be used, the Kauluwai to Hoolehua Transmission Main to replace a 6 inch asbestos pipe and the installation of an eight foot Deer Deterrent Fencing as water stored in the tank may be compromised by deer feces.

4. Hoolehua Tank Site Improvements to modify and improve the tanks by automation of Flow Control Valves, Replacement of Exposed Vertical Piping and Valves, replacement of exterior ladder, repair of the concrete holding the tanks, develop a new road way to the tanks and the installation of an eight foot Deer Deterrent Fencing as water stored in the tank may be compromised by deer feces.

5. Hoolehua Transmission and Fire Protection Improvements which includes replacing and extending the water main to the Veterans' Cemetery and several homesteads, install 17 fire hydrants and construct a gravel roadway, replacement of part of the transmission main and install two fire hydrants.

6. Hoolehua Pressure Breaker Tank Facility Improvements to create a new roadway over existing overgrown road, replace equipment that has reached the end of their usefulness and the installation of an eight foot Deer Deterrent Fencing as water stored in the tank may be compromised by deer feces.

7. Hoolehua Maintenance Yard Improvements, and Scattered Valve and Hydrant Replacements which include replacing values, fire hydrants and equipment, demolition of existing maintenance structure and expanding it to a warehouse facility, installation of a fire hydrant and meter, construction of a concrete pad for storage and parking.

As the water system work will be done at the seven above-mentioned sites throughout central Molokai but maps of the specific areas impacted were not provided, the DHS provides comments that there may be registered child care homes that may be impacted by the repair and replacement of the water mains and tanks as well as the construction of new roadways and buildings.

Please be advised that the Director for the Department of Human Services is Rachael Wong, DrPH and not Patricia McManaman who served under the previous administration.

If you have any questions or need further information, please contact Ms. Jill Arizumi, Child Care Program Specialist, at (808) 586-5240.

Sincerely,

Scott Nakasone
Assistant Division Administrator

c: Rachael Wong, DrPH, Director

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Mr. Scott Nakasone, Assistant Division Administrator
State of Hawai'i
Department of Human Services
Benefit, Employment & Support Services Division
820 Mililani Street, Suite 606
Honolulu, HI 96813

Attn: Ms. Jill Arizumi, Child Care Program Specialist

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Nakasone;

Thank you for your letter dated October 1, 2015 (Reference #15-0558). We acknowledge your review of the project and offer the following responses to your comments.

1) The well site improvements will include the installation of a 200,000 gallon tank. The existing tank will remain in place and continue to be operational. This additional capacity is necessary to provide improved fire protection for the Kalama'ula residents while maintaining adequate water flow to service Ho'olehua users.

2) Your summary of the remaining projects is correct.

3) My apologies that the location map with insets of the seven project areas was not provided with your letter. An electronic copy of the Draft Environmental Assessment (DEA) has been included with this letter. The DEA includes location graphics that may help your staff better understand the location of each project action.

4) Some of the PWS No. 230 users including registered child care homes will be affected by construction projects proposed as part of this project. DHHL will work with the contractors selected for construction to ensure adequate notification of users, and make every effort to

minimize service disruptions. It is our assertion that these repairs will minimize the future unscheduled repairs (and associated service disruption) due to equipment failure.

5) Finally, thank you for advising us on the change in leadership at the Department of Human Services. We have noted the change and will contact Ms. Jill Arizumi, Child Care Program Specialist, should we have questions.

Thank you again for your participation in this consultation process. An electronic copy of the DEA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, Administrator-Land Development Division
Gigi Cairel, Planner-Planning Office
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

October 14, 2015

PBR Hawaii & Associates, Inc.
Attn: Ms. Malia Cox
1001 Bishop Street, Suite 650
Honolulu, HI 96813-3484

Dear Ms. Cox:

SUBJECT: Proposed Improvements to the Department of Hawaiian Home Lands Ho'olehua Water System, Ho'olehua, Palaau, Kalanionole, Kahamauhu, etc., Island of Molokai, Hawaii; TMK: (2) various

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

At this time, enclosed are comments from the (i) Engineering Division, and (ii) Commission on Water Resource Management on the subject matter. Should you have any questions, please feel free to call Lydia Morikawa at 587-0410.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)

DAVID Y. IGE
Ggovernor of Hawaii

'15 SEP 24 AM 10:36 ENGINEERING

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 24, 2015

2015 OCT 12 PM 3:04
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII
RECEIVED
LAND DIVISION

MEMORANDUM

TO: FR:

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

TO:
FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Proposed Improvements to the Department of Hawaiian Home Lands Ho'olehua Water System
LOCATION: Ho'olehua,Palaau, Kalanionole, Kahamauhu, etc., Island of Molokai; TMK: (2) various
APPLICANT: Department of Hawaiian Home Lands

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by **October 14, 2015**

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

Attachment

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

Signed:
Print Name: Carty S. Chang, Chief Engineer
Date: 10/12/15

cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
REF: NEPA and Chapter 343, HRS Consultation on Proposed Improvements to DHHL Ho'olehua Water System, Molokai
Maui.029

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.
( ) Please take note that the project site according to the Flood Insurance Rate Map (FIRM), is located in Zone ___.
( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.
(X) Please note that the project(s) located in the Flood Hazard Zones (A, AO, AH, AE, AEF, V, VE, and XS) must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Mario Siu Li at (808) 768-8098 of the City and County of Honolulu, Department of Planning and Permitting.
( ) Mr. Carter Romero (Acting) at (808) 961-8943 of the County of Hawaii, Department of Public Works.
(X) Ms. Carolyn Cortez at (808) 270-7253 of the County of Maui, Department of Planning.
( ) Mr. Stanford Iwamoto at (808) 241-4896 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.
(X) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments: _____

( ) Other: _____

Should you have any questions, please call Mr. Dennis Imada of the Planning Branch at 587-0257.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER
Date: 10/12/15

DAVID Y. IGE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION
2015 OCT -9 AM 10:56
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 24, 2015

MEMORANDUM

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

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Proposed Improvements to the Department of Hawaiian Home Lands Ho'olehua Water System
LOCATION: Ho'olehua,Palaau, Kalanionole, Kahamauhu, etc., Island of Molokai; TMK: (2) various
APPLICANT: Department of Hawaiian Home Lands

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by **October 14, 2015**

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

Attachment

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

Signed: /s/ Jeffrey T. Pearson

Print Name: Deputy Director
Date: October 5, 2015

cc: Central Files

FILE ID: RFD.4258.4
DOC ID: 13446

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON

WILLIAM D. BALFOUR, JR.
KAMANA BEAMER, PH.D.
MICHAEL G. BUCK
MILTON D. PAVAO
VIRGINIA PRESSLER, M.D.
JONATHAN STARR

JEFFREY T. PEARSON, P.E.
DEPUTY DIRECTOR

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

October 5, 2015

REF: RFD.4258.4

TO: Mr. Russell Tsuji, Administrator
Land Division Oahu, DLNR-LD

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

SUBJECT:

FILE NO.:
TMK NO.: (2) various

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

Our comments related to water resources are checked off below.

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

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

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

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

[ ] 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://hawaii.gov/dbedt/czm/initiative/lid.php.

[x] 6. We recommend the use of alternative water sources, wherever practicable.

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

[ ] 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf.

☐ 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

☐ 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.

☐ 11. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.

☐ 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.

☐ 13. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.

☐ 14. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

☐ 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.

☐ 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.

☐ 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.

☐ 18. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

☒ OTHER: As this is a public water system, Department of Health would have appropriate comments. The unnamed sources for this system are the Kauluwai Wells (Well Nos. 0801-001 & 002) which are not involved in the project. The system presumably incorporates current and foreseeable needs of DHHL, which includes areas yet to be developed, presumably identified in the proposed improvements but not noted in the review summary. The system is currently overpumping its water use permit. Its request for increased allocation to come from its water reservation in the Kualapuu Aquifer System Area will be the subject of a contested case hearing as potentially in conflict with other potable wells in close proximity; as a public trust purpose, DHHL's use is protected by a requirement that others show non-interference.

If you have any questions, please contact Charley Ice of the Commission staff at 587-0218.

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Mr. Carty Chang, Chief Engineer
State of Hawai'i
Department of Land and Natural Resources
Engineering Division
P.O. Box 621
Honolulu, Hawai'i 96809

Attn: Mr. Dennis Imada, Planning Branch

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I
(Reference: NEPA and Chapter 343, HRS Consultation on a Proposed Improvements to DHHL Ho'olehua Water System, Molokai Maui.029)

Aloha mai Mr. Chang;

Thank you for your comments dated October 12, 2015. We acknowledge your review of the project and offer the following responses to your comments.

We acknowledge that the project is located in Flood Hazard Zones and compliance with rules and regulations of Title 44 of the Code of Federal Regulations (CFR) and Maui County Code is necessary. Approximately 3.3 acres of the project are located in identified flood hazard areas. This includes 1.6 acres in Zone AE floodway; 0.6 acres in Zone A, and 0.9 acres in Zone AE of the 100-year floodplain; and 0.2 acres is Zone XS of the 500-year floodplain. The proposed actions located in these areas (replacement of existing transmission pipes, in-line valves, and fire hydrants) will replace aging equipment, reducing potential for leaks that can exacerbate naturally occurring flooding. According to Chapter 19.62 of the Maui County Code for Flood Hazard Areas and 44 CFR 59.1, the proposed activities include excavation and grading; therefore, Special Flood Hazard Permit requirements apply. Coordination and consultation with Maui County Department of Planning is underway.

Water demands and calculations will be provided to the Engineering department for inclusion in the State Water Projects Plan Update during design/construction phase of the project.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL-Administrator-Land Development Division
Gigi Cairel, DHHL-Planner-Planning Office
Niniau Simmons, DHHL-Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII
Russell Tsuji, DLNR, Land Division
Ms. Carolyn Cortez, County of Maui, Department of Planning

Enclosure

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DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Mr. Jeffrey Pearson, P.E., Deputy Director
State of Hawai'i
Department of Land and Natural Resources
Commission on Water Resource Management
P.O. Box 621
Honolulu, Hawai'i 96809

Attn: Mr. Charley Ice

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Pearson;

Thank you for your comments dated October 5, 2015 (Reference number RFD.4258.4). We acknowledge your review of the project and offer the following responses to your comments.

We concur with your recommendations to coordinate with Maui County Planning Department and Department of Water Supply, and the Engineering Division of the State of Hawai'i's Department of Land and Natural Resources. Coordination and consultation with all of these organizations is underway.

We acknowledge your recommendation to utilize water efficient fixtures. Where appropriate, such fixtures will be incorporated during the design phase of this project.

We acknowledge your recommendation to utilize alternative water sources wherever practicable. The proposed project is designed to develop improvements to the existing potable water system, PWS 230. Due to the nature of the project, use of the existing water sources (potable water wells numbered 0801-001- &002) is necessary. However, if practical opportunities for alternative sources are identified they will be incorporated into design.

We acknowledge your comment that the Department of Health would have appropriate comments. Consultation and coordination with the Department of Health is underway.

We acknowledge your comments that the system is over-pumping its water use permit, and that there is a contested case hearing regarding increased allocation and water reservations. The proposed project is proposing to improve transmission, storage and disinfection. As proposed, it will not increase the pumping rate of the water sources for PWS 230.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL-Administrator-Land Development Division
Gigi Cairel, DHHL-Planner-Planning Office
Niniau Simmons, DHHL- Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII
Russell Tsuji, DLNR, Land Division

Enclosure

DAVID Y. IGE
Governor

SHAN S. TSUTSUI
Lt. Governor

SCOTT E. ENRIGHT
Chairperson, Board of Agriculture

PHYLLIS SHIMABUKURO-GEISER
Deputy to the Chairperson

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 South King Street
Honolulu, Hawaii 96814-2512
Phone: (808) 973-9600 FAX: (808) 973-9613

October 16, 2015

The Honorable Jobie Masagatani, Chairman
Hawaiian Homes Commission
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, HI 96805

Dear Chairman Masagatani:

Subject: National Environmental Policy Act and Chapter 343, Hawai'i Revised Statutes Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Ho'olehua Water System, PWS No. 230, Molokai'I, Hawai'i

The Department of Agriculture completed its review of the information received from DHHL via letter dated September 16, 2015 and has no comments at this time. However, because the proposed improvements at Site Nos. 2, 4, 5, 6, & 7 appear to be in close proximity to Molokai Irrigation System's infrastructure, we respectfully request to be kept on your list for future reviews.

Thank you for giving us the opportunity to review DHHL's proposed improvements. Should there be any questions, please contact Mr. Glenn Okamoto of the Agricultural Resource Management Division at 973-9436.

Sincerely,

Scott E. Enright, Chairperson
Board of Agriculture

c: ARMD

Island Fresh

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Mr. Scott Enright
Chairperson, Board of Agriculture
State of Hawai'i
Department of Agriculture
1428 South King Street
Honolulu, Hawai'i 96814-2512

Attn: Mr. Glenn Okamoto, Agriculture Resource Management Division

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Enright:

Thank you for your letter dated October 16, 2015. Thank you for taking the time to review the information provided, and we understand that you have no comments at this time. We acknowledge that you would like to be included in future reviews due to the proximity of proposed improvements at Sites 2, 4, 5, 6, and 7 to the Moloka'i Irrigation System infrastructure.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL Administrator-Land Development Division
Gigi Cairel, Planner, DHHL Planning Office
Niniau Simmons, DHHL Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure

DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:

15-746A CAB

October 20, 2015

Ms. Malia Cox
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Ms. Cox:

SUBJECT: Department of Hawaiian Home Lands
Hoolehua Water System, PWS No. 230, Molokai, Hawaii

This letter is in response to your request for comments on the subject project and your applications for funding from the U.S. Department of Housing and Urban Development, U.S. Department of Agriculture, and related agencies.

The project, which extends to numerous sites on Molokai, is within an "attainment" area and therefore conforms to the State Implementation Plan. Currently, the State of Hawaii is in attainment with the National Ambient Air Quality Standards.

If you have any questions, please contact Mr. Barry Ching of my staff at 586-4200 or send an e-mail to cab@doh.hawaii.gov.

Sincerely,

NOLAN S. HIRAI, P.E.
Manager, Clean Air Branch

BC:rg

c: Gigi Cairel, Planning Office, State Department of Hawaiian Home Lands

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Mr. Nolan Hirai, P.E., Manager
State Hawai'i
Department of Health
Clean Air Branch
P.O. Box 3378
Honolulu, HI 96801-3378

Attn: Mr. Barry Ching

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I

Aloha mai Mr. Hirai;

Thank you for your letter dated October 20, 2015 (Reference Number 15-746A CAB). We appreciate you taking the time to review the information provided.

We concur with your statement that the project is located within an "attainment" area and conforms to the State Implementation Plan, and that the State of Hawai'i is in attainment with the National Ambient Air Quality Standards.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL- Administrator-Land Development Division
Gigi Cairel, Planner, DHHL- Planning Office
Niniau Simmons, DHHL- Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure

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DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
EMD/CWB

10021PJF.15

October 8, 2015

Ms. Malia Cox
PBR Hawaii & Associates
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

SUBJECT: Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System Molokai, Island of Hawaii

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your letter, dated September 16, 2015, requesting comments on your project. The DOH-CWB has reviewed the subject document and offers these comments. Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: http://health.hawaii.gov/epo/files/2013/05/Clean-Water-Branch-Std-Comments.pdf.

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. You may be required to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55).

For NPDES general permit coverage, a Notice of Intent (NOI) form must be submitted at least 30 calendar days before the commencement of the discharge. An application for an NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. To request NPDES permit coverage, you must submit the applicable form ("CWB Individual NPDES Form" or "CWB NOI Form") through the e-Permitting Portal and the hard copy certification statement with the respective filing fee ($1,000 for an individual NPDES permit or $500 for a Notice of General Permit Coverage). Please open the e-Permitting Portal website located at: https://eha-cloud.doh.hawaii.gov/epermit/. You will be asked to do a one-time registration to obtain your login and password. After you register, click on the Application Finder tool and locate the appropriate form. Follow the instructions to complete and submit the form.

3. If your project involves work in, over, or under waters of the United States, it is highly recommended that you contact the Army Corp of Engineers, Regulatory Branch (Tel: 835-4303) regarding their permitting requirements.

   Pursuant to Federal Water Pollution Control Act [commonly known as the "Clean Water Act" (CWA)], Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may **result** in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40 of the Code of Federal Regulations, Section 122.2; and HAR, Chapter 11-54.

4. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

5. It is the State's position that all projects must reduce, reuse, and recycle to protect, restore, and sustain water quality and beneficial uses of State waters. Project planning should:

   a. Treat storm water as a resource to be protected by integrating it into project planning and permitting. Storm water has long been recognized as a source of irrigation that will not deplete potable water resources. What is often overlooked is that storm water recharges ground water supplies and feeds streams and estuaries; to ensure that these water cycles are not disrupted, storm water cannot be relegated as a waste product of impervious surfaces. Any project planning must recognize storm water as an asset that sustains and protects

natural ecosystems and traditional beneficial uses of State waters, like community beautification, beach going, swimming, and fishing. The approaches necessary to do so, including low impact development methods or ecological bio-engineering of drainage ways must be identified in the planning stages to allow designers opportunity to include those approaches up front, prior to seeking zoning, construction, or building permits.

   b. Clearly articulate the State's position on water quality and the beneficial uses of State waters. The plan should include statements regarding the implementation of methods to conserve natural resources (e.g., minimizing potable water for irrigation, gray water re-use options, energy conservation through smart design) and improve water quality.

   c. Consider storm water Best Management Practice (BMP) approaches that minimize the use of potable water for irrigation through storm water storage and reuse, percolate storm water to recharge groundwater to revitalize natural hydrology, and treat storm water which is to be discharged.

   d. Consider the use of green building practices, such as pervious pavement and landscaping with native vegetation, to improve water quality by reducing excessive runoff and the need for excessive fertilization, respectively.

   e. Identify opportunities for retrofitting or bio-engineering existing storm water infrastructure to restore ecological function while maintaining, or even enhancing, hydraulic capacity. Particular consideration should be given to areas prone to flooding, or where the infrastructure is aged and will need to be rehabilitated.

If you have any questions, please visit our website at: http://health.hawaii.gov/cwb/, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

for

ALEC WONG, P.E., CHIEF
Clean Water Branch

JF:ay

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Mr. Alec Wong, P.E., Chief
State of Hawai'i
Department of Health
Clean Water Branch
P.O. Box 3378
Honolulu, HI 96801-3378

Attn: Engineering Section

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Wong;

Thank you for your letter dated October 8, 2015 (Reference Number 10021PJF.15). We acknowledge your review of the project, have reviewed both the project specific and the standard comments (provided at http://health.hawaii.gov/epo/files/2013/05/Clean-Water-Branch-Std-Comments.pdf), and offer the following responses to your comments:

1) The project as proposed will improve disinfection, safety, storage and transmission. The project and potential impacts will maintain or improve existing water quality thus protecting and maintaining the receiving state waters and designated uses. The project as proposed will meet Hawai'i Administrative Rules (HAR) §11-54-1.1, §11-54-3, and §11-54-4 through §11-54-8 regarding anti-degradation, designated uses, and water quality.

2) As proposed, we concur that a National Pollutant Discharge Elimination System (NPDES) permit will be required. An application/notice of intent of coverage under the general construction permit will be submitted at least 30 days prior to construction activities that will create discharge. Additionally, during the design phase the project team will further assess if the completed project will require an individual NPDES permit and submit the required application and documentation 180 days prior to the completion of construction or discharge (whichever is sooner).

3) Consultation with the U.S. Army Corps of Engineers, Regulatory Branch (DA) was initiated in September 2015. It is not anticipated that the project will involve work in the waters of the United States; however, should permits/authorization be required, DHHL will work with DA to meet their requirements.

4) Water is a limited resource that needs to be managed appropriately and not wasted. We concur that storm water when appropriately integrated into a development is an asset that recharges ground water and ultimately affects surface water (streams to estuaries), and improves ecosystem health. Low-impact development, and maintaining/improving hydraulic capacity have been identified as goals in the preliminary engineering phase of this project. By changing storage requirements, and by improving the transmission and energy system of PWS 230, it is our belief that the pumping rate can be better managed and less potable water will be lost due to pipe/equipment failure. The actual selection of strategies such as the use of native vegetation, pervious pavement, ecological bio-engineering, etc., will be conducted once the project enters into the design phase. The Draft EA includes information regarding conservation of methods.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL Administrator-Land Development Division
Gigi Cairel, Planner, DHHL Planning Office
Niniau Simmons, DHHL Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure

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DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
SAFE DRINKING WATER BRANCH
919 ALA MOANA BLVD., ROOM 308
HONOLULU, HI 96814-4920

In reply, please refer to:
File: SDWB
230F1015.docx

October 29, 2015

PBR HAWAII
Attn: Ms. Malia Cox
1001 Bishop Street, Suite 650
Honolulu, HI 96813

Dear Ms. Cox:

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAII REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HOOLEHUA WATER SYSTEM, PWS NO. 230, MOLOKAI, HAWAII

Thank you for submitting the subject-referenced document for our input. Please submit for our review and approval, as required by Hawaii Administrative Rules Chapter 11-20-30, the construction plans for these water system improvements as early as practical, but before the start of construction.

If there are any questions, please call Mr. Alain Carey of the SDWB Engineering Section at 586-4258.

Sincerely,

JOANNA L. SETO, P.E., CHIEF
Safe Drinking Water Branch

AC:cw

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Ms Joanna Seto, P.E., Chief
State Hawai'i
Department of Health
Safe Drinking Water Branch
919 Ala Moana Boulevard, Room 308
Honolulu, HI 96814-4920

Attn: Mr. Alain Carey, SDWB Engineering Section

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I

Aloha mai Ms. Seto;

Thank you for your letter dated October 29, 2015 (Reference Number SDWB 230F1015.docx). We appreciate you taking the time to review the information provided and offer the following responses to your comments.

Prior to the start of construction, construction plans for the proposed water system improvements will be provided to your office for review and approval as required by Hawai'i Administrative Rules Chapter 11-20-30.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL - Administrator-Land Development Division
Gigi Cairel, Planner, DHHL - Planning Office
Niniau Simmons, DHHL - Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure: Regional Location

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DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

LORRIN W. PANG, M.D., M.P.H.
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, HAWAII 96793-3378

November 19, 2015

Ms. Malia Cox
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Ms. Cox:

Subject: National Environmental Policy Act and Chapter 343, Hawaii Revised Statutes Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Ho'olehua Water System, PWS No. 230, Molokai, Hawaii

Thank you for the opportunity to review this project. We have no comments to offer.
It is strongly recommended that the Standard Comments found at the Department's website: http://health.hawaii.gov/epo/home/landuse-planning-review-program/ be reviewed and any comments specifically applicable to this project should be adhered to.

Should you have any questions, please contact me at 808 984-8230 or email me at patricia.kitkowski@doh.hawaii.gov.

Sincerely,

Patti Kitkowski
District Environmental Health Program Chief

c EPO

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Ms. Patti Kitkowski
State Hawai'i
Department of Health
Maui District Office
54 High Street
Wailuku, HI 96793-3378

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I

Aloha mai Ms. Kitkowski;

Thank you for your letter dated November 19, 2015. We appreciate you taking the time to review the information provided. We acknowledge that you have no comments at this time.

The Standard Comments found as the Department's website have been reviewed and those applicable to the project will be adhered to.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL - Administrator-Land Development Division
Gigi Cairel, Planner, DHHL - Planning Office
Niniau Simmons, DHHL - Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure: Regional Location

OFFICE OF PLANNING
STATE OF HAWAII

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

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
ACTING DIRECTOR
OFFICE OF PLANNING

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

Ref. No. P-14919

October 12, 2015

2015 OCT 15 AM 9:47

To: Jobie Masagatani, Chairman
Department Hawaiian Home Lands

From: Leo R. Asuncion, Acting Director

Subject: National Environmental Policy Act and Chapter 343, Hawaii Revised Statutes (HRS) Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System, PWS No. 230, Molokai, Hawaii

Thank you for the opportunity to provide comments on the pre-assessment consultation request for the proposed well site improvements for the Hoolehua Water System in central Molokai. The pre-consultation review material was transmitted to our office by letter dated September 16, 2015.

It is our understanding that this project integrates into the existing Department of Hawaiian Home Lands (DHHL) potable Hoolehua Water System that serves the residents of the island of Molokai. The proposed well improvements will occur along seven dis-contiguous well sites in central Molokai. These well site improvements will improve reliability and functionality, while decreasing the operating costs of the system. Improvements include the installation of storage tanks and water disinfection facilities, booster pump replacement, valve replacements, fencing improvements, and the replacement of electrical transmission lines.

Additionally, the water system's deficiencies that affect health, sanitation, and security, identified by both the Department of Health and DHHL, will be corrected upon completion of this project.

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

1. Pursuant to the Hawaii Administrative Rules, Chapter 11-200-17(h) – land use plans, policies, and controls – this project must demonstrate that it is consistent with a number of state environmental, social, and economic goals and policies for land-use and housing development. OP provides technical assistance to state and county agencies in administering the statewide planning system in HRS Chapter 226, the Hawaii State Planning Act, better known as the Hawaii State Plan. The Hawaii State Plan provides goals, objectives, policies, and priority guidelines for growth, development, and the allocation of resources throughout the State. The Hawaii State Plan includes diverse objectives and policies of state interest including but not limited to the economy, agriculture, the visitor industry, federal expenditure, the physical environment, facility systems, socio-cultural advancement, climate change adaptation, and sustainability.

   The Draft Environmental Impact Statement (Draft EIS) should include an analysis that addresses whether the proposed project conforms or is in conflict with the goals, objectives, policies, and priority guidelines listed in the Hawaii State Plan.

2. The coastal zone management area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea" see HRS § 205A-1 (definition of "coastal zone management area").

   HRS Chapter 205A requires all State and county agencies to enforce the coastal zone management (CZM) objectives and policies. The Draft EIS should include an assessment as to how the proposed project conforms to the CZM objectives and its supporting policies set forth in HRS § 205A-2. The assessment on compliance with HRS Chapter 205A is an important component for satisfying the requirements of HRS Chapter 343. These objectives and policies include recreational resources, historic resources, scenic and open space resources, coastal ecosystems, economic uses, coastal hazards, managing development, public participation, beach protection, and marine resources.

3. It appears that a portion of the proposed infrastructure improvements along Well Site #2 (near the coastal area of Kaunakakai), may be within the boundary of the Special Management Area (SMA) designated by the County of Maui, Department of Planning. Please consult with said agency to obtain a determination of the improvements to Well Site #2 and their relation to the SMA.

4. Federal funding from the U.S. Department of Agriculture-Rural Development Division, Water and Waste Disposal Loan and Grant Program will require a CZM federal consistency review by the Hawaii CZM Program. However, the federal funds from the U.S. Department of Housing and Urban Development are not subject to CZM review.

   Please contact John Nakagawa of our CZM Program for information on the CZM federal consistency review. You may also consult our CZM federal consistency web site for detailed information at http://planning.hawaii.gov/czm/federal-consistency/.

5. The Draft EIS should include Tax Map Key (TMK) parcel locations and detailed maps of the well sites in question, in order for our office to make a better determination on this project's relationship with SMA boundaries, State Land Use District Classification, County of Maui zoning watersheds, and nearby water resources. In general, central Molokai is classified as within the Rural or Agricultural State Land Use Districts, and has numerous watersheds and water resources that need to be safeguarded. The improvements to the well sites may result in ground disturbance, require the removal of vegetation, and exacerbate sediment loss and erosion concerns from stormwater runoff. This could have a negative effect on the fragile water and coastal resources of Molokai.

   In order to ensure that the natural resources of central Molokai remain protected, the negative effects of stormwater runoff and a wide range of human activities should be evaluated and mitigated if necessary. The Draft EIS should summarize the area's relation to the State Land Use District classifications and nearshore marine resources; County of Maui zoning as it relates to density and erosion controls; and this project's relation to wetlands, perennial streams, tsunami evacuation zone, and the flood zone. These items, as well as the nearshore water quality classification, should be considered when developing mitigation strategies to protect the coastal ecosystem.

   OP has a number of resources available to assist in the development of projects which ensure sediment and stormwater control on land, thus protecting the nearshore environment. OP recommends consulting these guidance documents and stormwater evaluative tools when developing strategies to address polluted runoff. They offer useful techniques to keep soil and sediment in place and prevent contaminating nearshore waters, while considering the practices best suited for each project. These three evaluative tools should be used during the design process:

   - Hawaii Watershed Guidance provides direction on site-appropriate methods to safeguard Hawaii's watersheds and implement watershed plans http://files.hawaii.gov/dbedt/op/czm/initiative/nonpoint/HI Watershed Guidance Final.pdf

   - Stormwater Impact Assessments can be used to identify and evaluate information on hydrology, stressors, sensitivity of aquatic and riparian resources, and management measures to control runoff, as well as consider secondary and cumulative impacts to the area http://files.hawaii.gov/dbedt/op/czm/initiative/stomwater_imapct/final_storm water_impact_assessments_guidance.pdf

   - Low Impact Development (LID), A Practitioners Guide covers a range of structural best management practices (BMP's) for stormwater control management, roadway development, and urban layout that minimizes negative environmental impacts http://files.hawaii.gov/dbedt/op/czm/initiative/lid/lid_guide_2006.pdf

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

c: Malia Cox, PBR HAWAII

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Mr. Leo Asuncion, Acting Director
State Hawai'i
Office of Planning
P.O. Box 2359
Honolulu, HI 96804

Attn: Mr. Josh Hekekia

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I

Aloha mai Mr. Asuncion;

Thank you for your letter dated October 12, 2015 (Reference Number P-14919). We appreciate you taking the time to review the information provided and offer the following responses to your comments.

1. Based on the scope of this project a Draft Environmental Assessment (DEA), not a Draft Environmental Impact Statement (DEIS), is being prepared.

2. The DEA includes an analysis of the proposed project's conformance with the Hawai'i State Plan objectives, policies and guidelines.

3. Based on a review of the project, the proposed actions conform to the objectives and policies described in Hawai'i Revised Statutes (HRS) §205A. The DEA includes a compliance assessment of the proposed project as it relates to the coastal zone management objectives and policies.

4. We concur with your assessment that a portion of the proposed project is located within the Special Management Area (SMA) boundaries. Coordination and consultation with the

County of Maui, Department of Planning, is already underway.

5. We acknowledge that the project will receive funds from the U.S. Department of Agriculture -Rural Development Division and a federal consistency review is required. A Federal Consistency Review application and assessment report has been prepared for this project and is being forwarded to John Nakagawa of your CZM program under a separate cover.

6. The DEA will include Tax Map Key (TMK) parcel locations, graphics, and summaries identifying/describing the project's relationship to SMA boundaries, zoning, State Land Use Districts, etc., as well as mitigating measures where appropriate.

7. We appreciate you providing all of the resources described in your letter to assist us in the development of the project in a manner protective of the environment and resources.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL- Administrator-Land Development Division
Gigi Cairel, Planner, DHHL- Planning Office
Niniau Simmons, DHHL- Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure: Regional Location

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PHONE (808) 594-1888

FAX (808) 594-1938

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
560 N. NIMITZ HWY., SUITE 200
HONOLULU, HAWAI'I 96817

HRD15/7621B

October 5, 2015

Malia Cox
PBR Hawaii
1001 Bishop St., Suite 650
Honolulu, HI 96813

Re: Request for Consultation Under the National Environmental Policy Act and Hawai'i Chapter 343 for Proposed Improvements to the Department of Hawaiian Home Lands Ho'olehua Water System, PWS No. 230
Kalama'ula, Kahanui, Nā'iwa, and Ho'olehua-Pālā'au Ahupua'a, Kona Moku, Moloka'i Mokupuni
Tax map key (2) 5-2-007:029, 030, 035, 040, 055, 078, 079, 080, 082-085; (2) 5-2-008:051, 052, 079, 084, 086-089, 091, 114: (2) 5-2-010:001, 002, 003: (2) 5-2-012:999; (2) 5-2-013:010, 017, 028-032; and (2) 5-2-033:001, 002, 003

Aloha Ms. Cox:

The Office of Hawaiian Affairs (OHA) is in receipt of your September 16, 2015 letter requesting consultation on cultural, historic, and archaeological sites within the area of potential effect. PBR Hawai'i is acting as consultant to the Department of Hawaiian Home Lands (DHHL), who intends to propose improvements to the Ho'olehua Water System, PWS No. 230.

The DHHL is requesting federal funds for the waterline improvements from the U.S. Department of Agriculture-Rural Development division of Water and Waste Disposal Loan and Grant program, and the U.S. Department of Housing and Urban Development, Native American Housing Assistance and Self-Determination Act, Native Hawaiian Housing Block Grant program, triggering consultation under the National Environmental Policy Act and the Hawai'i Environmental Policy Act.

The proposed improvements are to address issues with the potable water system that services the homesteads, which were identified by the State of Hawai'i Department of Health. Improvements include among others new storage tanks, chlorination facilities, booster pump and pipe replacements.

OHA would like to suggest that the following entities and individuals be contacted:

- The Nature Conservancy – Moloka'i
  - Ed Misaki, Director
  - Penny Martin
  - Opulani Albino
- Billy Akutagawa (work: 808-560-3653)

In addition, OHA recommends consultation with the petitioners of In re Wai'ola O Moloka'i, Inc.[1] and In re Water Use Permit Application ("Kukui Moloka'i Inc.),[2] as both cases were instrumental in setting parameters for the protection of the Moloka'i aquifer system, as well as Native Hawaiian traditional and cultural practices on Moloka'i.

Mahalo for the opportunity to consult. Should you have any questions, please contact Jeannin Jeremiah at 594-1790 or by email at jeanninj@oha.org.

'O wau iho nō me ka 'oia 'i'o,

Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer

KC:jj

C: Gayla Haliniak-Lloyd – OHA Community Outreach Coordinator, Moloka'i Island

**Please address replies and similar, future correspondence to our agency:*
Dr. Kamana'opono Crabbe
Attn: OHA Compliance Enforcement
560 N. Nimitz Hwy, Ste. 200
Honolulu, HI 96817

[1] 103 Hawai'i 401 (2004).
[2] 116 Hawai'i 481 (2007).

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Dr. Kamana'opono Crabbe
Attn: OHA Compliance Enforcement
560 N. Nimitz Hwy, Suite 200
Honolulu, HI 96817

Attn: Ms. Jeannin Jeremiah

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I

Aloha mai Dr. Crabbe;

Thank you for your letter dated October 5, 2015 (Reference Number HRD15/7621B). We appreciate you taking the time to review the information provided and offer the following responses to your comments.

The Nature Conservancy and Billy Akutagawa were contacted at your request. We have attempted to contact the petitioners in the Wai'ola O Moloka'i and Water Use Permit Application (Kukui Moloka'i Inc.) cases, but have not received any responses to date.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL- Administrator-Land Development Division
Gigi Cairel, Planner, DHHL- Planning Office
Niniau Simmons, DHHL- Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure: Regional Location

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DAVID Y. IGE
GOVERNOR

KATHRYN S. MATAYOSHI
SUPERINTENDENT

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

OFFICE OF THE SUPERINTENDENT

November 13, 2015

Ms. Malia Cox
Project Coordinator
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Re: NEPA and Chapter 343 HRS Consultation
DHHL Ho'olehua Water System, PWS No. 230 Improvements
Molokai, Hawaii

Dear Ms. Cox:

The Hawaii State Department of Education (DOE) appreciates this opportunity to provide consultation and comment on the proposed action. The DOE has a vested interest in the success, sustainability, safety, security and reliability of the DHHL PWS No. 230 Water System. It is the current source of potable, fire protection and irrigation service to our Molokai High School and Intermediate School; and, to Kualapuu School PCCS.

DOE has a current construction project, pending permit completion, to relocate the 4-inch DHHL school service lateral now serving Kualapuu School to a new connection point in Farrington Avenue at Kulea Street providing a 12-inch potable, fire protection and irrigation extension, some 2620 feet east of Molokai High School. These improvements are shown schematically attached; and, in more detail described in the contract documents of DOE Job No. Q57001-07 "Kualapuu School Waterline." DOE has undertaken this lateral relocation to address shortcomings and hydraulic issues within the PWS No. 230 Water System where transient, unpredictable and periodic loss of water service to Kualapuu School results, and lack of reliable and adequate fire protection supply exists.

Those portions of the PWS No. 230 Water System improvements having greatest impact to DOE include the Site No. 1 Well Improvements (1A-1E), Site No. 3 Kauluwai Tank and Transmission Improvements (3A-3D), Site No. 4 Ho'olehua Tank Site Improvements (4A-4C); and Site No. 7 Ho'olehua Maintenance Yard Improvements (7B).

DOE's general comment for the actions proposed by this project is that, in our opinion, this work is greatly needed and long overdue. We recognize that through careful planning, best practices and appropriate engineering control, the proposed actions may be performed in a way least impacting the natural, historical and cultural environment. We offer specific comments and suggestions to the proposed site improvements below.

Site No. 1 Well Site Improvements: We agree that a separate and redundant storage tank is needed at the well head for reliable pumping operation and SCADA systems for control; and, that disinfection operations and disinfectant storage improvements consistent with best practices be provided.

We would expect that a review of the seismic integrity of the existing 100,000 gallon storage tank and associated piping be conducted and necessary improvements required be implemented.

We suggest that adding additional above ground diesel fuel storage at the well head for an extended grid outage might be reconsidered, owing to the intrinsic starting reliability and maintenance issues of diesel fuel driven generators. The problem, in our opinion, with standby diesel fuel storage at the well head is that for spill containment and control from accidental release associated with fueling, defueling and maintenance of the equipment. Adding additional diesel at the well head exacerbates the release control need and presents a larger issue of diesel fuel turnover and diesel fuel freshness and fitness for emergency use. A redundancy in standby generator equipment is useful, if it can be afforded, allowing for backup power during generator maintenance times. The use of propane as the preferred fuel source for a standby generator operation might be considered as it potentially reduces spill containment and control issues and simplifies equipment maintenance and fuel fitness issues.

Well site compound modifications required to suit the new storage tank consistent with best practices for well head protection are indeed needed. Deer fence sanitary control and site safety and security monitoring CCTV or similar, to be leveraged off the SCACA platform, would also seem to be required, but not noted in the proposed improvements.

We presume the wells, with their collateral and driven equipment, have been found adequate in capacity and sustainable water quality for the term proposed by the PWS No. 230 improvements. If this is not the case, this too should be addressed with other improvements.

Site No. 3 Kauluwai Tank and Transmission Line Improvements: Pipeline and hydraulic adjustment of the transmission line, allowing the full volume of the Kauluwai Tank's depth to be used, is an obviously needed design correction.

Seismic review and any needed repairs of this tank and its piping systems need to be considered. The arrangements for and safe operation of the DWS Kale, "Ranch" and Ho'olehua supply systems from this tank need to be considered should external or internal tank repair necessitate an outage. An open stand pipe or other hydraulic element to take the place of the hydraulic grade line of the Kauluwai Tank during outage is not identified, but likely needed, in our opinion.

Replacement of the 6-inch transite transmission line between the Kauluwai Tank and the terminal Ho'olehua Tanks should include collaborative scheduling to minimize tie-in impacts to school operations. This is especially true at Kualapuu School if this work precedes implementation of the DOE's service lateral relocation project, noted before.

Provision for corrosion protection for the new transmission line and its appurtenances was a detail not indicated, but needing careful selection consideration. Cathodically impressed sacrificial anode ductile iron systems might be considered for high corrosive site and transmission alignments.

Site No. 4 Ho'olehua Tanks Improvements: We agree that the two 3.5MG Ho'olehua tanks are critical to the PWS No. 230 water system operation and ability to furnish reliable water to our DOE schools and the larger served community. Our concern is that the structural and seismic integrity of tanks and piping are assured by these improvements. We are concerned that flow controls, SCADA automation, site entry and security monitoring systems, site sanitation; and an all-weather access are appropriately budgeted, and thus, will be implemented.

Site No. 7 Maintenance Yard Improvements: We concur with the need to replace and upgrade the maintenance building and associated service and storage facilities at the base yard. It is not proposed, but the water system SCADA operational and monitoring control headquarters might be located in the new maintenance yard building, thus enhancing dispatch of operators and equipment as needed.

DOE would like the opportunity to participate in future discussion for this project, as we believe we have a strong and integral relationship with DHHL, with PWS No. 230; and, with the DHHL served beneficiaries within our school community.

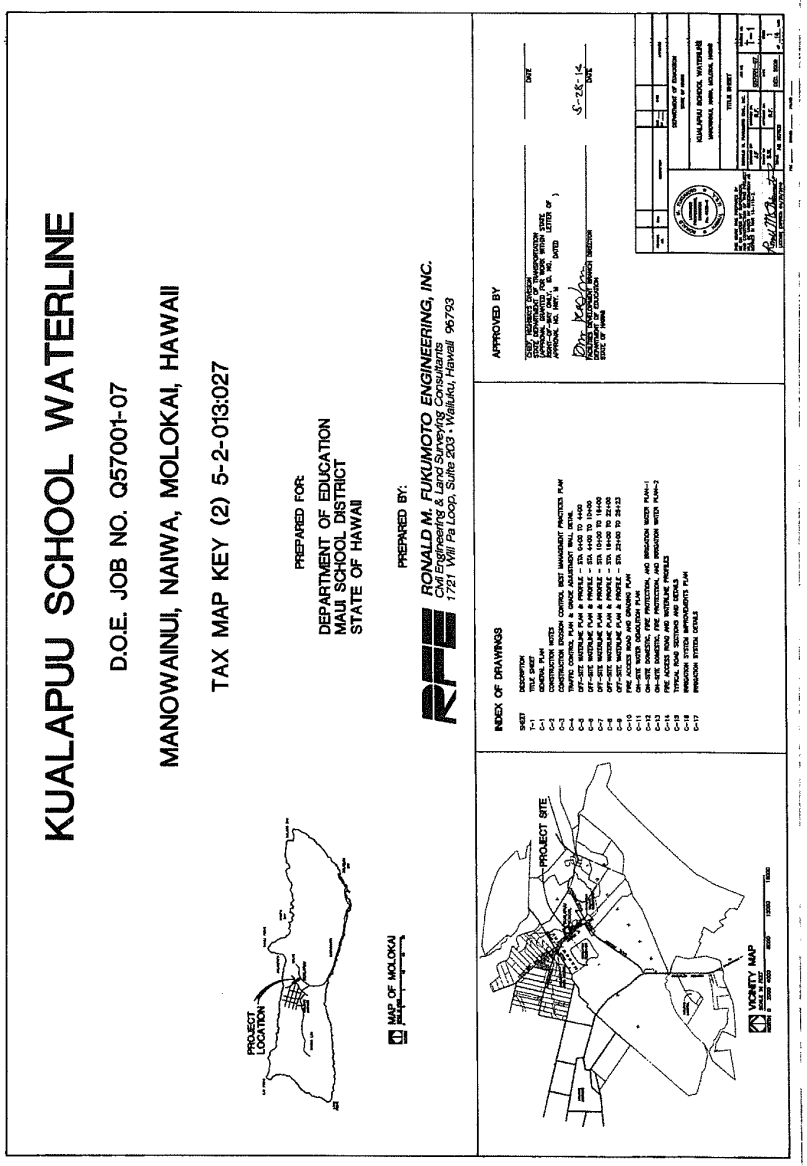
Should you have any questions or if issues remain, please do not hesitate to call Robert W. Purdie, Jr., of our Project Management Section, Project Coordinator of our Kualapuu School Waterline Project at 808-586-0448 or via e-mail at robert_purdie@notes.k12.hi.us.

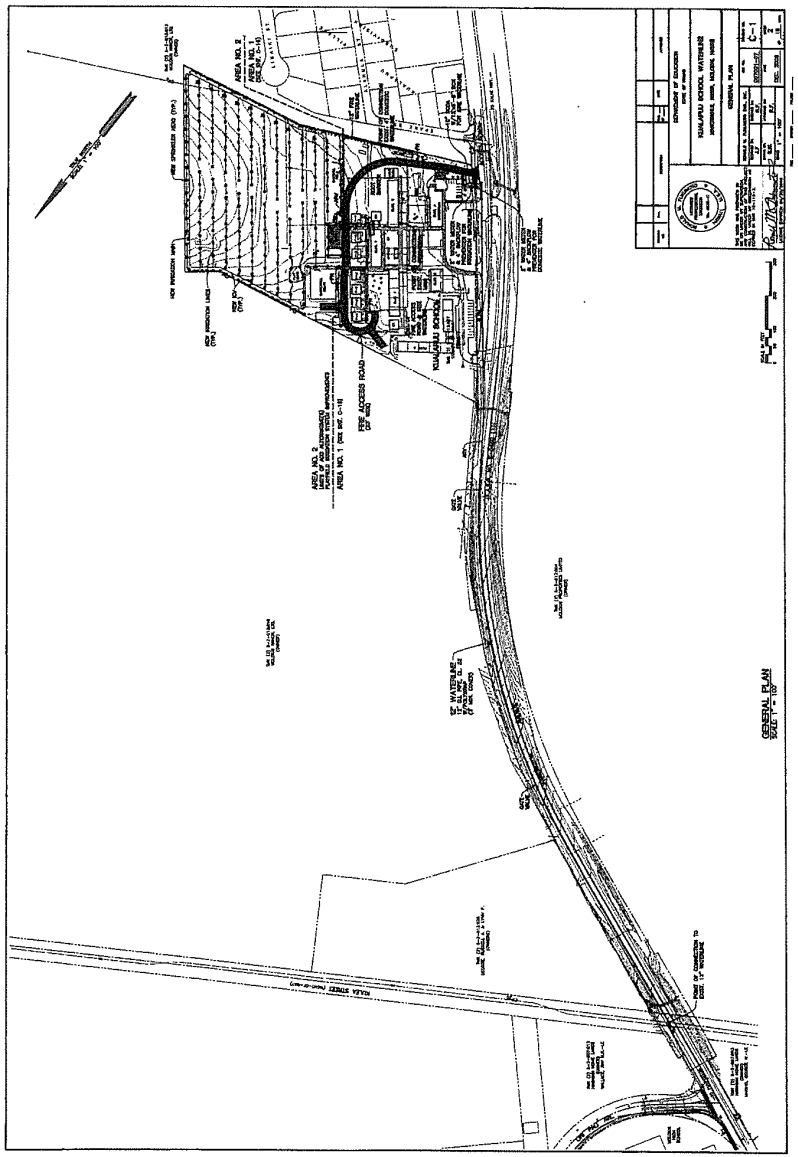
Very truly yours,

Kathryn S. Matayoshi
Superintendent

KSM:dw
Attachment

c: Facilities Development Branch





DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
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JOBIE M. K. MASAGATANI
CHAIRMAN
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WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

February 5, 2016

Ms. Kathryn S. Matayoshi, Superintendent
State of Hawai'i
Department of the Education
PO Box 2360
Honolulu, HI 96804

Attn: Robert Purdie Jr.

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I
(DA file number POH-2012-00123)

Aloha mai Ms. Matayoshi;

Thank you for your letter dated November 13, 2015. We appreciate you taking the time to review the information provided. We acknowledge the pending Department of Education (DOE) water projects and appreciate your office keeping us informed on the status of the DOE improvements to PWS230. We agree that both the DOE and DHHL improvements are greatly needed. DHHL is making every effort to construct our Project in a manner that minimizes impact to natural, historical and cultural resources. Following are our responses to your comments.

We concur with the assessment that additional water storage is needed at the well site. The design and construction of a new tank to the well site will include a review of the seismic integrity of the existing systems (wells, tanks, piping, etc.), and appropriated improvements made as necessary.

The disinfection operations have already been modified to replace the use of chlorine gas system with a liquid disinfection system. The system utilizes a sodium hypochlorite injection system to disinfect the water prior to storage and distribution. This not only reduce the safety risk

to the water operators, but also significantly reduce the public health risk in the event of an accidental release. No other modifications are proposed for the disinfection system.

We acknowledge your comment regarding additional fuel storage. Several different options including different emergency energy systems and locations for fuel storage to increase the capacity of emergency energy operations were evaluated. The US Environmental Protection Agency (EPA) was consulted regarding the potential impact to groundwater. Increasing the fuel storage of the existing emergency generator by installing an above ground fuel storage tank and the well site was selected. The EPA concurred that the preferred option (adding an above ground fuel storage tank was adequately protective of groundwater).

We acknowledge that well site compound modifications are needed for continued well head protection and to integrate the new storage tanks (fuel and water). Proposed modifications will include fencing, gates, and connection to the existing SCADA system. The SCADA system allows for both remote monitoring and operation of many system components. During design and construction, the new well site elements will be integrated into the SCADA system.

We acknowledge your concern regarding the adequacy of the wells and collateral and driven equipment. The Department of Health-Safe Drinking Water Branch (SDWB) conducts a sanitary survey of the PWS230 system every 3 years. The survey looks at both existing deficiencies and identifies future areas of concern. The 2013 survey found the wells and appurtenant structures to be functioning appropriately and in no need of repair or replacement. While not part of the capital improvements proposed with this project, DHHL will continue to evaluate the system to address repairs and seismic reviews as required.

We acknowledge your concern that corrosion protection details were not included in the information provided. We are still in the general planning phase of the project and specific materials have not been selected. Provisions for corrosion protection will be evaluated and integrated as appropriate during the design phase of the project. Your recommendations will be forwarded to the design team.

We acknowledge your concern regarding the seismic and structural integrity of the tanks/piping. The 3.5 million gallon tanks in Ho'olehua have been evaluated by DHHL and its contractors. Repairs rather than replacement were deemed appropriate to extend the life of these tanks. The design team will be forwarded your comments regarding these tanks.

We acknowledge your concern regarding the budget to complete the proposed improvements at Site 4. DHHL is applying for grant funding from both US Housing and Urban Development as well as US Department of Agriculture specifically ear-marked for DHHL projects. While DHHL has eliminated several components of the proposed projects since the pre-

consultation letter was released, all proposed tasks for Site 4 identified in the pre-consultation letter are still part of the project. The preliminary engineering cost estimates are sufficiently conservative to accommodate the improvements proposed.

We acknowledge your concurrence with the proposed maintenance building replacement and upgrade. DHHL has been informed of your recommendation to locate the SCADA operation and monitoring headquarters in the new maintenance yard building.

DHHL is aware of the DOE's proposed improvements to the PWS230. We encourage DOE to work collaboratively with DHHL and maintain communication regarding all phases of the DOE's proposed projects to minimize any tie-in impacts to the school. DHHL will notify all users including DOE of service of any service interruptions. DOE's continued participation in this project is welcomed.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, Administrator – DHHL Land Development Division
Gigi Cairel, Planner – DHHL Planning Office
Niniau Simmons, DHHL Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosures

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COUNTY COUNCIL
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793
www.MauiCounty.us

September 30, 2015

PBR HAWAII
Attn. Ms Malia Fox
1001 Bishop Street, Suite 650
Honolulu, HI 96813

Dear Ms. Cox:

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAIʻI REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIʻIAN HOME LANDS HOʻOLEHUA WATER SYSTEM, PWS NO. 230, MOLOKAʻI, HAWAIʻI

With reference to the request for comment from the Maui County Council to satisfy the requirements of the National Environmental Policy Act (NEPA) and related laws and authorities including, Section 106 of the National Historic Preservation Act, and Section 7 of the Endangered Species Act and being that this project is located on State lands, it further is required to meet Hawai'i Environmental Policy Act (HEPA) Chapter 343 Hawai'i Revised Statutes (HRS), Chapter 112-200 Hawai'i Administrative Rules (HAR) as well as the USDA-RD and HUD requirements, this correspondence serves to document my comments, as the Molokai representative to the Maui County Council, regarding the above-mentioned subject matter.

I applaud the Department of Hawaiian Home Lands' (DHHL) efforts to improve its existing water system on Moloka'i. DHHL, in consultation with USDA-RD, is requesting federal funds to improve the safety, security and reliability of their water system. The request incorporates proposed improvements to the DHHL Ho`olehua Water System, PWS No. 230, Moloka'i, Hawai'i. Furthering DHHL's efforts are the agencies, organizations and individuals previously consulted who

have been re-engaged for consultation based on the expanded scope of the project.

As the Molokai Council Member, I support the DHHL Project and its "Proposed Tasks and Activities" because it proposes to improve the following:

- Protection of Water Sources
- Support Management of DHHL's Water System
- Support infrastructure so that Homestead Water will always be usable and accessible
- Provides adequate amounts of Water
- The improvements will meet efficiency measures. Upgrading maintenance of the water system will reduce costs. Operational costs are extremely high for a system with a customer base of 587 customers. Electrical costs are one of the driving factors of the operational costs. To address this costly component, improvements and modifications to the energy system will be addressed.

DHHL, through this project, encompasses its *Kuleana (rights and responsibilities).* The department is being responsible by seeking means to develop a comprehensive effort of protecting its water assets inventory, DHHL owned water infrastructure, current and future water demand and potential water sources.

Respectfully,

STACY HELM CRIVELLO
Councilmember – Molokai

SSC:aas

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. ARLA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

County of Maui
County Council
200 S. High Street
Wailuku, Maui, 96793

Attn: Councilmember Stacy Helm Crivello

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Ms. Helm Crivello;

Thank you for your letter dated September 30, 2015. We appreciate your review and support of this project. The Department of Hawaiian Home Lands (DHHL) takes its kuleana regarding both protection and management of its water assets and infrastructure seriously. It is our belief that these improvements will reduce the operational costs of the system while improving security, health/safety, and reliability.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL Administrator-Land Development Division
Gigi Cairel, Planner, DHHL Planning Office
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure

ALAN M. ARAKAWA
Mayor

KA'ALA BUENCONSEJO
Director

BRIANNE L. SAVAGE
Deputy Director

DEPARTMENT OF PARKS & RECREATION
700 Hali'a Nakoa Street, Unit 2, Wailuku, Hawaii 96793

(808) 270-7230
FAX (808) 270-7934

October 15, 2015

PBR Hawaii
Attn: Ms. Malia Cox
1001 Bishop Street, Suite 650
Honolulu, HI 96813

Dear Ms. Cox:

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Thank you for the opportunity to review and comment on the proposed improvements to the Department of Hawaiian Home Lands Ho'olehua Water System project. The Department has no comments to the proposed action, but would like to review the project as it develops. In accordance with the requirements of Chapter 343, Hawaii Revised Statutes (HRS) and Section 11-2-00-6, Hawaii Administrative Rules (HAR) please provide a copy of the Draft Environmental Assessment (EA).

Feel free to contact me or Robert Halvorson, Chief of Planning and Development, at 270-7387, should you have any questions.

Sincerely,

KA'ALA BUENCONSEJO
Director of Parks and Recreation

c: Robert Halvorson, Chief of Planning and Development

KB:RH:do

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Mr. Ka'ala Buenconsejo, Director
County of Maui
Department of Parks and Recreation
700 Hali'a Nakoa Street, Unit #2
Wailuku, HI 96793

Attn: Robert Halvorson, Chief of Planning and Development

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I

Aloha mai Mr. Buenconsejo;

Thank you for your letter dated October 15, 2015. We appreciate you taking the time to review the information provided and acknowledge that you have no comments at this time, but would like to review the project as it develops.

An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL- Administrator-Land Development Division
Gigi Cairel, Planner, DHHL- Planning Office
Niniau Simmons, DHHL- Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure: Regional Location

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ALAN M. ARAKAWA
Mayor

DAVID C. GOODE
Director

ROWENA M. DAGDAG-ANDAYA
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
200 SOUTH HIGH STREET, ROOM NO. 434
WAILUKU, MAUI, HAWAII 96793

GLEN A. UENO, P.E., P.L.S.
Development Services Administration

CARY YAMASHITA, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

October 5, 2015

Ms. Malia Cox
PBR HAWAII
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Ms. Cox:

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

We reviewed the subject application and have no comments at this time.

If you have any questions regarding this memorandum, please call Rowena Dagdag-Andaya at (808) 270-7845.

Sincerely,

DAVID C. GOODE
Director of Public Works

DCG:RMDA:da
xc: Highways Division
Engineering Division
S:\DSA\Engr\CZM\Draft Comments\Ntnl_env_policy_act_and_chptr_343_DHHL_hoolehua_wtr_imp.wpd

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Mr. David Goode, Director
County of Maui
Department of Public Works
200 South High Street, Room No. 434
Wailuku, Hawai'i 96793

Attn: Rowena Dagdag-Andaya

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Goode;

Thank you for your letter dated October 5, 2015. We acknowledge that you have no comments at this time.

We appreciate your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL Administrator-Land Development Division
Gigi Cairel, Planner, DHHL Planning Office
Niniau Simmons, DHHL Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure: Regional Location

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ALAN M. ARAKAWA
MAYOR

JEFFREY A. MURRAY
FIRE CHIEF

ROBERT M. SHIMADA
DEPUTY FIRE CHIEF

COUNTY OF MAUI
DEPARTMENT OF FIRE AND PUBLIC SAFETY
FIRE PREVENTION BUREAU

313 MANEA PLACE • WAILUKU, HAWAII 96793
(808) 876-4690 • FAX (808) 244-1363

October 9, 2015

PBR Hawaii
Attn: Malia Cox
1001 Bishop St. Ste. 650
Honolulu, HI 96813

Re: Improvements to the DHHL Ho'olehua Water System
PWS No. 230
Molokai, Hawaii

Dear Malia:

Thank you for the opportunity to comment on this subject. Our department supports this project to improve the water system for the residents of Hawaiian Homelands on Moloka'i. At this time, our office provides the following comments:

- Fuel ASTs our permitted through the Fire Prevention Bureau. The permit application can be found on the Dept. of Fire & Public safety's page of the county's website.
- The installation of the system should follow "Best Engineering Practices" and the National Fire Protection Agency's standard for the installation of private service mains (NFPA 24).
- It is recommended that the installation/replacement of fire hydrants during the improvement of the water system meet, as best as possible, the required fire flows and hydrant spacing for the designated land-use of the areas: Agriculture (minimum 500 gpm with maximum spacing of hydrants at 500 feet) and Rural (1000 gpm with maximum spacing of hydrants at 500 feet).

If there are any questions or comments, please feel free to contact me at (808) 876-4693.

Sincerely,

Paul Haake
Captain, Fire Prevention Bureau

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Captain Paul Haake
County of Maui
Department of Fire and Public Safety
Fire Prevention Bureau
313 Manea Place
Wailuku, Hawai'i 96793

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Captain Haake;

Thank you for your letter dated October 9, 2015. We acknowledge your review of the project and offer the following responses to your comments.

We concur that an above ground fuel storage tank (AST) requires a permit through the Fire Prevention Bureau. An application for a fuel AST permit will be filed with your organization and will follow National Fire Protection Agency and best engineering practice standards.

We acknowledge that the recommended hydrant spacing is 500 feet, and that the required fire flows for agriculture and rural designated areas are a minimum of 500 gallons per minute (gpm) and 1,000 gpm respectively. We concur with your statement, "that the installation/replacement of fire hydrants during the improvement of the water system meet, as best as possible, the required fire flows and hydrant spacing."

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, Administrator – DHHL Land Development Division
Gigi Cairel, Planner – DHHL Planning Office
Niniau Simmons, DHHL Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

October 28, 2015

SUBJECT: Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Ho'olehua Water System, PWS No. 230, in Moloka'i, Hawai'i; DA File No. POH-2012-00123

Jobie M. K. Masagatani
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawai'i, 96805

Dear Ms. Masagatani:

The Honolulu District, U.S. Army Corps of Engineers (Corps), has received your letter dated September 16, 2015 for the Proposed Improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230 located in Moloka'i, Hawai'i. Your project has been assigned Department of the Army (DA) file number POH-2012-00123. Please reference this number in all future correspondence.

Please be advised, if the proposed project involves work in waters of the U.S., a DA authorization may be required. Under Section 10 of the Rivers and Harbors Act, structures and/or work in or affecting the course, location, condition, or capacity of navigable waters of the U.S. require DA authorization. Navigable waters of the U.S. are waters subject to the ebb and flow of the tide.

Under Section 404 of the Clean Water Act, DA authorization is required for discharges of dredged or fill material into waters of the U.S., including wetlands. Generally, discharges of fill material include materials that change the bottom elevation of a water of the U.S. and includes rock, sand, soil, debris, overburden, etc. Waters of the U.S. include navigable waters of the U.S. and other waters including wetlands, rivers, streams, lakes, and ponds.

Based on our initial review of the information provided, it appears there may be waters of the U.S. on the project site. Several streams run through the project site and wetlands are identified along the northern boundry of Ho'olehua-Palaau and along the southern boundary of the Kalamaula DHHL project sites. Depending on the circumstances of your project, a permit may be required from this office prior to commencing proposed work. Accordingly, we recommend the landowner or the authorized agent continue coordination of the development of this project with our office.

Thank you for your cooperation with the Honolulu District Regulatory Program. Please contact this office if you have any questions. You may contact the me at 808-835-4306 or via email at kate.m.bliss@usace.army.mil

Sincerely,

Kate Bliss

Kate Bliss
Project Manager
Regulatory Office

cc:

Malia Cox, PBR HAWAII, 1001 Bishop Street, Suite 650, Honolulu, Hawai'i 96813

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Department of the Army
U.S. Army Corps of Engineers, Honolulu District
Fort Shafter, Hawai'i, 96858-5440

Attn: Kate Bliss

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I
(DA file number POH-2012-00123)

Aloha mai Ms. Bliss;

Thank you for your letter dated October 28, 2015. We appreciate you taking the time to review the information provided.

We acknowledge that works in the waters of the U.S. may require Department of the Army (DA) authorization under Section 10 of the Rivers and Harbors Act, and Section 404 of the Clean Water Act.

Since providing the DA with information regarding the project in our letter dated September 16, 2015, we have received updated information from the U.S. Fish and Wildlife online wetland mapping database regarding riverine and wetlands located in the vicinity of the project. Based on the October 1, 2015 revision, there is no overlap between the project and identified waters of the U.S. Updated graphics are included in Appendix A of the Draft EA. We understand that the DA may have other sources not available to us regarding waters subject to DA authority. Ps

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, Administrator – DHHL Land Development Division
Gigi Cairel, Planner – DHHL Planning Office
Niniau Simmons, DHHL Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure: Regional Location

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Malia Cox

From: Lu Ann Faborito <kaluhiokalanik@aol.com>
Sent: Thursday, October 29, 2015 11:44 AM
To: Malia Cox
Subject: Re: DHHL's Moloka'i Water System's Improvements, Section 106, Native Hawaiian Organization Consultation

great work, I'm back and forth on island and am sooooo happy this measure is going forward.

-----Original Message-----
From: Malia Cox <mcox@pbrhawaii.com>
To: kaluhiokalanik <kaluhiokalanik@aol.com>
Sent: Thu, Oct 29, 2015 11:36 am
Subject: DHHL's Moloka'i Water System's Improvements, Section 106, Native Hawaiian Organization Consultation

Aloha e Kakou,

In September 2015, DHHL sent out a packet of information to your organization as part of the Native Hawaiian Organization (NHO) consultation process for a federally funded project. The contact information was obtained from the U.S. Department of Interior's (DOI) NHO list. We are sending the information via email as a follow up if email contact information was provided on the DOI list. A copy of the letter is attached (click here to download attached PDF, 1.1MB: NHO_signed_letter_and_enclosures-_NA.pdf). This email is also being sent to individuals who attended the Oct 1, 2015 meeting, as well as individuals/organizations recommended by NHOs either in writing or verbally for those that we have obtained email contact information.

Subsequent to mailing the consultation letter in September, we received additional information regarding archaeological resources in the vicinity of Site 2 based on archaeological field work conducted after the letter was mailed. A brief post field summary from the archaeologist is included (click here to download attached PDF, 375.3 KB: Postfield_summary.pdf). Additional field testing is being scheduled based on the findings.

Finally, Pacific Legacy is also conducting a Cultural Impact Assessment regarding this same project to meet State of Hawai'i requirements. I encourage you to contact Lisa Kahahane if you would like to participate in that process. She can be reached at kahahane@pacificlegacy.com.

If you have any questions, don't hesitate to contact via email Ms. Malia Cox of PBR HAWAII at mcox@pbrhawaii.com, or Ms. Gigi Cairel of DHHL at gigi.o.cairel@hawaii.gov.

Mahalo,

Malia Cox, LEED® AP BD+C, REM
Project Manager

PBR HAWAII
Land Planning | Landscape Architecture
Environmental Planning | Land Use Entitlements
1001 Bishop Street Suite 650
Honolulu, HI 96813
Phone: 808-521-5631
Fax: 808-523-1402
Email: mcox@pbrhawaii.com
www.pbrhawaii.com

The linked documents referenced in this email contain maps and graphics. If you experience difficulties downloading linked documents, please contact Malia Cox by email, and PBR HAWAII staff will send you an electronic copy directly. Mahalo.

From: Thomas Lenchanko
To: Malia Cox
Cc: gov.contact@hawaii.gov
Subject: hoolehua, molokai
Date: Wednesday, October 07, 2015 8:15:35 PM
Attachments: Your Comment Submitted on Regulations.gov (ID DOI-2015-0002-0001).msg
hk.pdf 2015.pdf

October 07, 2015

The Kingdom of Hawaii continues to exist…

David Y. Ige
Governor

Shan S. Tsutsui
Lieutenant Governor

Jobie M.K. Masagatani
Chairman
Hawaiian Homes Commission

William J. Aila Jr
Deputy to the Chairman

Norman Sakamoto
Administrator-Land Development Division

Gigi Cairel
Planner-Planning Office

Malia Cox
PBR Hawaii

Regarding: September 16, 2015 consultation Department of Hawaiian Home Lands Hoolehua water system, PWS 230 Molokai, Hawaii

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPSED
IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM,PWS 230,MOLOKA'I HAWAI'I

anoai welina aloha

We, aha kukaniloko koa mana mea ola kanaka mauli Hawaiian Lineal Descendants, require of the Hawaiian Homes Commission,
State of Hawaii, its agents, public and private citizens working in their behalf, John and Jane Does…

1] to verify clear unbroken chain of ownership to Kingdom of Hawaii National Government land throughout the Hawaiian Archipelago,
Kingdom of Hawaii, Ko Hawaii Pae Aina;
2] to prove transfer of "exclusive territorial jurisdiction" of Kingdom of Hawaii National Government land to the United States Federal
Government;
3] and your claim of jurisdiction which has not been revealed or proven over Hawaiian land and Nationals – Jurisdiction over the land
(in rem) and in personum (Private Citizen) must be proven in writing, not just assumed, not just stated and not just claimed without
proof and written evidence of law. Jurisdiction when challenged, as in this instance, must be responded to in WRITING AND PROVEN,
AS REQUIRED BY YOUR OWN UNITED STATES LAW.

Therefore, please confirm or deny Convention (IV) relative to the Protection of Civilian Persons in Time of War, Geneva 12 August
1949,i.e., Article 42, 43 and 56, as either applying or not to our situation.

Noticed: Universal Humanitarian Rights Article 18.

ike pono a me hooiaio pule paulele

Thomas Joseph Lenchanko, Kingdom of Hawaii, Hawaiian National and Private Citizen
kahuakaiola, ko laila waha olelo aha kukaniloko koa mana mea ola kanaka mauli 10/07/2015

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Mr. Thomas Joseph Lenchanko
tlenchanko1@hawaii.rr.com

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I

Aloha mai Mr. Lenchanko;

Thank you for your email dated October 1, 2015. We appreciate you taking the time to review the information provided and offer the following response to your comments.

DHHL is a state agency that administers the Hawaiian Homes Commission Act of 1920, as amended, and has jurisdiction over Hawaiian home lands.

We thank you for your participation in this consultation process. The Draft EA is now available for public review and comment. You can access the electronic version of the Draft EA by clicking on the document title within the table of contents of the *Environmental Notice*. A link to the current issue of the *Environmental Notice* follows.
http://oeqc.doh.hawaii.gov/Shared%20Documents/Environmental_Notice/current_issue.pdf. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL- Administrator-Land Development Division
Gigi Cairel, Planner, DHHL- Planning Office
Niniau Simmons, DHHL- Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure: Regional Location

From: Malia Cox
To: Billy Akutagawa
Cc: Catie Cullison; Greg Nakai
Subject: Re: DHHL"s Moloka'i Water System"s Improvements, Section 106, Native Hawaiian Organization Consultation
Date: Thursday, November 19, 2015 2:27:46 PM

Uncle Billy,
Mahalo for emailing back. Your recommendations make a lot of sense, will be forwarded to DHHL, and incorporated into the environmental documents. A formal response will come from DHHL probably around the release of this projects EA.

Mahalo,
Malia

Sent from my iPhone

On Nov 19, 2015, at 1:40 PM, Billy Akutagawa <wakutagawa@napuuwai.com> wrote:

> Malia,
> Sorry for getting back so late. My experiences with the Kalamaula Mauka subdivision development and my term on the Molokai Island Burial Council is the inadvertent find on iwi (bones) in the subject area. Anytime excavation is conducted (lateral pipelines, the contractors may come upon burial finds. Having the Burial Council informed and/or Native Hawaiian monitors on the site will prove necessity. The could also be for archaeological sites as identified in the plan.
> BILLY

From: Malia Cox [mailto:mcox=pbrhawaii.com@mail65.atl11.rsgsv.net] **On Behalf Of** Malia Cox
Sent: Thursday, October 29, 2015 11:37 AM
To: wakutagawa@napuuwai.com
Subject: DHHL's Moloka'i Water System's Improvements, Section 106, Native Hawaiian Organization Consultation

Aloha e Kakou,

In September 2015, DHHL sent out a packet of information to your organization as part of the Native Hawaiian Organization (NHO) consultation process for a federally funded project. The contact information was obtained from the U.S. Department of Interior's (DOI) NHO list. We are sending the information via email as a follow up if email contact information was provided on the DOI list. A copy of the letter is attached (click here to download attached PDF, 1.1MB: NHO_signed_letter_and_enclosures-_NA.pdf). This email is also being sent to individuals who attended the Oct 1, 2015 meeting, as well as individuals/organizations recommended by NHOs either

in writing or verbally for those that we have obtained email contact information.

Subsequent to mailing the consultation letter in September, we received additional information regarding archaeological resources in the vicinity of Site 2 based on archaeological field work conducted after the letter was mailed. A brief post field summary from the archaeologist is included (click here to download attached PDF, 375.3 KB: Postfield_summary.pdf). Additional field testing is being scheduled based on the findings.

Finally, Pacific Legacy is also conducting a Cultural Impact Assessment regarding this same project to meet State of Hawai'i requirements. I encourage you to contact Lisa Kahahane if you would like to participate in that process. She can be reached at kahahane@pacificlegacy.com.

If you have any questions, don't hesitate to contact via email Ms. Malia Cox of PBR HAWAII at mcox@pbrhawaii.com, or Ms. Gigi Cairel of DHHL at gigi.o.cairel@hawaii.gov.

Mahalo,

Malia Cox, LEED® AP BD+C, REM
Project Manager

PBR HAWAII
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www.pbrhawaii.com

The linked documents referenced in this email contain maps and graphics. If you experience difficulties downloading linked documents, please contact Malia Cox by email, and PBR HAWAII staff will send you an electronic copy directly. Mahalo.

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Appendix C

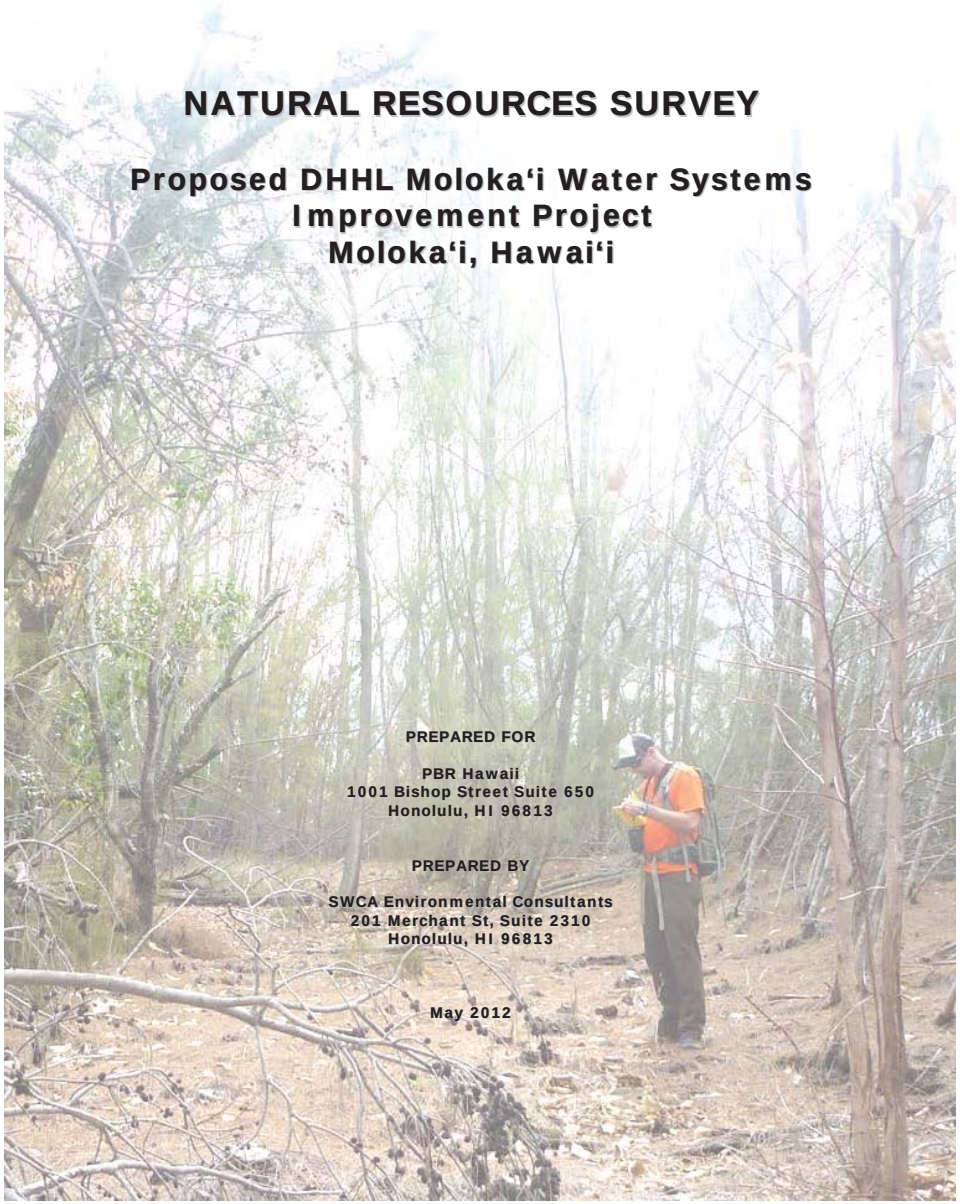
NATURAL RESOURCES SURVEYS

2012 Natural Resources Survey

2015 Biological Resources Survey Report

NATURAL RESOURCES SURVEY

Proposed DHHL Molokaʻi Water Systems Improvement Project
Molokaʻi, Hawaiʻi



PREPARED FOR

PBR Hawaii
1001 Bishop Street Suite 650
Honolulu, HI 96813

PREPARED BY

SWCA Environmental Consultants
201 Merchant St, Suite 2310
Honolulu, HI 96813

May 2012

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1 1.0 INTRODUCTION

1.1 Project Background

The proposed Moloka'i Water Systems Improvements Project of the Department of Hawaiian Home Lands (DHHL) aims to improve reliability and functionality of the delivery of potable water to approximately 1,900 users that rely on the Ho'olehua Water System on Moloka'i. Funding for this project will be requested from the United States Department of Agriculture (USDA), and the application for the federal funding requires inclusion of an evaluation of the existing conditions, and determination of any environmental impacts of the proposed project.

The proposed Moloka'i Water Systems Improvements Project includes activities at three existing well or tank sites, replacement of approximately 22,000 linear feet of existing piping, resurfacing of a water tank access road, and installation of a fire protection access roadway. The tasks associated with the proposed improvements will occur at five discontinuous sites located in central Molokai.

1.2 Survey Objectives

In November 2011, SWCA Environmental Consultants (SWCA) was tasked by PBR Hawaii to 1) review existing information addressing resources within the project area with specific emphasis on flora and fauna, and 2) conduct terrestrial flora and fauna surveys in areas with proposed ground disturbance. SWCA biologists Shahin Ansari, Ph.D.; Jaap Eijzenga, M.S., and Tiffany Thair, M.S. conducted surveys at five (5) proposed project areas on November 28 and 29, 2011. The SWCA field crew was escorted by Mr. Larry Sagario of the State Department of Hawaiian Homelands (DHHL) during both survey days.

The objectives of the field surveys were:

1. To identify and document the presence and relative abundance of all plant species which occur within the survey areas;
2. To provide a general description of the vegetation at the survey area;
3. To identify and document the presence and relative abundance of bird, mammal, amphibian, reptile and invertebrate macrofauna which occur within the survey area;
4. Identify and map any state- or federally listed candidate, threatened, or endangered species, species of concern and/or rare (either locally or statewide) species found or known to occur at the survey area.

This report is organized by resource type: flora and fauna. Each section begins with a review of existing information followed by the results of the field surveys conducted by SWCA.

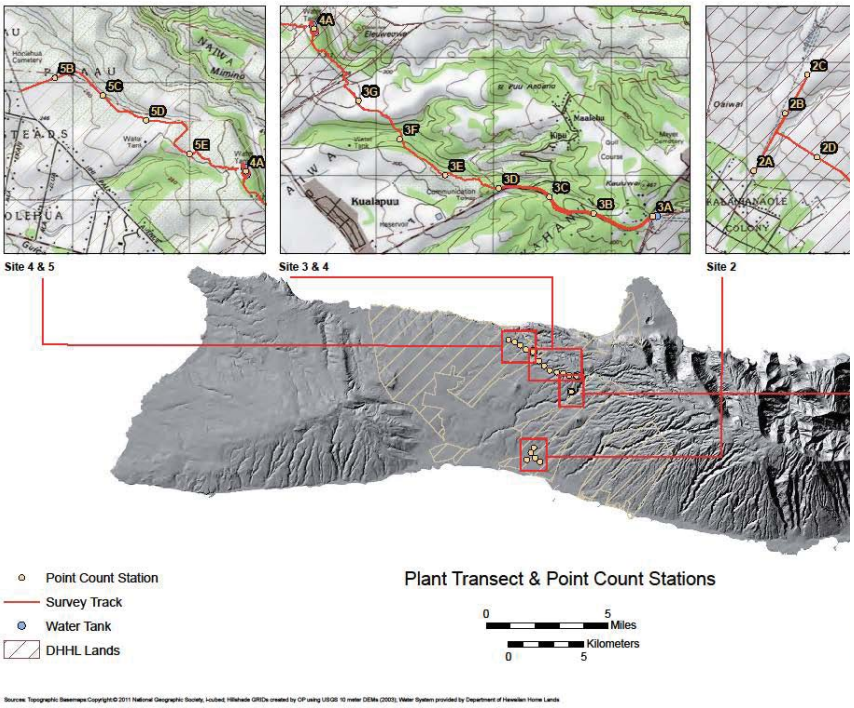

Figure 1-1: Survey sites

2 DESCRIPTION OF THE PROJECT AREA AND THE VICINITY

2.1 General Description

The project areas are located in the Ho'olehua saddle in central Moloka'i, stretching from western Ho'olehua to Kalama'ula, and a section in the southern portion of Kalama'ula located on the southern slope of East Moloka'i. The general topography of the area is characterized as relatively flat to gently sloping westward. The southernmost site slopes gently southward. The entire area is primarily composed of Silty Clay soil associations and Rough Broken, and Eroded Land (add reference to soil survey here).

Previous land use activities in this area include grazing by cattle, goats, pigs, and deer. The eastern part of the Ho'olehua Saddle, where much of the project is situated, was particularly important for cattle ranching in the mid 1800s, followed by sheep ranching in the early 1900s. By 1930 much of the area was devoted to pineapple cultivation. After pineapple cultivation ceased in the early 1970s, a variety of other agricultural crops were grown, including strawberries (Larry Segario, DHHL, pers. comm.), but in recent decades much of the land has remained fallow.

The climate in the area is relatively constant, with minor periods of diurnal and seasonal variability. Daily average high temperature in the area is 81.4°F, and the daily average low temperature is 67.6°F. August is the warmest month with a high of 85.2°F, and February is the coolest month with a low of 63.2°F. Mean annual precipitation ranges from 0.54 inches to 4.53 inches, which an average annual precipitation of 25.97 inches (Maui County Data Book 2008).

More detailed descriptions of the SWCA survey sites identified by PBR Hawaii are provided below. All sites surveyed by SWCA are shown in Figure 1-1.

2.2 Site Descriptions

Site 1. Well Site Compound
This site consists of a fenced and maintained area containing water storage facilities. It is located near Kalama'ula Homesteads, to which its facilities supply water. It is situated in an area where soils consist of Oli silty loam (OME) with 10-30% slopes.

Site 2. Kalama'ula Improvements
This site is located in the northwestern portion of Kaunakakai, and consists of approximately 3,000 linear feet of access road from Kahanu Place to an existing water storage facility, and approximately 3,000 linear feet of waterline. The area consists of abandoned agricultural fields, now consisting of dry grassland. The soil at the site is classified as Very Stony Land, Eroded Land (rVT2).

Site 3. Kauluwai Tank Site
This site consists of approximately 11,000 linear feet of water main transmission lines connecting the Kulawai tank to Ho'olehua. The area was used for agriculture, including pineapple, but has been fallow for decades, and has been revegetated by introduced shrubs and trees. In a portion of this area strips of vegetation have been mechanically cleared to facilitate cattle grazing, which still occurs as part of Kualapu'u Ranch operations. The main alignment runs through a variety of soils, from west to east: Naiwa Silty Clay Loam, 3-20% Slopes (NAC), Rough Broken Land (rRR), Kawaihapai Silty Clay Loam, 2-7% Slopes (KLcB), Kalae Silty Clay, 5-15% Slopes, Eroded (KcC3), Hoolehua Silty Clay, 0-3% Slopes (HzA), and Kalae Silty Clay, 0-3% Slopes (KcB).

Site 4. Ho'olehua Tank Site
This site is located in Ho'olehua, just north of Kualapu'u, and consists of a fenced and mowed area containing water storage facilities. It mostly consists of mowed lawn grass surrounded by non-native forest and shrub land. The existing facilities were constructed in the 1930s. The soil at the site is classified as Kalae Silty Clay, 0-3% Slopes (KcB).

Site 5. Ho'olehua /Veteran's Cemetery site
This site is located in Ho'olehua, and consists of approximately 8,000 linear feet of water main transmission line connecting the Ho'olehua tank site (Site 4) to Veteran's cemetery. This area has

been used extensively for agricultural purposes, including pineapple and strawberries, and has been fallow for several decades, allowing the establishment of non-native forest and shrubland. Soils here are classified as Kalae Silty Clay, 0-3% Slopes (KcB), and Kalae Silty Clay 5-15% Slopes (KcC).

3 TERRESTRIAL FLORA

3.1 Previous Surveys and Inventories

SWCA biologists initially conducted a literature review of available scientific and technical literature regarding botanical resources within the project area. Few specific botanical surveys or inventories appear to have been completed for the area, but some reports and documents on project areas in the vicinity of the survey areas describe the area to contain various roadside or invasive grasses and weedy and introduced species. (Brown and Caldwell 1993, RMTC 1996, Wilson Okamoto and Associates 2001, Munekio Hiraga Inc 2010) No sensitive botanical resources have been identified in the project area.

3.2 State and Federally Threatened & Endangered Species

No records of threatened or endangered species were found for the survey areas. The survey area does not contain designated critical habitat and is not near critical habitat for any listed endangered plant or animal species.

3.3 SWCA Survey Methods

Pedestrian surveys of the three water line alignment and road improvement sites and two tank improvement sites were conducted on November 28 and 29, 2011. A modified one-dimensional line transect method of plot-less sampling was employed to identify the vegetation and plant species present within the project area. The advantages of plot-less sampling are: 1) a sample plot does not need to be established, saving time; and 2) elimination of subjective error associated with the sample plot boundaries. Establishment of transects prior to the field survey dates was not possible because accurate GIS data of the alignments were not available. For the water line alignments the survey crew was dependent upon a DHHL representative to guide them along the actual alignment. Two botanists used parallel transects to survey an area of 25 feet from the center of the alignments. Private property that fell within this area, but which is not expected to be impacted by the proposed project, was not included in the survey. A pedestrian survey method was used to record the plant species at the existing tank fields.

Plants recorded during the survey are indicative of the dry season and the environmental conditions at the time of the survey. It is important to note that this survey was conducted during a drought period, which can preclude the presence or identification of plant species. It is likely that additional surveys conducted during the wet season would result in minor variations in the species and abundances of plants observed, in particular at Site 2, which was extremely dry with very little live vegetation present.

3.4 SWCA Findings

SWCA scientists recorded 94 plant species within the five areas surveyed. Only five of these taxa (5%) are native to the Hawaiian Islands: moa (*Psilotum nudum*) ʻilima (*Sida fallax*), ʻuhaloa (*Waltheria indica*), ʻilieʻe (*Plumbago zeylanica*), and ʻākia (*Wikstroemia oahuensis* var. *oahuensis*). The only endemic species found during the survey is ʻākia (*Wikstroemia oahuensis* var. *oahuensis*). SWCA did not observed any state or federally listed threatened, endangered, or candidate plant species in the survey areas. A comprehensive list of all plant species observed by SWCA biologists is included in Appendix 1 of this report.

Site 1. Thirty six (36) plants species were found at Site 1. The only native Hawaiian species found here is ʻuhaloa (*Waltheria indica*). The site is dominated by mowed Paspalum grass (*Paspalum vaginatum*) around the existing structures and various herbaceous weedy species. The sloped area is dominated by molasses grass (*Melinis minutiflora*) with lantana (*Lantana camara*), Christmas berry (*Schinus terebinthifolius*), a variety of herbaceous weedy species, and some cut trees.

Site 1 has been highly disturbed by the construction of the existing facilities at the well site, and subsequent and ongoing operations. The site is fenced, and the area immediately outside the fence is dominated by non-native trees and shrubs including silk oak (*Grevillea robusta*), Christmas berry (*Schinus terebinthifolius*), and Formosan koa (*Acacia confusa*).

Site 2. SWCA scientists recorded eleven (11) plant species at Site 2 , including two indigenous species: 'ilima (*Sida fallax*) and 'uhaloa (*Waltheria indica*). The vegetation in the well field portion of the survey area is characterized as kiawe-buffelgrass (*Prosopis pallida-Cenchrus ciliaris*) grassland. The kiawe trees range from 2 to 5 m (6-15 ft) tall with sparse buffelgrass cover in the understory due to dry conditions and grazing by ungulates. Lantana (*Lantana camara*) and hairy merremia (*Merremia aegyptia*) are scattered throughout the area. Most of the vegetation in Site 2 was extremely dry or dead during the survey presumably due to prolonged drought conditions.

Site 3. Sixty four (64) plant species were recorded by SWCA scientists at Site 3. The eastern half of the water line alignment more or less follows Kalae Highway. Along the road, vegetation is dominated by a variety of common roadside weeds. The canopy along the road is characterized by Formosan koa (*Acacia confusa*), and *Eucalyptus* species. Just west of the junction with Kipu Road the waterline continues in a northwesterly direction, away from the highway. Vegetation in this area consists mostly of dense stands of either ironwood (*Casuarina equisetifolia*) or Christmas berry (*Schinus terebinthifolius*). Both species form dense, monotypic stands under which very little understory vegetation exists as a result of shading, leaf litter accumulation and heavy browsing by deer. The alignment crosses on unnamed gulch in which approximately 12 'ākia (*Wikstroemia oahuensis* var. *oahuensis*) individuals occur. 'Ākia (*Wikstroemia oahuensis* var. *oahuensis*) is the only Hawai'i endemic species we encountered during the surveys.

Site 4. SWCA scientists recorded 21 plant species at Site 4. None of the plants found here are indigenous or endemic. This site is very similar to Site 1 in that the vegetation is dominated by mowed grass and various herbaceous weeds. *Acacia* leaf litter prevents growth of any vegetation in certain areas of the site. The site supports a mix of weedy grasses and shrubs, including seashore Paspalum grass (*Paspalum vaginatum*), narrow-leaved plantain (*Plantago lanceolata*), nodeweed (*Synedrella nodiflora*), and jungle rice (*Echinochloa colona*).

Site 5. SWCA scientists recorded 42 plant species at Site 5, including two individuals of one endemic species, 'ākia (*Wikstroemia oahuensis* var. *oahuensis*), and four indigenous species: 'ilima (*Sida fallax*), moa (*Psilotum nudum*), 'ilie'e, and 'uhaloa (*Waltheria indica*). This site is very similar to the western part of Site 3 in that it is primarily dominated by two vegetation types: Christmas berry (*Schinus terebinthifolius*) thickets and *Acacia confusa* thickets, with sourgrass (*Digitaria insularis*) and guinea grass (*M. maximum*) in the understory. Some areas are so heavily invested with Christmas berry (*Schinus terebinthifolius*) and Acacia (*Acacia confuse*) that nothing is growing in the understory. Other areas of the waterline are abandoned roads that are overgrown by various grasses including sourgrass. Other non-native plant species scattered throughout include lantana (*Lantana camara*), and guava (*Psidium guajava*).

3.5 Discussion

The entire survey area has been intensively disturbed by agriculture and urbanization, and secondary vegetative growth has been heavily impacted by browsing by introduced ungulates, mainly axis deer. As a result no native vegetation communities remain in the survey areas. At the existing tank sites the vegetation predominantly consisted of mowed lawn grass with ruderal vegetation. The majority of the waterline runs through former agricultural land, now dominated by ironwood forest, Christmas berry (*Schinus terebinthifolius*) shrubland, and Formosan koa (*Acacia confusa*) forest.

Roughly 5% of the plants recorded during the surveys are native to Hawai'i. Of these, only a single taxon is endemic, or found only on the Hawaiian Islands. The remaining four plant species are indigenous, or native to Hawai'i as well as elsewhere (Wagner et al. 1999). The only site where native species were not found is Site 4. Site 5 contained all five native species. The four indigenous species are all commonly found throughout Moloka'i and the main Hawaiian Islands. The most common native

species found during the surveys, 'uhaloa (*Waltheria indica*), is commonly found at disturbed sites throughout Hawai'i (Wagner et al. 1999). The one endemic species, 'ākia (*Wikstroemia oahuensis* var. *oahuensis*), has a more limited distribution. It was once a dominant species in the 'Ākia Shrubland community (Wagner et al. 1999) which may have been present at the site before it was converted for agricultural practices. The few 'ākia (*Wikstroemia oahuensis* var. *oahuensis*) shrubs found during the survey were all located in gulches.

4 TERRESTRIAL FAUNA

4.1 Previous Surveys and Inventories

SWCA biologists initially conducted a literature review of available scientific and technical literature regarding terrestrial fauna within the project area. There have been a few wildlife surveys conducted within the area which reported a number of common, introduced avian species, including zebra dove (*Geopelia striata*), spotted dove (*Streptopelia chinensis*), house finch (*Carpodacus mexicanus*), common mynah (*Acridotheres tristis*), Japanese white-eye (*Zosterops japonicas*), northern cardinal (*Cardinalis cardinalis*) (add references for previous surveys here). In addition to introduced birds, a number of introduced mammals have also been recorded from the general area, including axis deer (*Cervus axis*), cattle (*Bos taunis*), feral cats (*Felis catus*) and dogs (*Canus domesticus*), and mongoose (*Herpestes javanicus*). All of the reported species are likely to be widespread on Moloka'i, particularly in the more heavily disturbed, lowland areas.

Most of the native birds of Moloka'i have been extirpated or are extinct. Extant populations continue to decline, and their range has been highly reduced. Leading causes for population declines and extinctions across the Hawaiian Islands include habitat destruction, introduced predators, and avian disease (Ralph and Van Riper 1985). In recent years, only three of the originally nine forest bird species inhabiting Moloka'i have been detected (Reynolds and Snetsinger 2001). Forest birds have been restricted to higher elevation sites; seabirds have been restricted to inaccessible sites at either higher elevation sites and to the offshore islands. The endemic, endangered waterbird species are limited to the scarce wetland habitats on Moloka'i.

4.2 State and Federally Threatened & Endangered Species

No records of threatened or endangered species were found for the survey areas. The survey area does not contain critical habitat and is not near critical habitat for any listed vertebrate or invertebrate species.

The Hawaiian hoary bat (*Lasiurus cinereus semotus*) is the only native mammal species which is still extant within the Hawaiian Islands (UFWS 1998). It has been recorded on Moloka'i as well as on O'ahu, Maui, Kaua'i, and Hawai'i, but no historical or current population estimates or information exist for this endemic subspecies. Population estimates for all islands in the state in the recent past have ranged from hundreds to a few thousand bats (Menard 2001). The Hawaiian hoary bat (*Lasiurus cinereus semotus*) is believed to occur primarily below an elevation of 4,000 feet (1,220 m).

Hawaiian hoary bats (*Lasiurus cinereus semotus*) roost in native and non-native vegetation from 3 to 29 feet (1 to 9 m) above ground level. They have been observed roosting in ʻōhiʻa (*Metrosideros polymorpha*), hala (*Pandanus tectorius*), coconut palms (*Cocos nucifera*), kukui (*Aleurites moluccana*), kiawe (*Prosopis pallida*), avocado (*Persea americana*), mango (*Mangifera indica*), shower trees (*Cassia javanica*), pūkiawe *(Styphelia tameiameiae*), and fern clumps; they are also suspected to roost in eucalyptus (*Eucalyptus* spp.) and Sugi pine (*Cyrptomeria japonica*) stands (USFWS 1998). Breeding likely occurs primarily between April and August. Breeding has only been documented on the islands of Hawai'i and Kaua'i (Baldwin 1950; Kepler and Scott 1990; Menard 2001). It is not known whether bats observed on other islands breed locally or only visit these islands during non-breeding periods. Seasonal changes in the abundance of Hawaiian hoary bats (*Lasiurus cinereus semotus*) at different elevations indicate that altitudinal migrations occur on the Island of Hawai'i. During the breeding period, Hawaiian hoary bat (*Lasiurus cinereus semotus*) occurrences increase in the lowlands and decrease at high elevation habitats. Hawaiian hoary bat (*Lasiurus cinereus semotus*) occurrences are especially low from June until August in high elevation areas. In the winter, especially during the post-lactation period in October, bat occurrences increase in high elevation areas and in the central highlands, possibly receiving bats from the lowlands (Menard 2001).

4.3 SWCA Survey Methods

SWCA conducted avian point count surveys on November 29 and 30, 2011. Point count stations were placed 1,500 feet apart along the transects for Sites 2, 3, and 5. One point count station was located in both Site 1 and Site 4. The location of the observer at each point count site was established in the field with a hand-held GPS receiver. Field observations of birds were recorded using 10 x 50 binoculars with a 6.5 degree field of vision. The observer also listened for vocalizations. The relative densities of species were estimated using five-minute 60 m (200 ft) radius point counts (Lynch 1995). Ideally, these point counts are conducted during peak bird activity periods (0800–1100 and 1600–1900) to maximize the likelihood of detecting birds during the survey. However, due to time restraints based on the need to be escorted by a DHHL representative who was familiar with the sites and the actual water line alignments, point counts were conducted throughout the day. Birds observed between count stations were also noted.

Bat point counts were also conducted at sites likely to be utilized by the Hawaiian hoary bat (*Lasiurus cinereus semotus*), and which may require tree removal within the context of the proposed project. Bat point counts were restricted to sites that were accessible within the survey window; therefore, they focused mostly on Site 3. Bat point counts were completed between sunset and two hours past sunset, when bats are most active. SWCA also deployed a Wildlife Acoustics SM2 ultrasonic bat detector to facilitate identification of Hawaiian hoary bats (*Lasiurus cinereus semotus*) within the project area.

Mammals, reptiles, amphibians, insects, and other invertebrates seen or heard during the point count surveys or between count stations were also documented.

4.4 SWCA Findings

The dominant fauna of the survey sites consists almost entirely of non-native birds and mammals. Only one endangered species and one additional native species were observed during the surveys. The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) was detected using an ultrasonic detector at Site 3, and the migratory Pacific golden plover (*Pluvialis fulva*) was seen at Sites 4 and 5. No other state or federally listed threatened, endangered, or candidate endangered bird, mammal, or invertebrate species were observed during the surveys.

Besides the two species noted above, none of the fauna recorded by SWCA biologists during the surveys are native to the Hawaiian Islands. Specific invertebrate studies were not conducted; however, several dragonfly species were noted, as well as the rosy wolf snail (*Euglandina rosea*).

Sign of deer browsing was seen throughout the survey areas, and small herds of axis deer (*Cervus axis*) were seen at some of the sites.

Table 4-1: Relative abundance of birds based on point counts at proposed sites

	Common name	*Scientific Name*	*Number of detections*	*Number of Stations Occupied*	*Percent Occurrence*	*Birds per Station*	*Rank*	*Status*
Native	Pacific golden plover	*Pluvialis fulva*	3	2	12%	0.2	3	I
Introduced	Black francolin	*Francolinus francolinus*	4	3	18%	0.2	2	X
	Cattle egret	*Bulbulcus ibis*	2	2	12%	0.1	4	X
	Common mynah	*Acridotheres tristis*	11	6	35%	0.6	3	X
	House finch	*Carpodacus maxicanus*	10	6	35%	0.6	1	X
	Japanese white-eye	*Zosterops japonicus*	59	14	82%	3.5	3	X
	Northern cardinal	*Cardinalis cardinalis*	1	1	6%	0.1	4	X
	Northern Mockingbird	*Mimus polyglottos*	5	5	29%	0.3	3	X
	Ring-necked pheasant	*Phasianus colchicus*	1	1	6%	0.1	3	X
	Zebra dove	*Geopelia striata*	11	4	24%	0.6	3	X

Table 4-2: Presence of birds at the individual sites

	Common name	*Scientific Name*	*Site 1*	*Site 2*	*Site 3*	*Site 4*	*Site 5*
Native	Pacific golden plover	*Pluvialis fulva*				✓	✓
Introduced	Black francolin	*Francolinus francolinus*	✓		✓	✓	
	Cattle egret	*Bulbulcus ibis*			✓	✓	
	Common mynah	*Acridotheres tristis*	✓	✓	✓	✓	✓
	House finch	*Carpodacus mexicanus*	✓	✓	✓	✓	✓
	Japanese white-eye	*Zosterops japonicus*	✓	✓	✓	✓	✓
	Northern cardinal	*Cardinalis cardinalis*				✓	
	Northern Mockingbird	*Mimus polyglottos*	✓		✓	✓	
	Ring-necked pheasant	*Phasianus colchicus*					✓
	Zebra dove	*Geopelia striata*	✓	✓	✓	✓	

Site 1: Six introduced bird species were recorded during the survey at Site 1. The house finch was the most abundant during the survey. Black francolins (*Francolinus francolinus*) were heard during the survey, but none were actually detected within the fenced area. Other birds detected during the survey at this site are northern mockingbird (*Mimus polyglottos*), zebra dove (*Geopelia striata*), Japanese white-eye (*Zosterops japonicas*), and common mynah (*Acridotheres tristis*). All of these birds are common to the main Hawaiian Islands (HAS 2005). No state or federally listed threatened, endangered, or candidate endangered species were observed during the survey at this site.

Site 2: Site 2 had the lowest abundance and diversity of birds. The majority of the birds were detected at the southern end of the proposed road improvement area, where some green vegetation was present near a residence. The most abundant bird here was the zebra dove (*Geopelia striata*). Other species recorded were common mynah (*Acridotheres tristis*), Japanese white-eye (*Zosterops japonicas*), and house finch (*Carpodacus mexicanus*). The rest of the site was extremely dry, and very little green vegetation was found as a result of drought and ungulate grazing, and no birds or other animals were recorded during the survey. No state or federally listed threatened, endangered, or candidate endangered species were observed during the survey at this site.

Site 3: Seven introduced bird species were recorded during the survey at Site 3. The Japanese white-eye (*Zosterops japonicas*) was by far the most abundant species at this site, and it was detected at each of the seven point count stations. Other common birds at this site include common mynah, black francolin (*Francolinus francolinus*), house finch (*Carpodacus mexicanus*), and northern mockingbird. In addition to the species observed during the point counts, the Pacific golden plover (*Pluvialis fulva*) was documented at this site outside of the point counts.

During a bat point count at point 3g (figure 1-1) around 6:00 p.m., 15 minutes past sunset, a single Hawaiian hoary bat (*Lasiurus cinereus semotus*) was detected with an ultrasonic bat detection device (but not seen) just south of the dirt access road used to access Site 4. This was the only bat detected during the surveys.

Site 4: Site 4 had the highest number of species of all of the sites. It contained the largest, green, open area, surrounded by forest and shrubland. Nine bird species were recorded at Site 4 during the survey. The most abundant species during the survey was the Japanese white-eye, followed by the house finch (*Carpodacus mexicanus*) and zebra dove (*Geopelia striata*). One species, the northern cardinal (*Cardinalis cardinalis*), was recorded at this site, and at none of the other sites. The migratory Pacific golden plover (*Pluvialis fulva*) was recorded at this site. These birds are attracted to lawns and open green spaces (HAS 2005), and likely find this site a suitable foraging and loafing area during their non-breeding season. No state or federally listed threatened, endangered, or candidate endangered species were observed during the survey at this site.

Site 5: Five bird species were recorded during the survey at Site 5. The Japanese white-eye (*Zosterops japonicas*) was the most abundant species during the survey. Additional introduced birds detected at this site were the house finch, ring-necked pheasant (*Phasianus colchicus*), and common mynah. The migratory Pacific golden plover (*Pluvialis fulva*) was also recorded at this site. No state or federally listed threatened, endangered, or candidate endangered species were observed during the survey at this site.

4.5 Discussion

It appears that none of the sites provide breeding habitat for native birds, and only the sites with lawn grass and open green spaces provide foraging and loafing habitat for the migratory Pacific golden plover (*Pluvialis fulva*). Although this species was only observed during the point counts at Site 4 and 5, and outside of the point counts at site 3, other areas with open green spaces, and particularly lawns, may be used by this species during the non-breeding (winter) months. All of the birds documented are common, introduced birds that are widespread on Moloka'i and most or all of the main Hawaiian Islands.

Small herds of axis deer were seen on several occasions at Site 3 and 5. Sign of axis deer (*Cervus axis*) browsing was evident at all of the unfenced sites. Axis deer (*Cervus axis*) appear to have a

significant effect on the vegetation structure throughout the survey areas. In addition, Site 3 is still actively grazed by cattle, and strip of brush have been cleared to open up areas to facilitate grazing.

The Hawaiian hoary bat (*Lasiurus cinereus semotus*) is the only native land mammal in the Hawaiian Islands, and there are no native reptiles or amphibians. Thus the project will not impact native mammals, other than the Hawaiian hoary bat (*Lasiurus cinereus semotus*), nor native reptiles and amphibians.

The only state and federally listed invertebrate that may be found at the survey areas is the endangered endemic Blackburn's sphinx moth (*Manduca blackburni*). For reproduction this species relies on plant and tree species in the Solenaceae family, on which the larvae feed (USFWS 2005). The main host species are native trees in the genus *Nothocestrum*, and the introduced tree tobacco (*Nicotiana glauca*). No potential native or non-native host species for adult or juvenile moths were found during the surveys. It is highly unlikely that this species is found within the survey area.

5 CONCLUSIONS AND RECOMMENDATIONS

The only state or federally listed species observed at the survey sites by SWCA was the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) at Site 3; however, we found no evidence that bats are actively roosting in the project area Therefore, to avoid potential impacts to bats, the clearing of trees above 15 feet in height should be avoided between June 1 and September 15, which is when non-volent Hawaiian hoary bat juveniles may be present within the project area. We believe that this measure, promulgated by the U.S. Fish and Wildlife Service, will be sufficient to mitigate for any potential negative impacts associated with the proposed waterline improvements. In addition, the U.S. Fish and Wildlife Service discourages the use of barbed wire in fencing, because of evidence that barbed wire fences pose a risk to bats in open areas. The proposed project does not include the use of barbed wire fence, thus mitigation measures will not be needed to address this concern.

Besides the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), the only native vertebrate species recorded by SWCA during the surveys is the Pacific golden plover (*Pluvialis fulva*), which is abundant throughout Hawai'i and uses a variety of habitats including mudflats, lawns, and rooftops (HAS 2005). This species does not nest in Hawai'i.

The project area falls within the breeding range of the Hawaiian goose (*Branta sandvicensis*), and although this species was not observed during the survey, it may be present in the vicinity of the proposed project area. The U.S. Fish and Wildlife Service recommends that if the species is observed within the project area during the breeding season, which is from December through April, a qualified biologist survey the area prior to the start of construction activities. This survey should be repeated anytime construction work is halted for a period of at least three days, during which the birds may attempt to nest. Should any Hawaiian goose nest be discovered within a 100 foot radius of proposed construction activities, work in this area should be halted and the U.S. Fish and Wildlife Service should be contacted for further guidance.

Should night-time construction be required within the breeding season of the threatened Newell's shearwater (*Puffinus auricularis newelli*) and the endangered Hawaiian petrel (*Pterodroma phaeopygia sandwichensis*) (March through December), we recommend that measures to reduce light glare are implemented. These two seabird species may be attracted to the light as they traverse between the ocean and their nesting sites in the mountains at night, become disoriented, and either collide with structures in the vicinity, or become grounded and at risk of predation or vehicle collision. Minimization measures include the use of shielded and downward pointed lights. The U.S. Fish and Wildlife Service recommends that they be contacted for further guidance if night-time construction is planned.

Only five of the 94 plant species found during the survey are native to the Hawaiian Islands, and only one of those is endemic, or native to Hawai'i and nowhere else. The four indigenous species moa (*Psilotum nudum*) , 'ilima (*Sida fallax*), 'uhaloa (*Waltheria indica*), and 'ile'e (*Plumbago zeylandica*) are fairly common throughout the main Hawaiian islands. The endemic ʻākia (*Wikstroemia oahuensis* var. *oahuensis*) used to be a common component of the native vegetation community, but has been restricted in its range due to habitat conversion, competition with introduced species, and grazing by introduced ungulates.

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Appendices

APPENDIX 1
List of Plant Species Observed

The following checklist is an inventory of all the plant species observed by SWCA biologists on November 28 and 29, 2011 during surveys of the five survey area designated as Water System Improvement Sites by PBR Hawaii, on the Island of Moloka'i, Hawai'i. The plant names are arranged alphabetically by family and then by species into three groups: Ferns and Lycophytes, Monocots, and Dicots. The taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999), Wagner and Herbst (1999), and Staples and Herbst (2005). Recent name changes are those recorded in the Hawaii Biological Survey series (Evenhuis and Eldredge, eds., 1999-2002) and the Bernice P. Bishop Museum Hawaiian Flowering Plants Checklist (2010). Fern and lycophyte taxonomy follows Palmer (2003) and taxonomic changes for the ferns and lycophytes are in accordance with the Hawaii Biological Survey series (Evenhuis and Eldredge, eds., 2009-2010)

Status:

E = endemic = native only to the Hawaiian Islands.
I = indigenous= native to the Hawaiian Islands and elsewhere.
P = Polynesian = introduced by Polynesians.
X =introduced/ alien = all those plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact (Cook's arrival in the islands in 1778).

Location:

Site 1 = Well Site Compound Kalamaula
Site 2 = Kalamaula
Site 3 = Kauluwai Tank Site
Site 4 = Hoolehua Tank Site
Site 5 = Hoolehua/Veteran's Cemetery Site

Relative Site Abundance:

Abundant = forming a major part of the vegetation within the survey area.
Common = widely scattered throughout the area or locally abundant within a portion of it.
Uncommon = scattered sparsely throughout the area or occurring in a few small patches.
Rare = only a few isolated individuals within the survey area.

Scientific Name	Common & Hawaiian Name (s)	Status	Relative Site Abundance				
			Site 1	Site 2	Site 3	Site 4	Site 5
FERNS & LYCOPHYTES							
Lomariopsidaceae							
Nephrolepis brownii (Desv.) Hovenkamp & Miyam.		X			rare		rare
Polypodiaceae							

Scientific Name	Common & Hawaiian Name (s)	Status	Relative Site Abundance				
			Site 1	Site 2	Site 3	Site 4	Site 5
Phlebodium aureum (L.) J.Sm.	laua'e haole, rabbit's-foot fern	X			rare		rare
Psilotaceae							
Psilotum nudum (L.) P.Beauv.	moa, moa nahele, pipi, 'o'omoa, upright whiskfern	Ind					uncommon
MONOCOT							
Agavaceae							
Agave sisalana Perrine	sisal, sisal hemp, century plant	X	rare			rare	
Commelinaceae							
Commelina diffusa Burm.f.	honohono	X			rare		
Cyperaceae							
Cyperus gracilis L.	McCoy grass, mau'u hunehune	X			rare		
Kyllinga brevifolia Rottb.	kili'o'opu, kaluhā	X			rare		rare
Liliaceae							
Asparagus plumosus Baker		X			rare		rare
Poaceae							
Andropogon virginicus L.	broomsedge	X	uncommon				
Bothriochloa pertusa (L.) A.Camus	pitted beardgrass	X	uncommon		uncommon	uncommon	
Cenchrus ciliaris L.	buffelgrass	X	uncommon	abundant			
Chloris barbata Sw.	swollen fingergrass	X	rare				
Cynodon dactylon (L.) Pers.	Bermuda grass, manienie	X	uncommon		uncommon		
Digitaria ciliaris (Retz.) Koeler	Henry's crabgrass, kūkaepua'a	X					uncommon
Digitaria insularis (L.) Mez ex Ekman	sourgrass	X					abundant
Echinochloa colona (L.) Link	jungle-rice	X			rare	common	

Scientific Name	Common & Hawaiian Name (s)	Status	Relative Site Abundance				
			Site 1	Site 2	Site 3	Site 4	Site 5
Eragrostis amabilis (L.) Wight & Arn. ex Nees	lovegrass	X	uncommon		uncommon		uncommon
Megathyrsus maximus (Jacq.) B. K. Simon & S. W. L. Jacobs	Guinea grass	X	common		common	uncommon	common
Melinis minutiflora P.Beauv.	molasses grass	X	abundant		uncommon		
Melinis repens (Willd.) Zizka	Natal redtop, Natal grass	X			rare		
Paspalum conjugatum P.J.Bergius	Hilo grass	X	rare				
Paspalum vaginatum Sw.	seashore paspalum	X	common		uncommon	abundant	uncommon
DICOT							
Acanthaceae							
Justicia betonica L.	white shrimp plant	X					rare
Amaranthaceae							
Amaranthus spinosus L.	spiny amaranth	X	rare				rare
Alternanthera sessilis (L.) R.Br. ex DC.	sessile joyweed	X					
Anacardiaceae							
Schinus terebinthifolius Raddi	Christmas berry, wilelaiki	X	uncommon		abundant	rare	abundant
Apiaceae							
Centella asiatica (L.) Urb	Asiatic pennywort	X	rare			rare	
Araliaceae							
Schefflera actinophylla (Endl.) Harms	octopus tree, umbrella tree	X			rare		
Asclepiadaceae							
Asclepias physocarpa (E.Mey.) Schltr.	ballon plant	X			rare		
Asteraceae							
Bidens pilosa L.	Spanish needle, ki, ki nehe	X	rare		rare		
Calyptocarpus vialis Less.		X	rare		rare		
Conyza bonariensis (L.) Cronq.	hairy horseweed	X			rare	common	uncommon

Scientific Name	Common & Hawaiian Name (s)	Status	Relative Site Abundance				
			Site 1	Site 2	Site 3	Site 4	Site 5
Emilia fosbergii Nicolson	pualele	X	rare		rare		rare
Erigeron karvinskianus DC.	daisy fleabane	X				rare	
Heterotheca grandiflora Nutt.	telegraph weed	X				rare	
Synedrella nodiflora (L.) Gaertn.	nodeweed	X	uncommon		rare	common	rare
Sonchus oleraceus L.	sow thistle, pualele	X	rare			rare	
Tridax procumbens (L.)	coat buttons	X			rare		
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown-beard	X			rare		
Xanthium strumarium L.	cocklebur, kikania	X		rare			
Cactaceae							
Opuntia ficus-indica (L.) Mill.	pānini, pāpipi	X			rare		
Capparaceae							
Cleome gynandra L.	wild spider flower, spider wisp	X	rare				
Casuarinaceae							
Casuarina equisetifolia L.	common ironwood	X			abundant	rare	uncommon
Chenopodiaceae							
Chenopodium carinatum R.Br.?	goosefoot, pigweed	X	uncommon		rare		
Convolvulaceae							
Ipomoea triloba L.	little bell	X			rare		
Merremia aegyptia (L.) Urb.	hairy merremia, koali kua hulu	X		common	rare		
Euphorbiaceae							
Aleurites moluccana (L.) Willd.	kukui	P			rare		
Chamaesyce hirta (L.) Millsp.	hairy spurge, garden spurge	X			rare		
Chamaesyce hypericifolia (L.) Millsp.	graceful spurge	X			rare		
Chamaesyce prostrata (Aiton) Small	prostrate spurge	X	rare		rare		
Phyllanthus debilis Klein ex Willd.	niruri	X			rare		

Scientific Name	Common & Hawaiian Name (s)	Status	Relative Site Abundance				
			Site 1	Site 2	Site 3	Site 4	Site 5
Fabaceae							
Acacia confusa Merr.	Formosa koa	X	uncommon		abundant	uncommon	abundant
Acacia farnesiana (L.) Willd.	klu, aroma	X		uncommon			
Acacia mearnsii De Wild.	black wattle	X			uncommon		
Chamaecrista nictitans subsp. *patellaria* var. *glabrata* (Vogel) H.S.Irwin & Barneby	partridge pea	X			rare		rare
Crotalaria incana L.	fuzzy rattlepod, kolomona	X	rare	rare			
Desmodium incanum DC.	Spanish clover	X	uncommon		rare	uncommon	rare
Indigofera hendecaphylla Jacq.	creeping indigo	X	uncommon				
Indigofera suffruticosa Mill.	indigo	X			uncommon		uncommon
Leucaena leucocephala (Lam.) de Wit	koa haole	X	rare	uncommon	uncommon	uncommon	uncommon
Neonotonia wightii (Wight & Arn.) Lackey					uncommon		rare
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe, algaroba, mesquite,	X		common			rare
Stylosanthes sp.	Poor man's friend	X	uncommon		rare		rare
Lamiaceae							
Leonotis nepetifolia (L.) R.Br.	lion's ear	X		uncommon			
Malvaceae							
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	X					rare
Malva parviflora L.	cheese weed	X	rare				
Malvastrum coromandelianum (L.) Garke ssp. *coromandelianum*	false mallow	X	uncommon				rare
Sida ciliaris L.		X			rare		
Sida fallax Walp.	ʻilima	Ind		rare			rare
Sida rhombifolia L.		X			uncommon	uncommon	rare
Moraceae							
Ficus macrophylla Desf. ex Pers.	Moreton Bay fig	X			uncommon		

Scientific Name	Common & Hawaiian Name (s)	Status	Relative Site Abundance				
			Site 1	Site 2	Site 3	Site 4	Site 5
Ficus microcarpa L.f.	Chinese banyan	X			rare		
Myrtaceae							
Eucalyptus crebra F. Muell.	narrow-leaved ironbark	X			rare		
Eucalyptus robusta Sm.	swamp mahogany	X			rare		
Eucalyptus sideroxylon subsp. *sideroxylon*	red ironbark	X			uncommon		uncommon
Eucalyptus sp.		X			rare		rare
Psidium cattleianum Sabine	strawberry guava	X			uncommon		rare
Psidium guajava L.	common guava	X	rare		uncommon		uncommon
Syzygium cumini (L.) Skeels	Java plum, jambolan plum	X			rare		
Nyctaginaceae							
Boerhavia coccinea Mill.		X					rare
Oxalidaceae							
Oxalis corniculata L.	yellow wood sorrel, ʻihi ʻai, ʻihi ʻawa	P?			rare	uncommon	
Passifloraceae							
Passiflora edulis Sims	passion fruit, liliko'i	X			uncommon		uncommon
Plantaginaceae							
Plantago lanceolata L.	narrow-leaved plantain, English plantain	X	uncommon		rare	abundant	rare
Plantago major L.	Broad-leaved plantain	X			rare		
Plumbaginaceae							
Plumbago zeylanica K.	ʻilieʻe	Ind					rare
Portulacaceae							
Portulaca oleracea L.	pigweed, ʻākulikuli kula	X	rare				
Proteaceae							
Grevillea robusta A.Cunn. ex R.Br.	silk oak, silver oak	X	rare		uncommon		

Scientific Name	Common & Hawaiian Name (s)	Status	Relative Site Abundance				
			Site 1	Site 2	Site 3	Site 4	Site 5
Macadamia integrifolia Maiden & Betche	Mac nut, queensland	X			rare		
Sterculiaceae							
Waltheria indica L.	'uhaloa	Ind	uncommon	rare	rare		rare
Thymelaeaceae							
Wikstroemia oahuensis var. *oahuensis*	'ākia, kauhi	End			rare		rare
Verbenaceae							
Citharexylum spinosum L.	fiddlewood	X			rare		
Lantana camara L.	lantana	X	common	common	common	rare	abundant
Verbena litoralis Kunth	vervain, ōwī, oī	X					rare
Stachytarpheta jamaicensis (L.) Vahl	Jamaica vervain, ōwī, oī	X			uncommon	rare	uncommon

APPENDIX 2
List of Bird Species Observed

The following checklist is an inventory of all the bird species observed by SWCA biologists on November 28 and 29, 2011 during surveys of the five survey area designated as Water System Improvement Sites by PBR Hawaii, on the Island of Moloka'i, Hawai'i.

Status:

E = endemic = native only to the Hawaiian Islands.
I = indigenous= native to the Hawaiian Islands and elsewhere.
X =introduced/ alien = all those birds brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact (Cook's arrival in the islands in 1778).

Location:

Site 1 = Well Site Compound Kalamaula
Site 2 = Kalamaula
Site 3 = Kauluwai Tank Site
Site 4 = Hoolehua Tank Site
Site 5 = Hoolehua/Veteran's Cemetery Site

Site	Common name	Scientific Name	Number of Detections	Relative abundance	Rank	Status	Number of Stations Occupied
Site 1							
	Northern Mockingbird	*Mimus polyglottos*	1	1.0	3	X	1
	Black frankolin	*Francolinus francolinus*	2	2.0	2	X	1
	Zebra dove	*Geopelia striata*	1	1.0	3	X	1
	Japanese white-eye	*Zosterops japonicus*	1	1.0	3	X	1
	Common mynah	*Acridotheres tristis*	1	1.0	3	X	1
	House finch	*Carpodacus mexicanus*	3	3.0	1	X	1
Site 3							
	Japanese white-eye	*Zosterops japonicus*	35	5.0	1	X	7
	Common mynah	*Acridotheres tristis*	3	0.4	2	X	2
	Cattle egret	*Bulbulcus ibis*	1	0.1	4	X	1

Biological Resource Survey Report for the Proposed Department of Hawaiian Home Lands' Moloka'i Water Systems Improvement Project

Prepared for

PBR Hawai'i & Associates, Inc.

Prepared by

SWCA Environmental Consultants

October 2015

BIOLOGICAL RESOURCE SURVEY REPORT FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS' MOLOKAʻI WATER SYSTEMS IMPROVEMENT PROJECT

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SWCA Project No. 22600

October 15, 2015

EXECUTIVE SUMMARY

In 2011, SWCA Environmental Consultants (SWCA) conducted biological surveys in support of the Department of Hawaiian Home Lands' (DHHL) plans for the Moloka'i Water Systems Improvements project (SWCA 2012). This project aimed to improve the reliability and functionality of water delivery to 19,100 users connected to the Ho'olehua Water System PWS No. 230 on Moloka'i Island. PBR Hawai'i & Associates, Inc. has invited SWCA to provide supplemental biological surveys for additional proposed improvements to the Moloka'i Water Systems. SWCA's biological findings are summarized here and provided in more detail in the report that follows.

Flora

The vegetation types and species identified during the survey are not threatened, endangered, or candidate species. Therefore, the proposed project is not expected to have a significant adverse impact on any state or federally listed candidate, threatened, or endangered species; species of concern; and/or rare plants.

To avoid the unintentional introduction or transport of new terrestrial invasive species to Moloka'i during this project, all construction equipment and vehicles arriving from outside of Moloka'i should be washed and inspected, and, when possible, raw materials (e.g., gravel, rock, and soil) should be purchased from a local supplier on Moloka'i to avoid introducing non-native species not present on the island.

Fauna

The fauna in the survey site area are predominantly non-native birds and mammals common throughout Moloka'i and the main Hawaiian Islands. The proposed project is not expected to have a significant adverse impact on any state or federally listed candidate, threatened, or endangered species; species of concern; and/or rare animals.

Some recommendations are given to minimize impacts to the following federally and state endangered species because of their potential to either pass through or use the habitats in the surveys area: Hawaiian hoary bat (*Lasiurus cinereus semotus*), Hawaiian goose (*Branta sandvicensis*), Newell's shearwater (*Puffinus auricularis newelli*), and Hawaiian petrel (*Pterodroma phaeopygia sandwichensis*).

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1. INTRODUCTION

In 2011, SWCA Environmental Consultants (SWCA) conducted biological surveys in support of the Department of Hawaiian Home Lands' (DHHL) plans for the Moloka'i Water Systems Improvements project (SWCA 2012). This project aimed to improve the reliability and functionality of water delivery to 19,100 users connected to the Ho'olehua Water System PWS No. 230 on Moloka'i Island. Additional improvements to the Moloka'i Water Systems are now being proposed, and PBR Hawai'i & Associates, Inc. tasked SWCA with providing supplemental biological surveys for seven additional sites.

This report summarizes the findings of the biological resource surveys conducted at the seven proposed sites by SWCA Wildlife Biologist James Breeden and SWCA Botanist Danielle Frohlich on September 14–16, 2015.

2. DESCRIPTION OF THE SURVEY AREA

The survey area is in the Ho'olehua Saddle in central Moloka'i, stretching from western Ho'olehua to Kalama'ula (Figure 1). The survey area is split into seven sites with different water improvement projects occurring at each (see Figure 2 in section 3). More detailed descriptions of the seven sites identified by PBR Hawaii are provided in section 3.

The general topography of the survey area is characterized as relatively flat to gently sloping. The entire area is composed primarily of silty clay soil associations and rough broken and eroded land (Natural Resources Conservation Service 2013).

Historical land use in this area has been almost exclusively agricultural for more than 100 years. Beginning in the mid-1800s, the Ho'olehua Saddle, where much of the project is situated, was used for cattle and sheep ranching. In addition, starting in the 1930s, much of the area was devoted to pineapple cultivation. After pineapple cultivation ceased in the early 1980s, a variety of other agricultural crops have been grown, but in recent decades, much of the land has remained fallow (National Park Service 2000).

The climate in the survey area is relatively constant, with minor periods of diurnal and seasonal variability. The daily average high temperature in the area is 81.4 degrees Fahrenheit (˚F), and the daily average low temperature is 67.6˚F. August is the warmest month with a high of 85.2˚F, and February is the coolest month with a low of 63.2˚F. The average annual rainfall at Moloka'i Airport is 22.72 inches (Giambelluca 2013). August 2015 was unusually rainy, with all rain gauges in Maui County recording above-average rainfall for the month of August. Records for the wettest August were broken at several locations in Maui County, including Moloka'i Airport (National Weather Service 2015).

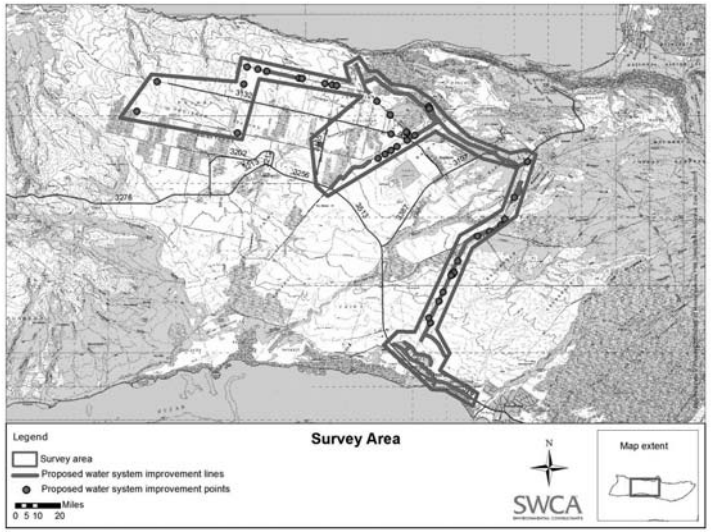

Figure 1. Survey area location.

3. PROJECT DESCRIPTION FOR EACH SITE

The survey area is split into seven sites, with different improvements occurring at each. Each site was surveyed separately. The descriptions of improvements occurring at each site are described below, and each site is shown in Figure 2 at the end of this section.

3.1. Site 1: Well Site Improvements

1-A. 200,000 Gallon Storage Tank: This task includes the installation of 200,000-gallon storage tank and ancillary equipment to connect to the existing system, excavation, and disposal of overburden/construction debris. The new tank will be located adjacent to the existing 100,000-gallon tank on a hillside at the well site. The proposed storage tank is necessary to ensure uninterrupted supply of water to Kalamaʻula residents. This tank will augment, not replace existing storage facilities.

1-B. Above-Ground Fuel Storage Tank (fuel AST): Currently, the water system has an emergency generator to supply electricity for pump operation when grid supplied energy is not available. The generator has fuel storage capacity to operate the generator for a maximum of 24-hours. A fuel AST would augment the existing capacity, increasing operational time of the generator during emergencies. Tasks associated with this action include the installation of a fuel AST at the well site, fuel lines connecting the tank to existing generator system, automation equipment, security fencing, excavation, and disposal of overburden/construction debris.

1-C. Well Site Compound Modifications: The existing well site compound does not have adequate space to accommodate a new 200,000 gallon storage tank, chlorination facility, a fuel AST, and ancillary equipment associated with the solar energy system. Activities associated with this task include the redesign and construction of a roadway system for security and access, excavation, disposal of overburden/construction debris.

1-D. Booster Pump Replacement: The existing booster pumps have reached their estimated useful life. Pump failure is a concern. This task requires the replacement of the existing booster pumps and ancillary equipment. It is anticipated that activities associated with the task will include grading, excavation, disposal of construction debris, demolition debris and overburden, as well as installation of a concrete pad, connection to the supervisory control and data acquisition (SCADA) and electrical systems as well as the existing water system. Reuse of existing site preparations such as a pre-existing concrete pad will be implemented if possible.

1-E. Energy System Modifications: A one-megawatt solar system will be built on approximately seven acres within a 25-acre area at the well site identified for solar production by DHHL. This system would be comprised of approximately 3,500 to 4,000 fixed ground-mounted solar panels (depending on panel efficiency). An inverter bank will convert the DC output of the solar panels into AC that can be used to drive the existing pumps. The system will include an energy storage system to allow for pump operation at night or on cloudy days. The system will be connected to the Maui Electric Company grid for redundancy as well as to the existing diesel backup generators located at the well site. It is anticipated that the system will not export electricity to the Maui Electric Company grid. The existing electrical panels are nearing the end of their expected useful life. They will be replaced to meet existing requirements and modified as necessary to accommodate additional solar requirements.

3.2. Site #2- Kalamaʻula Improvements

2-A. All-Weather Roadway to Kalamaʻula Tank: The access road to the existing 200,000 gallon tank in Kalamaʻula is unpaved and severely eroded, hampering access for maintenance and operations. This task will modify the existing dirt roadway with the installation of a 3,000 linear feet (LF) of all-weather roadway from Hāʻena Street to the reservoir. The new roadway will follow the existing road corridor. Tasks included in this action will include roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

2-B. Kalamaʻula Transmission Main and Lateral Replacements: The conveyance system in Kalamaʻula is not a looping system, occasionally resulting in lower pressure, and water sitting in pipes for a longer than optimal period of time. Additionally, portions of the existing galvanized transmission lines are over 30 years old and have reached the end of their useable life. This task will include the installation of new larger capacity mains and 15 laterals along approximately 5,600 LF in Kalamaʻula. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

2-C. Valves Replacement: One Pressure Relief Valve (PRV), 20 Gate Valves (GV), 9 Air Relief Valves ARV) and associated ancillary equipment in Kalamaʻula have reached the end of their useful life due in part to the harsh environmental conditions. This task will include replacing PRV, GV, and ARV valves and realigning manholes as necessary. This project will also require limited excavation at each valve site and debris disposal.

2-D. Fire Hydrants: Harsh environmental conditions have reduced the life expectancy of most fire hydrants in the coastal are of Kalamaʻula. Replacement of the deteriorated hydrants will improve fire protection capabilities in the areas. This task will include the replacement of approximately 30 fire hydrants.

3.3. Site #3- Kauluwai Tank and Transmission Improvements

3-A. Kauluwai Tank Transmission Main: A section of the 6-inch main transmission line at the existing 1.0 MG Kauluwai tank is approximately 12 feet above the lowest portion of the tank. As a result, the water stored at the base of the tank cannot be utilized. This task would redesign and replace the lower main increasing the useable storage capacity to the tank design capacity. Some excavation and associated disposal of debris is also anticipated. It is anticipated that completion of this tank will reduce water stagnation in the bottom of the tank.

3-B. Kauluwai to Hoʻolehua Transmission Main: The existing main was constructed utilizing a 6-inch transite (asbestos) pipe. Integrity of the existing pipe is a concern. This task requires the replacement of 11,000 LF of piping. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

3.4. Site #4- Hoʻolehua Tank Site Improvements

4-A. Hoʻolehua Tank Improvements: The tanks should be modified to improve safety and automation. This task, 4-A has been subdivided into four subtasks as described below. In addition to the subtasks described, this task will include site preparation, installation of ancillary equipment and disposal of construction debris/overburden.

4-A-1. Automation of Level and Flow Control Valves: Water flow from 1.0 MG reservoir to the two 3.5 MG tanks located in Ho'olehua requires manual operation of a gate valve. Changes in demand require manual adjustments. This sub-task would connect these tanks to the SCADA system and allow for automated adjustments providing more consistent water delivery. The sub-task will also include construction of a new control valve vault, installation and connection of control equipment to existing system and ancillary equipment.

4-A-2. Replacement of Exposed Vertical Piping and Valves: Some of the exposed pipes and valves are corroded. This sub-task would assess and replace corroded ancillary equipment.

4-A-3. Exterior Ladder: The exterior ladder is unsafe. This sub-task would replace or repair the existing ladder and safety railing system to meet OSHA safety requirements.

4-A-4. Tank Repair: There are two 3.5 MG tanks located at Site #4 that were placed in operation approximately 80 years ago. While the tanks are still operational, the concrete is showing signs of wear and is crumbling in some areas. Rebar supports show substantial rusting. This sub-task would repair the tanks.

4-B. All-Weather Roadway to 3.5 MG tanks: The existing access road to the 3.5MG tanks in Ho'olehua is unpaved and located on non-DHHL lands owned by Kualapu'u Ranch and subject to their authorization. This task will develop a new road within DHHL landholdings. The new roadway will extend from Pālā'au Road approximately 5,280 LF to the 3.5 MG tanks. Tasks included in this action will include grubbing, grading, roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

3.5. Site #5- Ho'olehua Transmission and Fire Protection Improvements

5-A. Ho'olehua to Veterans' Cemetery to Lihi Pali Avenue Transmission Main: The existing water main is comprised of a mix of one to three inch pipes of various materials. It does not extend to the Veterans' Cemetery, nor does it provide service to several homesteads along the northern extent of Lihi Pali Avenue. This task would include the replacement of the existing main and extend service to Veterans' cemetery and then on to Lihi Pali Avenue with approximately 11,000 LF of 8-inch main. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

5-B. Fire Protection: The Veterans' Cemetery as well as the homesteads in this section of Ho'olehua do not have fire protection. This task would improve brush fire protection as well as provide fire protection for existing homes in the vicinity through the installation of 17 fire hydrants between Ho'olehua and the Veterans' Cemetery. Tasks included in this action will include excavation, disposal of overburden/construction debris in addition to the installation of fire hydrants.

5-C. Pu'ukapele Transmission Main: The existing 1.25 inch galvanized transmission line is over 30 years old and has reached its useable life. Main breaks interrupt service to the areas. This task includes the replacement of approximately 3,350 LF of transmission main and laterals, and the installation of two new fire hydrants. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals not being replaced.

3.6. Site #6- Ho'olehua Pressure Breaker Tank Facility Improvements

6-A. All-Weather Roadway to the Pressure Breaker Tank: The existing access road to the 19,500 gallon pressure reducer tank in Ho'olehua is unpaved and inaccessible during heavy rains. This task will modify an existing dirt roadway. Approximately 7,920 linear feet (LF) of all-weather roadway will be installed from the intersection of Kūle'a and Mo'omomi Avenue to Farrington Avenue. The new roadway will follow an existing, overgrown road corridor. Tasks included in this action will include grubbing, grading, roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

6-B. Ancillary Equipment Improvements: Several of the equipment located at the Pressure Breaker Tank Facility such as the butterfly valves have reached the end of their useful life. This task will replace equipment in kind. This project may include limited excavation, disposal of demolition/construction debris and replacement of equipment.

3.7. Site #7- Ho'olehua Maintenance Yard Improvements, and Scattered Valve and Hydrant Replacements

7-A. Valve and Hydrant Replacement: Seven Pressure Relief Valve (PRV), seven Gate Valves (GV), five In-line Valves (IV)11 Air Relief Valves (ARV), up to five fire hydrants and associated ancillary equipment in Ho'olehua have reached the end of their useful life. This task will include replacing hydrants, PRV, GV, IV, ARV valves and realigning manholes as necessary. This project will also require limited excavation at each valve site and debris disposal.

7-B. Maintenance Yard Improvements: The Maintenance Building, built in 1969 is not large enough to house necessary equipment and materials needed to maintain the water system. Based on an evaluation of the existing structure, the deterioration of support structures dictated building replacement rather than expansion of the existing. This task will include the demolition of the existing structure, re-use of the existing concrete pad and expanding it to accommodate a 4,800 square foot warehouse type facility. In addition, critical /equipment necessary for emergency maintenance, safety and operations of the water system will be stocked/housed at this facility. At a minimum, the equipment identified will include a forklift, front-end loader and replacement pumps. A fire hydrant and water meter will be installed to provide fire protection for the building and surrounding DHHL lands. An additional concrete pad, up to 2,400 square feet, will be constructed to accommodate outside storage, loading, unloading, and parking. Tasks included in this action will include grubbing, grading, excavation, disposal of demolition, overburden, and construction debris as well as the installation of fire hydrant and ancillary equipment and construction of the building and concrete pad.

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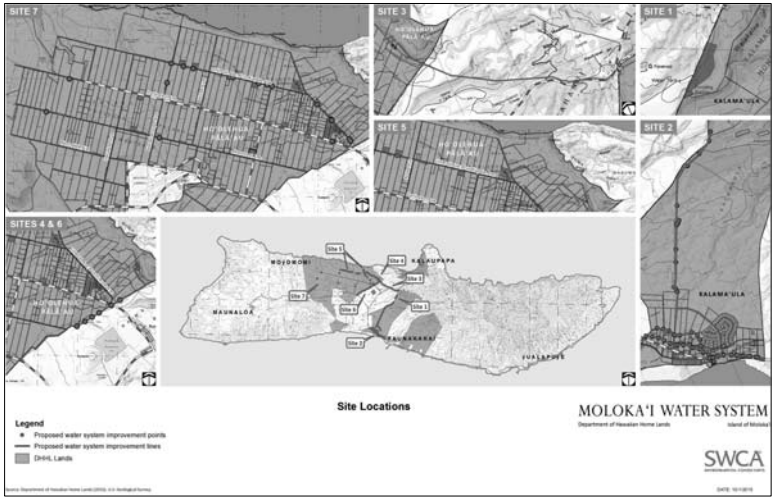

Figure 2. Site locations.

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4. METHODS

SWCA reviewed available scientific and technical literature regarding natural resources in and near the survey area. This literature review encompassed a thorough search of referred scientific journals, technical journals, and reports; relevant environmental assessments and environmental impact statements; relevant government documents; and unpublished data that provide insight into the natural history and ecology of the area. SWCA also reviewed available geospatial data, aerial photographs, and topographic maps of the survey area.

SWCA biologists conducted the supplemental flora and fauna biological surveys in the survey area on September 14–16, 2015.

4.1. Flora

Botanical surveys were conducted to document all vascular plant species and vegetation communities. Relative abundance (e.g., "abundant," "common," "uncommon," and "rare") of each species at each site was also noted. Areas more likely to support native plants (e.g., rocky outcrops and shady areas) were more intensively examined.

Plants recorded during the survey are indicative of the season ("rainy" versus "dry") and the environmental conditions at the time of the survey. It is likely that additional surveys conducted at a different time of the year would result in minor variations in the species and abundances of plants observed.

4.2. Fauna

Pedestrian surveys were conducted to record all observed birds, mammals, reptiles, amphibians, fish, and invertebrate species and any sign (e.g., scat, prints, rubbings, and remains). Variable circular plot (VCP) counts were used specifically for bird surveys and are detailed below. Auditory observations were also included.

Fifteen VCP count stations were used in the survey area, with at least one station immediately adjacent to each site (Figure 3). Eight-minute VCP counts were spaced at intervals large enough to minimize the potential of multiple detections (Reynolds et al. 1980). The location of the observer at each VCP count station was recorded in the field with a hand-held global positioning system (GPS) receiver. The distance of the bird from the observer was recorded. Field observations of birds were made using 10 × 50 binoculars with a 6.5-degree field of vision. An attempt was made not to double count individuals. The relative density of each bird species was estimated by dividing the total number of detections by the number of stations. Ideally, these VCP counts are conducted during peak bird activity periods (0800–1100 and 1600–1900) to maximize the likelihood of detecting birds during the survey. However, due to time restraints based on the need to be escorted by a DHHL representative who was familiar with the sites and the water line alignments, surveys were conducted throughout the day. Birds observed *between* VCP count stations were also noted, but were not included in relative density calculations.

Acoustic surveys for the endangered Hawaiian hoary bat or ʻōpeʻapeʻa (*Lasiurus cinereus semotus*) were not conducted in 2015; however, areas of suitable habitat for foraging and roosting were noted when present.

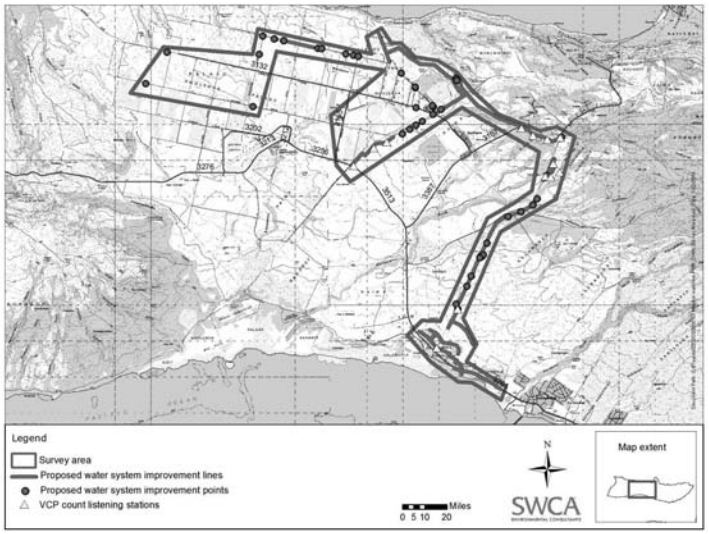

Figure 3. Variable circular plot (VCP) count station locations.

5. RESULTS

5.1. Flora

No state or federally listed threatened, endangered, or candidate plant species, or rare native Hawaiian plant species were observed in the survey area. In all, 126 plant species were recorded during the survey. Of these, eight species are native to the Hawaiian Islands: ʻākia (*Wikstroemia oahuensis* var. *oahuensis*), kou (*Cordia subcordata*), naupaka (*Scaevola taccada*), ʻilima (*Sida fallax*), ʻaʻaliʻi (*Dodonaea viscosa*), hau (*Hibiscus tiliaceus*), milo (*Thespesia populnea*), and ʻuhaloa (*Waltheria indica*). None of these species are considered rare (Wagner et al. 1999). In addition, four Polynesian-introduced species were recorded: kukui (*Aleurites moluccana*), ʻihiʻai (*Oxalis corniculata*), coconut or niu (*Cocos nucifera*), and ti *(Cordyline fruticosa).* Appendix A provides a list of all plant species observed by SWCA as well as the species' relative abundance in each site during the time of the survey.

Three main vegetation types were identified in the survey area: 1) mixed non-native forest, 2) ruderal, and 3) ornamental landscaping.

Mixed Non-Native Forest: The mixed non-native forest vegetation type is characterized by a mix of non-native trees with occasional herbaceous understory. It can be found in Sites 1, 3, 4, 5, and 6. The dominant trees in this vegetation type are Formosan koa (*Acacia confusa*), silk oak (*Grevillea robusta*), Christmas berry (*Schinus terebinthifolius*), eucalyptus (*Eucalyptus* spp.), and ironwood *(Casuarina equisetifolia*). Very little tends to grow in the shade of these species as a result of heavy shading, a thick duff layer, and browsing by deer; however, a vine species—*Neonotonia wightii*—is commonly seen growing in light gaps, as are shrubs and herbaceous plants, the most dominant species being lantana (*Lantana camara*) and Guinea grass (*Urochloa maxima*).

Ruderal: This vegetation type occurs along roadsides, or in heavily disturbed areas such as pastureland and mowed areas (Figure 4). It can be found at all seven sites in the survey area. It is characterized by a mix of non-native grasses and herbaceous species, with scattered non-native trees and shrubs. Grasses commonly seen throughout the sites include Guinea grass, which was common in all sites, and buffelgrass (*Cenchrus ciliaris*), which can be found primarily along roadsides and in pastures at lower elevations. Herbaceous species commonly seen in the ruderal vegetation type are slender amaranth (*Amaranthus viridis*), balloon plant (*Asclepias physocarpa*), maile honohono (*Ageratum conyzoides*), as well as two native species — ʻuhaloa and ʻilima. The most common tree and shrub species in these areas are Formosan koa and silk oak.

Ornamental Landscaping: The vegetation type occurs in Sites 2, 3, and 7 and is characterized by ornamental trees and shrubs planted adjacent to houses and commercial facilities. Ornamental species in the survey area include plumeria (*Plumeria rubra*), croton (*Codiaeum variegatum*), coral hibiscus (*Hibiscus schizopetalus*), pride-of-Barbados *(Caesalpinia pulcherrima)*, manila palm (*Veitchia merrillii*), bougainvillea (*Bougainvillea spectabilis*), coconut, and lemon (*Citrus limon*).

Figure 4. Ruderal vegetation at Site 2, including buffelgrass (*Cenchrus ciliaris*), along disturbed roadway.

5.2. Fauna

No federally listed threatened, endangered, or candidate animal species were found during the pedestrian and VCP count surveys. Although the endangered Hawaiian hoary bat was not directly observed, it may forage or roost in the survey area (see section 5.2.2 for more detail). The survey area does not encompass any designated or proposed critical habitat for threatened or endangered species.

5.2.1. Avifauna

The bird species observed in and near the survey area are species typically found in disturbed lowland areas. In all, 20 bird species were documented, four of which are protected under the Migratory Bird Treaty Act (Table 1). One species of migrant shorebird—the Pacific golden-plover (*Pluvialis fulva*)—was documented and was the only native bird detected during the surveys. All other species observed are introduced.

Table 1. Bird Species Observed in the Survey Area by Site

Status	Common Name	Scientific Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Native	Pacific golden-plover*	*Pluvialis fulva*	×		×	×	×	×	×
Introduced	African silverbill	*Lonchura cantans*				×		×	
	Black frankolin	*Francolinus francolinus*	×	×		×		×	
	Cattle egret*	*Bubulcus ibis*	×	×		×	×	×	

Table 1. Bird Species Observed in the Survey Area by Site

Status	Common Name	Scientific Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
	Chestnut munia	*Lonchura atricapilla*				×		×	
	Chicken	*Gallus gallus*		×		×		×	×
	Common mynah	*Acridotheres tristis*	×	×	×	×	×	×	×
	Gray frankolin	*Francolinus pondicerianus*		×		×		×	
	House finch*	*Carpodacus mexicanus*		×		×		×	×
	House sparrow	*Passer domesticus*		×					
	Japanese bush-warbler	*Cettia diphone*	×						
	Japanese white-eye	*Zosterops japonicus*	×	×	×	×	×	×	×
	Java sparrow	*Lonchura oryzivora*				×		×	
	Northern cardinal*	*Cardinalis cardinalis*				×		×	
	Northern mockingbird*	*Mimus polyglottos*	×	×					
	Red-crested cardinal	*Paroaria coronata*		×					×
	Rock dove	*Columba livia*				×	×	×	×
	Spotted dove	*Streptopelia chinensis*	×	×	×	×	×	×	×
	White-rumped shama	*Copsychus malabaricus*	×		×				
	Zebra dove	*Geopelia striata*	×	×	×	×	×	×	×

* Protected under the Migratory Bird Treaty Act.

The dominant avifauna consists almost entirely of non-native birds (Table 2). The Japanese white-eye (*Zosterops japonicas*) was the most common and abundant bird species detected during the surveys and occurred at all 15 VCP stations. Following the Japanese white-eye in abundance and occurrence at all sites were the zebra dove (*Geopelia striata*), common myna (*Acridotheres tristis*), and spotted dove (*Streptopelia chinensis*). The Pacific golden-plover, the only native species, was the fifth most abundant bird (see Table 2) and occurred at all but one site (see Table 1). The domestic chicken (*Gallus gallus*) was not recorded at the listening stations, although they did occur at some sites.

Table 2. Relative Abundance of Avifauna in the Survey Area

Common Name	Scientific Name	Number of Detections	Number of VCP Stations Occupied	Birds per Station	Rank
Japanese white-eye	*Zosterops japonicus*	46	15	3.07	1
Zebra dove	*Geopelia striata*	27	12	1.80	2

Table 2. Relative Abundance of Avifauna in the Survey Area

Common Name	Scientific Name	Number of Detections	Number of VCP Stations Occupied	Birds per Station	Rank
Common mynah	*Acridotheres tristis*	22	7	1.47	3
Spotted dove	*Streptopelia chinensis*	21	11	1.40	4
Pacific golden-plover	*Pluvialis fulva*	14	4	0.93	5
Black frankolin	*Francolinus francolinus*	13	6	0.87	6
Cattle egret	*Bubulcus ibis*	12	4	0.80	7
House sparrow	*Passer domesticus*	8	3	0.53	8
Rock dove	*Columba livia*	7	2	0.47	9
Chestnut munia	*Lonchura atricapilla*	6	1	0.40	10
House finch	*Carpodacus mexicanus*	6	4	0.40	10
Red-crested cardinal	*Paroaria coronata*	5	3	0.33	11
Gray Frankolin	*Francolinus pondicerianus*	4	3	0.27	12
White-rumped shama	*Copsychus malabaricus*	3	2	0.20	13
Japanese bush-warbler	*Cettia diphone*	2	2	0.13	14
Java sparrow	*Lonchura oryzivora*	2	1	0.13	14
Northern mockingbird	*Mimus polyglottos*	2	2	0.13	14
African silverbill	*Lonchura cantans*	1	1	0.07	15
Northern cardinal	*Cardinalis cardinalis*	1	1	0.07	15

5.2.2. Hawaiian Hoary Bat

The endangered Hawaiian hoary bat is the only native terrestrial mammal species that is still extant within the Hawaiian Islands (U.S. Fish and Wildlife Service [USFWS] 1998). Acoustic surveys for Hawaiian hoary bats were not conducted, but any areas of suitable habitat for roosting and foraging were noted during the pedestrian survey. The Hawaiian hoary bat forages along the edges of cluttered forest habitats and within open spaces such as pastures, windrows, roadways, forest gaps, and above forest canopy (Whitaker and Tomich 1983; Jacobs 1996, 1999; Bonnacorso et al. 2015). Hawaiian hoary bats feed on a variety of native and non-native night-flying insects, including moths, beetles, crickets, mosquitoes, and termites (Whitaker and Tomich 1983).

Hawaiian hoary bats typically roost in dense canopy foliage or in the subcanopy when canopy is sparse, with open access for launching into flight (U.S. Department of Agriculture 2009). Several of the tree species in the survey area— coconut (Site 2), ironwood (Sites 1, 2, 3 and 5), and kiawe (Sites 1 and 2)— could be used by Hawaiian hoary bats for roosting.

5.2.3. Other Mammals

Mammals observed and detected during the survey include axis deer (*Axis axis*), dog (*Canis domesticus*), cow (*Bos taurus*), goat (*Capra aegagrus hircus*), horse (*Equus ferus caballus*), and pig (*Sus scrofa*). The sites where these detections occurred at are listed in Table 3. Mammals that were not detected but could

be expected in the survey area include cat (*Felis catus*), mongoose (*Herpestes javanicus*), rat (*Rattus* spp.), and mouse (*Mus musculus*).

Table 3. Mammals Detected Observed in the Survey Area by Site

Status	Common Name	Scientific Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Introduced	Axis deer	*Axis axix*	×	×			×		
	Dog	*Canis domesticus*		×	×				×
	Cow	*Bos taurus*		×					
	Goat	*Capra aegagrus hircus*			×				
	Horse	*Equus ferus caballus*				×	×	×	
	Pig	*Sus scrofa*	×	×	×				

5.2.4. Reptiles and Amphibians

One copper-tailed skink (*Emoia cyanura*) and one cane toad (*Rhinella marina*) were seen during the survey at Site 2. No other terrestrial reptiles or amphibians were seen during the survey. No terrestrial reptiles or amphibians are native to Hawai'i.

5.2.5. Insects and Other Invertebrates

In all, 14 species of invertebrates were identified during the survey, including two native species of dragonfly that are common in Hawai'i: the green darner (*Anax junius*) and globe skimmer (*Pantala flavescens*) (Table 4). All other invertebrates observed in the survey area are non-native.

Table 4. Invertebrates Observed in the Survey Area by Site

Status	Common Name	Scientific Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Native	Green darner	*Anax junius*		×					×
	Globe skimmer	*Pantala flavescens*	×	×	×		×		
Introduced	African snail	*Achatina fulica*			×				
	Black witch moth	*Ascalapha odorata*			×	×		×	
	Bumble bee	*Xylocopa sonorina*	×	×					
	Butterfly	*Phoebis* sp.		×					×
	Honey bee	*Apis mellifera*		×					
	Housefly	*Musca domestica*	×						
	Monarch butterfly	*Danaus plexippus*			×				
	Mosquito (Aedes)	*Aedes* sp.			×				
	Paper wasp	*Vespidae*							×
	Spider	*Neoscona* sp.			×				

Table 4. Invertebrates Observed in the Survey Area by Site

Status	Common Name	Scientific Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
	Variable ladybeetle	*Coelophora inaequalis*		×					
	Southern house mosquito	*Culex quinquefasciatus*				×		×	

6. DISCUSSION AND RECOMMENDATIONS

6.1. Flora

The vegetation types and species identified during the survey are not considered unique. Over 90% of the plant species recorded are not native to the Hawaiian Islands. The native species present are not threatened or endangered, or rare species. Weedy non-native plant species are dominant throughout all sites. Most of these weedy species are widespread on Moloka'i, and their control is not expected to result in a significant decrease in their number or distribution. Additionally, the few botanical surveys or inventories that have been completed for the area also recorded mainly weedy non-native species (Brown and Caldwell 1993; RMTC 1996; Wilson Okamoto and Associates 2001; Munekio Hiraga Inc. 2010; SWCA 2012). Therefore, the proposed project is not expected to have a significant, adverse impact on botanical resources.

In general, because the water systems improvements will likely involve the movement of materials and construction equipment and installation of new landscaping, SWCA recommends the following invasive species minimization measures.

Decontamination of Off-Island/Out-of-Country Construction Equipment, Vehicles, and Materials

To avoid the unintentional introduction or transport of new terrestrial invasive species to Moloka'i, all construction equipment and vehicles arriving from outside Moloka'i should be washed and inspected before entering the survey area. When possible, raw materials (e.g., gravel, rock, and soil) should be purchased from a local supplier on Moloka'i to avoid introducing non-native species not present on the island. In addition, construction materials should also be washed and/or visually inspected (as appropriate) for excessive debris, plant materials, and invasive or harmful plant and animal species. Inspection and cleaning activities should be conducted at a designated location.

The inspector needs to be a qualified biologist that is able to identify invasive species that are of concern relevant to the point of origin of the equipment, vehicle, or material. Invasive species that should be checked for during inspections can be found here:

- Hawai'i State-listed Noxious Weeds: http://plants.usda.gov/java/noxious?rptType=State&statefips=15
- Moloka'i Invasive Species Committee Priority Target Species: http://www.molokaiisc.org/target-pests/

Revegetation/Landscaping

If portions of the survey area are landscaped as a result of the project, SWCA recommends that native Hawaiian plants be employed for landscaping around each site to the maximum extent possible. Potential

native species that may be appropriate for landscaping at the sites include kou, naio (*Myoporum sandwicense*) and 'a'ali'i. If native plants do not meet landscaping objectives, plants with a low risk of becoming invasive may be substituted. Additional information on selecting appropriate plants for landscaping can be obtained from the following sites:

- http://www.plantpono.org/
- http://nativeplants.hawaii.edu/

6.2. Fauna

The fauna in the survey area is predominantly non-native birds and mammals common throughout Moloka'i and the main Hawaiian Islands.

Potential impacts and recommendation measures for federally and state-listed species, as well as Migratory Bird Treaty Act–protected species are discussed below.

6.2.1. Federally and State-Listed Species

No state- or federally listed species were observed at the sites by SWCA during the survey; however, the endangered Hawaiian hoary bat could forage or roost within the site (see below). The proposed project is not expected to have a significant adverse impact on any state or federally listed candidate, threatened, or endangered species, species of concern, and/ or rare animals.

Hawaiian Hoary Bats

During acoustic surveys conducted by SWCA in 2011, the endangered Hawaiian hoary bat was detected at Site 3 (SWCA 2012). For this reason, coupled with the vegetation present on each site (Table 5), it is likely the Hawaiian hoary bat occurs in the survey area and could occur at each site. The Hawaiian hoary bat may forage above the ruderal vegetation type along the edges of the mixed non-native forest and ornamental landscaping vegetation types and roost in trees such as ironwood and coconut in the mixed non-native forest and ornamental landscaping vegetation types (see section 4.1).

Table 5. Bat Habitat Type Observed in the Survey Area by Site

Bat Habitat Type	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Roost	×	×	×	×	×	×	×
Forage	×	×	×	×	×	×	×

The following measures are recommended to avoid impacts to bats:

- No trees taller than 15 feet (4.6 meters) should be trimmed or removed as a result of this project between June 1 and September 15, when juvenile bats that are not yet capable of flying may be roosting in the trees.
- USFWS discourages the use of barbed wire in fencing because of evidence that barbed wire fences pose an entanglement risk to bats in open areas. Any fences that are erected as part of the project should have barbless top-strand wire to prevent entanglements of the Hawaiian hoary bat on barbed wire. No fences with barbed wire were observed in the survey area; however, if fences are present, the top strand of barbed wire should be removed or replaced with barbless wire.

Implementation of these guidelines, which have been promulgated by the USFWS (1998), is expected to avoid all direct impacts to Hawaiian hoary bats as a result of project implementation.

Hawaiian Goose

The survey area falls within the breeding range of the Hawaiian goose (*Branta sandvicensis*), and although this species was not observed during the survey, it may forage in the ruderal vegetation type and nest in and around the ruderal and ornamental landscaping vegetation types (see section 4.1) of the survey area. USFWS recommends that if a Hawaiian goose is observed near any of the sites during the breeding season (December through April), construction activities should cease and a qualified biologist should survey the area before construction activities are resumed. This survey should be repeated anytime construction work is halted for a period of at least 3 days, because the birds may attempt to nest during this time. Should any Hawaiian goose nest be discovered within a 100-foot radius of proposed construction activities, work in this area should be halted and USFWS should be contacted for further guidance.

Seabirds

Should night-time construction be required within the breeding season of the threatened Newell's shearwater (*Puffinus auricularis newelli*) and the endangered Hawaiian petrel (*Pterodroma phaeopygia sandwichensis*) (March through December), SWCA recommends that measures to reduce light glare are implemented. These two seabird species may be attracted to the light as they traverse between the ocean and their nesting sites in the mountains at night, become disoriented, and either collide with structures in the vicinity, or become grounded and at risk of predation or vehicle collision. Minimization measures include the use of shielded and downward pointed lights. USFWS recommends that they be contacted for further guidance if night-time construction is planned.

6.2.2. Migratory Bird Treaty Act

Most of the native birds of Moloka'i have been extirpated or are extinct. Extant populations continue to decline, and their range has been highly reduced. Leading causes for population declines and extinctions across the Hawaiian Islands include habitat destruction, introduced predators, and avian disease (Ralph and Van Riper 1985). In recent years, only three of the originally nine forest bird species inhabiting Moloka'i have been detected (Reynolds and Snetsinger 2001). Forest birds have been restricted to high-elevation sites; seabirds have been restricted to inaccessible sites at either high-elevation sites and to the offshore islands. The endemic, endangered waterbird species are limited to the scarce wetland habitats on Moloka'i. The Pacific golden-plover was the only native bird species observed during the survey.

SWCA observed five bird species protected under the Migratory Bird Treaty Act during the survey. These species include the cattle egret (*Bubulcus ibis*), House finch (*Haemorhous mexicanus*), northern cardinal (*Cardinalis cardinalis*), northern mockingbird (*Mimus polyglottos*) and the migratory Pacific golden-plover. The Pacific golden-plover is abundant throughout Hawai'i, uses a variety of habitats, including mudflats, lawns, and rooftops (Hawai'i Audubon Society 2005), but does not nest in Hawai'i. The Pacific golden-plover was most common in the ruderal vegetation type (see section 4.1). Construction at the sites may temporarily displace some of these bird species, but long-term impacts are not expected. These birds (likely limited to a few individuals) are expected to find suitable foraging habitat nearby. The temporary displacement of these individuals at each site is not expected to affect individual's survival or the overall species' populations.

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Appendix A

Checklist of Plants Observed during Biological Resource Surveys for the Proposed Department of Hawaiian Home Lands' Moloka'i Water Systems Improvement Project on September 14–16, 2015

Table A1 provides an inventory checklist of plant species observed by SWCA on September 14–16, 2015. The plant names are arranged alphabetically by family and then by species into four groups: dicots, gymnosperms, monocots, and ferns and lycophytes. The taxonomy and nomenclature of the ferns and lycophytes are in accordance with Palmer (2003) and Evenhuis and Eldredge (2011). The taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999), Wagner and Herbst (2003), and Staples and Herbst (2005). Recent name changes are those recorded in Wagner et al. (2012).

Status:
E = endemic (native only to the Hawaiian Islands).
I = indigenous (native to the Hawaiian Islands and elsewhere).
P = Polynesian (introduced by Polynesians).
X = introduced/ alien (plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact [Cook's arrival in the islands in 1778]).
* = cultivated

Abundance:
A = Abundant (forming a major part of the vegetation within the survey area).
C = Common (widely scattered throughout the area or locally abundant within a portion of it).
U = Uncommon (scattered sparsely throughout the area or occurring in a few small patches).
R = Rare (only a few isolated individuals within the survey area).

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Taxon Name and Authorship	Status	Common Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
DICOTS									
Acanthaceae									
Dicliptera chinensis (L.) Juss.	X				R				
Amaranthaceae									
Amaranthus spinosus L.	X	spiny amaranth, pakai kukū		C	U		C	C	U
Amaranthus viridis L.	X	slender amaranth, pakai, ʻāheahea, pākaikai, pakapakai (Niʻihau)		C	C				U
Anacardiaceae									
Schinus terebinthifolius Raddi	X	Christmas berry, wilelaiki, nani o Hilo (Molokaʻi)	U		C		C	C	
Apocynaceae									
Plumeria rubra L.	X*	plumeria		R					
Araliaceae									

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Taxon Name and Authorship	Status	Common Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Polyscias guilfoylei (W.Bull) L.H.Bailey	X*	geranium aralia		R					
Asclepiadaceae									
Asclepias physocarpa (E.Mey.) Schltr.	X	balloon plant	C	C	U		C		
Calotropis gigantea (L.) W.T.Aiton	X			R					
Asteraceae									
Ageratum conyzoides L.	X	maile hohono, maile honohono, maile kula	C	C	C		C	C	
Bidens alba var. radiata (Sch.Bip.) Ballard ex Melchert	X	Spanish needle, beggartick	U		U			U	
Calyptocarpus vialis Less.	X		U		U		U	U	U
Cirsium vulgare (Savi) Ten.	X	bull thistle, pua kala			R				
Conyza bonariensis (L.) Cronquist	X	hairy horseweed, ilioha, 'awi'awi, pua mana, lani wela (Ni'ihau)	U	U	U	C		C	U
Conyza canadensis var. canadensis	X	horseweed, lani wela, ilioha, 'awi'awi, pua mana	U						
Emilia fosbergii Nicolson	X	pualele (Ni'ihau)	U	U	U			U	U
Hypochoeris radicata L.	X	hairy cat's-ear, gosmore	R						
Pluchea carolinensis (Jacq.) G.Don	X	sourbush, marsh fleabane		C					
Pluchea indica (L.) Less.	X	Indian fleabane, Indian pluchea, marsh fleabane			R				
Sonchus oleraceus L.	X	sow thistle, pualele			R				
Synedrella nodiflora (L.) Gaertn.	X	nodeweed			U				
Verbesina encelioides (Cav.) Benth. & Hook.	X	golden crown-beard	C	C				C	
Bataceae									
Batis maritima L.	X	pickleweed, 'ākulikuli kai		C					
Boraginaceae									
Cordia subcordata Lam.	I	kou		R					
Brassicaceae									

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Lepidium oblongum Small	X	pepperwort, peppergrass		U				U	U
Campanulaceae									
Wahlenbergia gracilis (G.Forst.) A.DC.	X				R				
Capparaceae									
Cleome gynandra L.	X	wild spider flower, spider wisp, honohina, 'ili'ohu		R					
Casuarinaceae									
Casuarina equisetifolia L.	X	common ironwood, paina	A	C	C		C		
Chenopodiaceae									
Dysphania carinata (R.Br.) Mosyakin & Clemants	X	goosefoot, pigweed, lamb's quarters			U				
Convolvulaceae									
Ipomoea obscura (L.) Ker Gawl.	X	morning glory	U		U			U	
Merremia aegyptia (L.) Urb.	X	hairy merremia, koali kua hulu, kuahulu		C				C	C
Cucurbitaceae									
Sechium edule (Jacq.) Sw.	X	pipinella, chayote, choko		R					
Euphorbiaceae									
Aleurites moluccana (L.) Willd.	P	kukui, kuikui, candlenut	R		U		U		
Codiaeum variegatum (L.) Rumph. ex A.Juss.	X*	croton			R				
Euphorbia hirta L.	X	hairy spurge, garden spurge, koko kahiki	U	U	C			U	U
Euphorbia hypericifolia L.	X	graceful spurge		U					
Euphorbia lactea Haw.	X			R			R		
Ricinus communis L.	X	castor bean, pā'aila, ka'apehā, kamākou, kolī, lā'au 'aila	U	U				C	U
Fabaceae									
Acacia confusa Merr.	X	Formosa koa	A	A	A	A	C	C	

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Alysicarpus vaginalis (L.) DC.	X	alyce clover	U	U	U		U	C	C
Bauhinia monandra Kurz	X			R					
Caesalpinia pulcherrima (L.) Sw.	X*	pride-of-Barbados		R					
Chamaecrista nictitans subsp. patellaria var. glabrata (Vogel) H.S.Irwin & Barneby	X	partridge pea, laukī	U		U				C
Crotalaria pallida Aiton	X	smooth rattlepod, pikakani, kolomona (Ni'ihau)		C				C	
Desmodium incanum DC.	X	Spanish clover, ka'imi	C		U				U
Indigofera spicata Forssk.	X	creeping indigo	U						
Indigofera suffruticosa Mill.	X	indigo, 'inikō, 'inikoa, kolū	U	U	C				
Leucaena leucocephala (Lam.) de Wit	X	koa haole, ēkoa, lilikoa	U	U	U	U	U	U	U
Macroptilium atropurpureum (DC.) Urb.	X				U			U	
Neonotonia wightii (Wight & Arn.) Lackey	X		C	C	C		C	C	U
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	X	algaroba, mesquite, kiawe	U	C					
Samanea saman (Jacq.) Merr.	X	monkeypod, rain tree, 'ohai, pū 'ohai		R					
Senna pendula var. advena (Vogel) H.S.Irwin & Barneby	X		C	U	U				
Stylosanthes scabra Vogel	X		U						
Vachellia farnesiana (L.) Wight & Arn.	X	klu, aroma, kolū							
Goodeniaceae									
Scaevola taccada (Gaertn.) Roxb.	I*	naupaka kahakai, huahekili, naupaka kai, auaka (Ni'ihau)		U					
Lamiaceae									
Leonotis nepetifolia (L.) R.Br.	X	lion's ear		U					
Lauraceae									
Persea americana Mill.	X	avocado, alligator pear		R					
Malvaceae									

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Abutilon grandifolium (Willd.) Sweet	X	hairy abutilon, ma'o		U					R
Hibiscus tiliaceus L.	I?	hau		C					
Hibiscus schizopetalus (Dyer) Hook.f.	X*	coral hibiscus		R					
Malva parviflora L.	X	cheese weed		C				C	U
Malvastrum coromandelianum subsp. coromandelianum	X	false mallow		U				C	U
Sida fallax Walp.	I	'ilima		A	U			C	U
Sida spinosa L.	X	prickly sida	U				U	U	U
Thespesia populnea (L.) Sol. ex Corrêa	I?	milo, portia tree		U					
Moraceae									
Ficus macrophylla Desf. ex Pers.	X				R				
Myrtaceae									
Corymbia citriodora (Hook.) K.D.Hill & L.A.S.Johnson	X	lemon-scented gum			C		U		
Eucalyptus robusta Sm.	X	swamp mahogany	U		U		U	U	
Psidium guajava L.	X	common guava, kuawa, kuawa ke'oke'o, kuawa lemi, kuawa momona, puawa	C	U	U		U		R
Nyctaginaceae									
Boerhavia coccinea Mill.	X			U				C	C
Bougainvillea spectabilis Willd.	X*	bougainvillea		U					
Oxalidaceae									
Oxalis corniculata L.	P?	yellow wood sorrel, 'ihi 'ai, 'ihi 'awa, 'ihi maka 'ula, 'ihi mākole	U		U				U
Passifloraceae									
Passiflora edulis Sims	X	passion fruit, purple granadilla, purple water lemon, liliko'i		R	R				
Passiflora laurifolia L.	X	yellow granadilla, yellow water lemon, bell apple			R		R		

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Taxon Name and Authorship	Status	Common Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Plantaginaceae									
Plantago lanceolata L.	X	narrow-leaved plantain, English plantain, buckhorn	U		U				U
Polygonaceae									
Antigonon leptopus Hook. & Arn.	X	Mexican creeper, mountain rose, confederate vine, chain-of-love, hearts-on-a-chain		R					
Portulacaceae									
Portulaca oleracea L.	X	pigweed, 'ākulikuli kula, 'ākulikuli lau li'i, 'ihi		U	U		U	U	
Proteaceae									
Grevillea banksii R.Br.	X	kāhili flower, ha'ikū, kāhili, 'oka pua 'ula'ula (Ni'ihau)	U						
Grevillea robusta A.Cunn. ex R.Br.	X	silk oak, silver oak, he oak, 'oka kilika, ha'ikū ke'oke'o	A	C	C				
Rhizophoraceae									
Rhizophora mangle L.	X	American mangrove, red mangrove		C					
Rubiaceae									
Richardia scabra L.	X		U		U				
Rutaceae									
Citrus limon (L.) Osbeck	X*	lemon, Meyer lemon							R
Sapindaceae									
Cardiospermum halicacabum L.	X	heartseed, balloon vine, pōniu, haleakai'a (Ni'ihau), 'inalua, pōhuehue uka	U						
Dodonaea viscosa Jacq.	I	'a'ali'i, 'a'ali'i kū makani, 'a'ali'i kū ma kua, kūmakani	R						
Solanaceae									

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Solanum linnaeanum Hepper & P.-M.L.Jaeger	X	apple of Sodom, yellow-fruited pōpolo, thorny pōpolo, pōpolo kīkānia		R	R				R
Solanum seaforthianum Andrews	X				R				
Sterculiaceae									
Waltheria indica L.	I?	'uhaloa, 'ala'ala pū loa, hala 'uhaloa, hi'aloa, kanakaloa	C	C				C	C
Thymelaeaceae									
Wikstroemia oahuensis var. oahuensis	E	'ākia, kauhi		R					
Verbenaceae									
Citharexylum spinosum L.	X	fiddlewood			U				
Lantana camara L.	X	lākana, lā'au kalakala, lanakana (Ni'ihau), mikinolia hihiu, mikinolia hohono, mikinolia kukū	A	C	C	U	U		R
Stachytarpheta cayennensis (Rich.) Vahl	X	ōwī, oī	U	U	U		U		U
Verbena litoralis Kunth	X	vervain, ōwī, oī, ha'uoi (Ni'ihau), ha'uōwī (Ni'ihau)			R				
Zygophyllaceae									
Tribulus terrestris L.	X	puncture vine, goat head		R				R	R
GYMNOSPERMS									
Araucariaceae									
Araucaria columnaris (G.Forst.) Hook.	X			U					
MONOCOTS									
Agavaceae									
Agave sisalana Perrine	X	sisal, sisal hemp, century plant, malina	R		U			C	U
Cordyline fruticosa (L.) A.Chev.	P*	kī, ti		R					R
Arecaceae									

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Adonidia merrillii (Becc.) Becc..	X*	Manila palm		R					
Cocos nucifera L.	P	niu, ololani, coconut		R					
Dypsis lutescens (H.Wendl.) Beentje & J.Dransf.	X*	areca palm		R					
Roystonea regia (Kunth) O.F.Cook	X			R					
Bromeliaceae									
Aechmea blanchetiana (Baker) L.B.Sm.	X*				R				
Commelinaceae									
Commelina diffusa Burm.f.	X	honohono, honohono wai, mākolokolo, dayflower			R				
Tradescantia spathacea Sw.	X				U				
Cyperaceae									
Cyperus gracilis R.Br.	X	McCoy grass, mau'u hunehune			U		U		
Cyperus rotundus L.	X	nut grass, kili'o'opu, mau'u mokae			U			U	
Liliaceae									
Asparagus plumosus Baker	X				R				
Poaceae									
Andropogon virginicus var. virginicus	X	broomsedge, yellow bluestem	U						
Axonopus compressus (Sw.) P.Beauv.	X		C	C			C		
Bothriochloa pertusa (L.) A.Camus	X	pitted beardgrass	U		U	U			C
Cenchrus ciliaris L.	X	buffelgrass	U	A				A	A
Chloris barbata Sw.	X	swollen fingergrass, mau'u lei	U	U	U			U	C
Cynodon dactylon (L.) Pers.	X	Bermuda grass, mānienie, mānienie haole	U		U				
Digitaria ciliaris (Retz.) Koeler	X	Henry's crabgrass, kūkaepua'a	U						U
Digitaria insularis (L.) Mez ex Ekman	X	sourgrass	U						
Eragrostis amabilis (L.) Wight & Arn.	X	lovegrass		U			U	U	

Appendix A. Checklist of Plants Observed during Biological Resource Surveys for the Proposed Department of Hawaiian Home Lands' Moloka'i Water Systems Improvement Project on September 14–16, 2015

Table A1. Checklist of Plants Observed during Biological Resource Surveys for the Proposed Department of Hawaiian Home Lands' Moloka'i Water Systems Improvement Project on September 14–16, 2015

Taxon Name and Authorship	Status	Common Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Melinis minutiflora P.Beauv.	X	molasses grass	C		U				
Melinis repens (Willd.) Zizka	X	Natal redtop, Natal grass	C		U			U	
Paspalum conjugatum P.J.Bergius	X	Hilo grass, mau'u Hilo, sour paspalum		U					C
Paspalum vaginatum Sw.	X	seashore paspalum	C						C
Sporobolus pyramidatus (Lam.) Hitchc.	X		U		U				
Urochloa maxima (Jacq.) R.D.Webster	X	Guinea grass	A	C	A	C	C	A	A
Zingiberaceae									
Alpinia zerumbet (Pers.) B.L.Burtt & R.M.Sm.	X				U				
FERNS AND LYCOPHYTES									
Polypodiaceae									
Phlebodium aureum (L.) J.Sm.	X	laua'e haole, rabbit's-foot fern, golden polypody			R				
Phymatosorus grossus (Langsd. & Fisch.) Brownlie	X	laua'e, maile-scented fern			U				
Phymatosorus scolopendria (Burm.f.) Pic.Serm.	X				U				
Pteridaceae									
Pityrogramma austroamericana Domin	X	goldfern, goldback fern			R				

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Appendix D

ARCHAEOLOGICAL INVENTORY SURVEY

Malia Cox

From: Davis, Morgan E <morgan.e.davis@hawaii.gov>
Sent: Friday, April 01, 2016 10:10 AM
To: Hilo, Regina; Malia Cox; James (mcintosh@pacificlegacy.com); Paul Cleghorn (cleghorn@pacificlegacy.com); Catie Cullison; Greg Nakai
Cc: Lebo, Susan A; Cairel, Gigi O
Subject: RE: Ho'olehua Water System DEA letter

Mahalo; I have the AIS under review.

Aloha,

Morgan

Morgan E. Davis, M.A.
Lead Archaeologist, Maui Section
State Historic Preservation Division
130 Mahalani Street
Wailuku, Hawaii 96793
(808) 243-4641 (direct)
(808) 243-1285 (main)

To submit a new item for review: DLNR.Intake.SHPD@hawaii.gov

From: Hilo, Regina
Sent: Friday, April 01, 2016 10:06 AM
To: Malia Cox <mcox@pbrhawaii.com>; James (mcintosh@pacificlegacy.com) <mcintosh@pacificlegacy.com>; Paul Cleghorn (cleghorn@pacificlegacy.com) <cleghorn@pacificlegacy.com>; Catie Cullison <ccullison@pbrhawaii.com>; Greg Nakai <gnakai@pbrhawaii.com>
Cc: Davis, Morgan E <morgan.e.davis@hawaii.gov>; Lebo, Susan A <susan.a.lebo@hawaii.gov>; Cairel, Gigi O <gigi.o.cairel@hawaii.gov>
Subject: Re: Ho'olehua Water System DEA letter

Aloha hou,

We have a meeting on April 20th for the Molokai Burial Council; I'll email the council members to see if they have any concerns.

Ke aloha,
RKH

Sent from my iPhone

On Apr 1, 2016, at 3:55 PM, Malia Cox <mcox@pbrhawaii.com> wrote:

> Aloha e Kākou,

We are in the process of finalizing the State 343 EA and wanted to follow up with you regarding the AIS Pacific Legacy submitted to SHPD on January 27, 2016. The 45-day comment period for the AIS ended on March 12th. The 30-day comment period for the draft EA ended on March 24rd. If you prepared any comments can you please send them via email to me and Paul Cleghorn at Pacific Legacy.

Mahalo,

Malia Cox, LEED® AP BD+C, REM
Project Manager

PBR HAWAII
Land Planning | Landscape Architecture
Environmental Planning | Land Use Entitlements

1001 Bishop Street Suite 650
Honolulu, HI 96813
Phone: 808-521-5631
Fax: 808-523-1402
Email: mcox@pbrhawaii.com
www.pbrhawaii.com

From: Hilo, Regina [mailto:regina.hilo@hawaii.gov]
Sent: Thursday, March 17, 2016 9:06 AM
To: Greg Nakai <gnakai@pbrhawaii.com>
Cc: Malia Cox <mcox@pbrhawaii.com>
Subject: RE: Ho'olehua Water System DEA letter

Aloha e Greg,

Mahalo nui, and my apologies for the inconvenience.

Ke aloha,
RKH

From: Greg Nakai [mailto:gnakai@pbrhawaii.com]
Sent: Thursday, March 17, 2016 9:03 AM
To: Hilo, Regina
Cc: Malia Cox
Subject: Ho'olehua Water System DEA letter

Aloha Regina,

Thank you for your call this morning. As requested, here is the PDF of the Ho'olehua Water System Draft EA letter (dated Feb. 17) that had been sent to you at the State Historic Preservation Division.

Please let me know if you have any difficulties downloading or viewing the PDF.

Mahalo,

Greg Nakai
Planner

PBR HAWAII
Land Planning | Landscape Architecture
Environmental Planning | Land Use Entitlements
1001 Bishop Street Suite 650
Honolulu, HI 96813
Phone: 808-521-5631
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www.pbrhawaii.com

<DATE-STA.PDF>

<email chain with maui shpd archaeologist response..pdf>

Pacific Legacy

Historic Preservation

DRAFT

ARCHAEOLOGICAL INVENTORY SURVEY FOR THE PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS WATER SYSTEM ON MOLOKAʻI LANDS IN PĀLĀʻAU, HOʻOLEHUA, NĀʻIWA, KAHANUI, AND KALAMAʻULA AHUPUAʻA

[TMK (2) 5-2-002:999; (2) 5-2-005:999; (2) 5-2-006:999; (2) 5-2-007:029, 030, 035, 039, 040, 055, 076-080, 082-085, 090, 999; (2) 5-2-008:001, 002, 004-006, 029, 043, 044, 046, 079, 084, 086, 091, 099, 102, 122, 123, 999; (2) 5-2-009:012, 016, 018, 026, 999; (2) 5-2-010:001-004, 007; (2) 5-2-012:034, 035, 999; (2) 5-2-013:010, 020, 021; (2) 5-2-021:999; (2) 5-2-023:009; (2) 5-2-024:999; (2) 5-2-025: 999; (2) 5-2-032:068, 070; and (2) 5-2-033:047-053, 058, 061]

Pacific Legacy: Exploring the past, informing the present, enriching the future.

CULTURAL RESOURCES CONSULTANTS

Hawai'i Offices:
Kailua, O'ahu
Hilo, Hawai'i

California Offices:
Business Office
Bay Area
Sierra/Central Valley

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DRAFT

ARCHAEOLOGICAL INVENTORY SURVEY FOR THE PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS WATER SYSTEM ON MOLOKAʻI LANDS IN PĀLĀʻAU, HOʻOLEHUA, NĀʻIWA, KAHANUI, AND KALAMAʻULA AHUPUAʻA

[TMK (2) 5-2-002:999; (2) 5-2-005:999; (2) 5-2-006:999; (2) 5-2-007:029, 030, 035, 039, 040, 055, 076-080, 082-085, 090, 999; (2) 5-2-008:001, 002, 004-006, 029, 043, 044, 046, 079, 084, 086, 091, 099, 102, 122, 123, 999; (2) 5-2-009:012, 016, 018, 026, 999; (2) 5-2-010:001-004, 007; (2) 5-2-012:034, 035, 999; (2) 5-2-013:010, 020, 021; (2) 5-2-021:999; (2) 5-2-023:009; (2) 5-2-024:999; (2) 5-2-025:999; (2) 5-2-032:068, 070; and (2) 5-2-033:047-053, 058, 061]

Prepared by:
James D. McIntosh, B.A.
Caleb C. Fechner, B.A.
and
Paul L. Cleghorn, Ph.D.

Pacific Legacy, Inc.
30 Aulike Street, Suite 301
Kailua, HI 96734
(808) 263-4800

Prepared for:
PBR Hawaiʻi
1001 Bishop Street, Suite 650
Honolulu, HI 96813

January 2016

ABSTRACT

Pacific Legacy, Inc., under contract to PBR Hawaiʻi, conducted an archaeological inventory survey (AIS) of various Department of Hawaiian Homes Lands (DHHL) properties [TMK (2) 5-2-002:999; (2) 5-2-005:999; (2) 5-2-006:999; (2) 5-2-007:029, 030, 035, 039, 040, 055, 076-080, 082-085, 090, 999; (2) 5-2-008:001, 002, 004-006, 029, 043, 044, 046, 079, 084, 086, 091, 099, 102, 122, 123, 999; (2) 5-2-009:012, 016, 018, 026, 999; (2) 5-2-010:001-004, 007; (2) 5-2-012:034, 035, 999; (2) 5-2 013:010, 020, 021; (2) 5-2-021:999; (2) 5-2-023:009; (2) 5-2-024:999; (2) 5-2-025: 999; (2) 5-2-032:068, 070; and (2) 5-2-033:047-053, 058, 061] in the *ahupuaʻa* of Pālāʻau, Hoʻolehua, Nāʻiwa, Kahanui, and Kalamaʻula in the central portion of the Island of Molokaʻi. To support this project, DHHL is receiving funds from the U.S. Department of Agriculture (USDA). Because of this federal funding, this project is considered an "undertaking" under 36 CFR 800. As such it must comply with the different regulations associated with the National Historic Preservation Act of 1966 (as amended), especially 36 CFR 60.

This archaeological inventory survey is meant to identify areas or potential areas of concern for the DHHL for the proposed Water System Improvements, which will include actions to improve reliability and functionality of water delivery to the 2,400 users connected to the Hoʻolehua Water System—PWS No. 230 on Molokaʻi Island.

A total of 14 new archaeological sites (Site 2516 through 2521 and Site 2565 through 2572) and three previously documented sites (Site 800 through 802) were identified within the project's area of potential effect (APE). One isolated find of a sandstone *ʻulu maika* stone was also identified and collected. These sites included nine traditional Hawaiian pre-Contact or early post-Contact sites, seven historic sites, and one military site.

In addition, a total of four of the newly identified archaeological sites (Site 2516, 2519, 2565, 2572) were tested in order to provide additional information on the possible age, chronology, and function of the sites.

All of the sites recorded in the APE (n=17), with the exception of Site 2517 (a probable historic wind break or hunting blind) are assessed as significant under Criterion (d). These 16 sites have either yielded or have the potential to yield information important to Hawaiʻi's history. In addition, Site 801, a complex of cairns interpreted as possible burial facilities is also assessed as significant under Criterion (e) because of its cultural importance.

No further work is recommended for 15 of the 17 recorded sites. Preservation and monitoring are recommended for Site 2572, the large lithic scatter that was probably associated with stone adze manufacture. Preservation is also recommended for Site 801, the cluster of stone cairns that were interpreted as possible human burial facilities.

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Frontispiece: Recording Site 2568 along Project Area 2 located in Kalamaʻula (view to south).

1.0 INTRODUCTION

Pacific Legacy, Inc., under contract to PBR Hawai'i, conducted an archaeological inventory survey (AIS) of various Department of Hawaiian Home Lands (DHHL) properties [TMK (2) 5-2-002:999; (2) 5-2-005:999; (2) 5-2-006:999; (2) 5-2-007:029, 030, 035, 039, 040, 055, 076-080, 082-085, 090, 999; (2) 5-2-008:001, 002, 004-006, 029, 043, 044, 046, 079, 084, 086, 091, 099, 102, 122, 123, 999; (2) 5-2-009:012, 016, 018, 026, 999; (2) 5-2-010:001-004, 007; (2) 5-2-012:034, 035, 999; (2) 5-2 013:010, 020, 021; (2) 5-2-021:999; (2) 5-2-023:009; (2) 5-2-024:999; (2) 5-2-025: 999; (2) 5-2-032:068, 070; and (2) 5-2-033:047-053, 058, 061], on the Island of Moloka'i. These properties are located in the *ahupua'a* (traditional Hawaiian land divisions that typically extended from the mountains to the sea) of Pālā'au, Ho'olehua, Nā'iwa, Kahanui, and Kalama'ula in central Moloka'i. To support this project, DHHL is receiving funds from the U.S. Department of Agriculture (USDA). Because of this federal funding, this project is considered an "undertaking" under 36 CFR 800. As such it must comply with the different regulations associated with the National Historic Preservation Act of 1966 (as amended), especially 36 CFR 60.

Fieldwork for this project was conducted during four separate phases: between October 24-26, 2011, between November 13-16, 2012, between September 21-30, 2015, and between November 9-13, 2015. The four separate phases were necessary because of minor changes in the infrastructure routes and improvements.

The proposed Moloka'i Water System Improvements project will include actions to improve reliability and functionality of water delivery to the 2,400 users connected to the Ho'olehua Water System—PWS No. 230 on Moloka'i Island. Proposed actions to the water system will occur at seven discontiguous areas located in portions of the *ahupua'a* of Pālā'au, Ho'olehua, Nā'iwa, Kahanui, and Kalama'ula in central Moloka'i (Figure 1 and Figure 2). Presented below is a brief description of the project Area of Potential Effect (APE) for the proposed Water System Improvements project.

Project Area 1 - Well Site Improvements

1-A 200,000 Gallon Storage Tank: This task includes the installation of 200,000-gallon storage tank and ancillary equipment to connect to the existing system, excavation, and disposal of overburden/construction debris. The new tank will be located adjacent to the existing 100,000-gallon tank on a hillside at the well site. The proposed storage tank is necessary to ensure uninterrupted supply of water to Kalama'ula residents. This tank will augment, not replace existing storage facilities.

1-B Above-Ground Fuel Storage Tank (fuel AST): Currently, the water system has an emergency generator to supply electricity for pump operation when grid supplied energy is not available. The generator has fuel storage capacity to operate the generator for a maximum of 24-hours. A fuel AST would augment the existing capacity, increasing operational time of the generator during emergencies. Tasks associated with this action include the installation of a fuel AST at the well site, fuel lines connecting the tank to existing generator system, automation equipment, security fencing, excavation, and disposal of overburden/construction debris.

1-C Well Site Compound Modifications: The existing well site compound does not have adequate space to accommodate a new 200,000 gallon storage tank, chlorination facility, a fuel AST, and ancillary equipment associated with the solar energy system. Activities associated with this task include the redesign and construction of a roadway system for security and access, excavation, disposal of overburden/construction debris.

1-D Booster Pump Replacement: The existing booster pumps have reached their estimated useful life. Pump failure is a concern. This task requires the replacement of the existing booster pumps and ancillary equipment. It is anticipated that activities associated with the task will include grading, excavation, disposal of construction debris, demolition debris and overburden, as well as installation of a concrete pad, connection to the supervisory control and data acquisition (SCADA) and electrical systems as well as the existing water system. Reuse of existing site preparations such as a pre-existing concrete pad will be implemented if possible.

1-E Energy System Modifications: A one-megawatt solar system will be built on approximately seven acres within a 25-acre area at the well site identified for solar production by DHHL. This system would be comprised of approximately 3,500 to 4,000 fixed ground-mounted solar panels (depending on panel efficiency). An inverter bank will convert the DC output of the solar panels into AC that can be used to drive the existing pumps. The system will include an energy storage system to allow for pump operation at night or on cloudy days. The system will be connected to the Maui Electric Company grid for redundancy as well as to the existing diesel backup generators located at the well site. It is anticipated that the system will not export electricity to the Maui Electric Company grid. The existing electrical panels are nearing the end of their expected useful life. They will be replaced to meet existing requirements and modified as necessary to accommodate additional solar requirements.

Project Area 2 - Kalama'ula Improvements

2-A All-Weather Roadway to Kalama'ula Tank: The access road to the existing 200,000 gallon tank in Kalama'ula is unpaved and severely eroded, hampering access for maintenance and operations. This task will modify the existing dirt roadway with the installation of a 3,000 linear feet (LF) of all-weather roadway from Hā'ena Street to the reservoir. The new roadway will follow the existing road corridor. Tasks included in this action will include roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

2-B Kalama'ula Transmission Main and Lateral Replacements: The conveyance system in Kalama'ula is not a looping system, occasionally resulting in lower pressure, and water sitting in pipes for a longer than optimal period of time. Additionally, portions of the existing galvanized transmission lines are over 30 years old and have reached the end of their useable life. This task will include the installation of new larger capacity mains and 15 laterals along approximately 5,600 LF in Kalama'ula. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

2-C Valves Replacement: One Pressure Relief Valve (PRV), 20 Gate Valves (GV), 9 Air Relief Valves ARV) and associated ancillary equipment in Kalama'ula have reached the end of their useful life due in part to the harsh environmental conditions. This task will include replacing PRV, GV, and ARV valves and realigning manholes as necessary. This project will also require limited excavation at each valve site and debris disposal.

2-D Fire Hydrants: Harsh environmental conditions have reduced the life expectancy of most fire hydrants in the coastal are of Kalama'ula. Replacement of the deteriorated hydrants will improve fire protection capabilities in the areas. This task will include the replacement of approximately 30 fire hydrants.

Project Area 3 - Kauluwai Tank and Transmission Improvements

3-A Kauluwai Tank Transmission Main: A section of the 6-inch main transmission line at the existing 1.0 MG Kauluwai tank is approximately 12 feet above the lowest portion of the tank. As a result, the water stored at the base of the tank cannot be utilized. This task would redesign and replace the lower main increasing the useable storage capacity to the tank design capacity. Some excavation and associated disposal of debris is also anticipated. It is anticipated that completion of this tank will reduce water stagnation in the bottom of the tank.

3-B Kauluwai to Ho'olehua Transmission Main: The existing main was constructed utilizing a 6-inch transite (asbestos) pipe. Integrity of the existing pipe is a concern. This task requires the replacement of 11,000 LF of piping. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

Project Area 4 – Ho'olehua Tank Site Improvements

4-A Ho'olehua Tank Improvements: The tanks should be modified to improve safety and automation. This task, 4-A has been subdivided into four subtasks as described below. In addition to the subtasks described, this task will include site preparation, installation of ancillary equipment and disposal of construction debris/overburden.

4-A-1 Automation of Level and Flow Control Valves: Water flow from 1.0 MG reservoir to the two 3.5 MG tanks located in Ho'olehua requires manual operation of a gate valve. Changes in demand require manual adjustments. This sub-task would connect these tanks to the SCADA system and allow for automated adjustments providing more consistent water delivery. The sub-task will also include construction of a new control valve vault, installation and connection of control equipment to existing system and ancillary equipment.

4-A-2 Replacement of Exposed Vertical Piping and Valves: Some of the exposed pipes and valves are corroded. This sub-task would assess and replace corroded ancillary equipment.

4-A-3 Exterior Ladder: The exterior ladder is unsafe. This sub-task would replace or repair the existing ladder and safety railing system to meet OSHA safety requirements.

4-A-4 Tank Repair: There are two 3.5 MG tanks located at Site #4 that were placed in operation approximately 80 years ago. While the tanks are still operational, the concrete is showing signs of wear and is crumbling in some areas. Rebar supports show substantial rusting. This sub-task would repair the tanks.

4-B All-Weather Roadway to 3.5 MG tanks: The existing access road to the 3.5MG tanks in Ho'olehua is unpaved and located on non-DHHL lands owned by Kualapu'u Ranch and subject to their authorization. This task will develop a new road within DHHL landholdings. The new roadway will extend from Pālā'au Road approximately 5,280 LF to the 3.5 MG tanks. Tasks included in this action will include grubbing, grading, roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

Project Area 5 – Ho'olehua Transmission and Fire Protection Improvements

5-A Ho'olehua to Veterans' Cemetery to Lihi Pali Avenue Transmission Main: The existing water main is comprised of a mix of one to three inch pipes of various materials. It does not extend to the Veterans' Cemetery, nor does it provide service to several homesteads along the northern extent of Lihi Pali Avenue. This task would include the replacement of the existing main and extend service to Veterans' cemetery and then on to Lihi Pali Avenue with approximately 11,000 LF of 8-inch main. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

5-B Fire Protection: The Veterans' Cemetery as well as the homesteads in this section of Ho'olehua do not have fire protection. This task would improve brush fire protection as well as provide fire protection for existing homes in the vicinity through the installation of 17 fire hydrants between Ho'olehua and the Veterans' Cemetery. Tasks included in this action will include excavation, disposal of overburden/construction debris in addition to the installation of fire hydrants.

5-C Pu'ukapele Transmission Main: The existing 1.25 inch galvanized transmission line is over 30 years old and has reached its useable life. Main breaks interrupt service to the areas. This task includes the replacement of approximately 3,350 LF of transmission main and laterals, and the installation of two new fire hydrants. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals not being replaced.

Project Area 6 – Ho'olehua Pressure Breaker Tank Facility Improvements

6-A All-Weather Roadway to the Pressure Breaker Tank: The existing access road to the 19,500 gallon pressure reducer tank in Ho'olehua is unpaved and inaccessible during heavy rains. This task will modify an existing dirt roadway. Approximately 7,920 linear feet (LF) of all-weather roadway will be installed from the intersection of Kūle'a and Mo'omomi Avenue to Farrington Avenue. The new roadway will follow an existing,

overgrown road corridor. Tasks included in this action will include grubbing, grading, roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

6-B **Ancillary Equipment Improvements:** Several of the equipment located at the Pressure Breaker Tank Facility such as the butterfly valves have reached the end of their useful life. This task will replace equipment in kind. This project may include limited excavation, disposal of demolition/construction debris and replacement of equipment.

Project Area 7 – Hoʻolehua Maintenance Yard Improvements, and Scattered Valve and Hydrant Replacements

7-A **Valve and Hydrant Replacement:** Seven Pressure Relief Valve (PRV), seven Gate Valves (GV), five In-line Valves (IV)11 Air Relief Valves (ARV), up to five fire hydrants and associated ancillary equipment in Hoʻolehua have reached the end of their useful life. This task will include replacing hydrants, PRV, GV, IV, ARV valves and realigning manholes as necessary. This project will also require limited excavation at each valve site and debris disposal.

7-B **Maintenance Yard Improvements:** The Maintenance Building, built in 1969 is not large enough to house necessary equipment and materials needed to maintain the water system. Based on an evaluation of the existing structure, the deterioration of support structures dictated building replacement rather than expansion of the existing. This task will include the demolition of the existing structure, re-use of the existing concrete pad and expanding it to accommodate a 4,800 square foot warehouse type facility. In addition, critical equipment necessary for emergency maintenance, safety and operations of the water system will be stocked/housed at this facility. At a minimum, the equipment identified will include a forklift, front-end loader and replacement pumps. A fire hydrant and water meter will be installed to provide fire protection for the building and surrounding DHHL lands. An additional concrete pad, up to 2,400 square feet, will be constructed to accommodate outside storage, loading, unloading, and parking. Tasks included in this action will include grubbing, grading, excavation, disposal of demolition, overburden, and construction debris as well as the installation of fire hydrant and ancillary equipment and construction of the building and concrete pad.

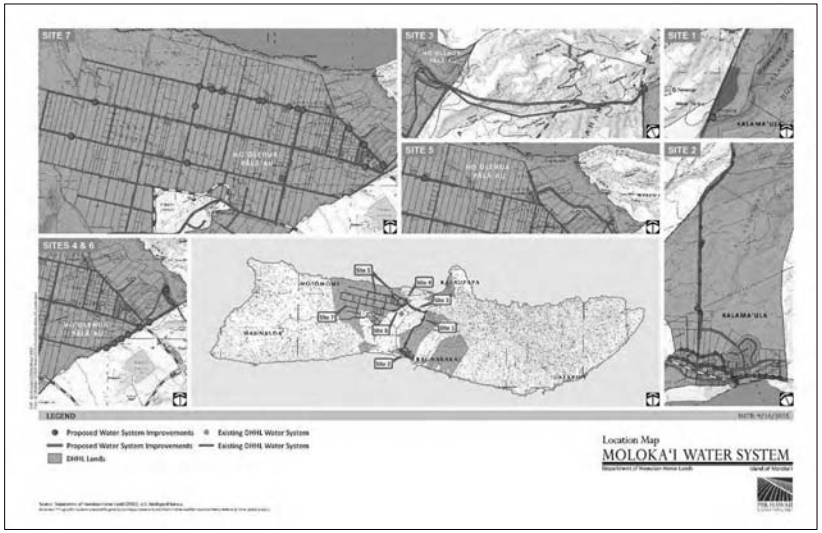

Figure 1. Location of project areas (courtesy of PBR Hawaiʻi).

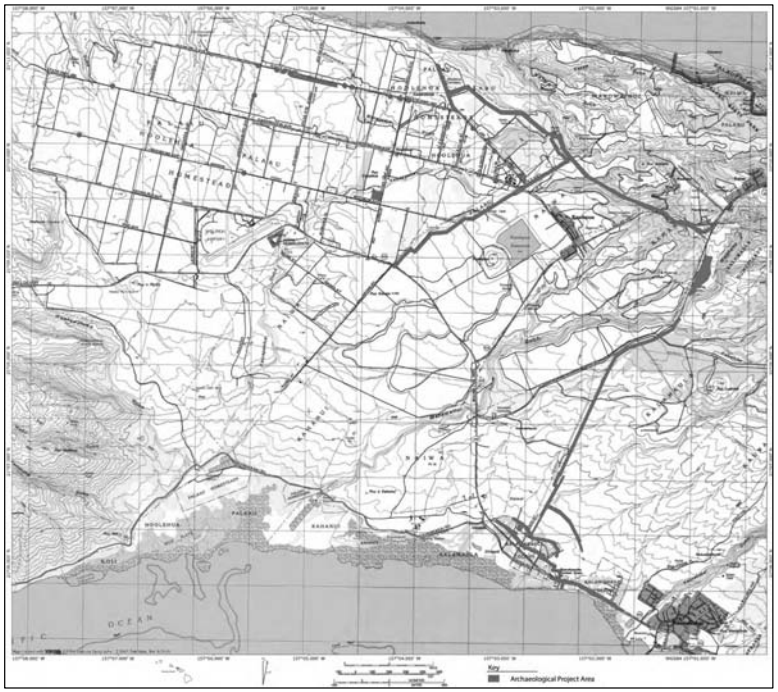

Figure 2. Topographic map showing APE.

2.0 PROJECT SETTING

Located 26 miles southeast of Oʻahu and nine miles northwest of Maui, Molokaʻi is the fifth largest of the Hawaiian Islands. This elongated island is 38 miles long east to west, and is at most 10 miles wide and covers an area of 260 square miles with an approximate total of 88 miles of coastline. The Department of Hawaiian Home Lands manages approximately 26,000 acres, or 15% of the total land area of Molokaʻi.

The island of Molokaʻi was formed from the volcanic flows of two large shield volcanoes on the eastern and western ends of the island, and one much smaller one to the north. The younger and larger eastern volcano of the island rises much higher than the west, up to 1,515 m in elevation compared to only 421 m on the West End. A large plain between the two large volcanoes was created where the lava flows overlap. This area is commonly referred to as the Hoʻolehua Plain. The eastern peaks tend to intercept the majority of the trade winds, along with the moisture they bring. This causes the lower western half of the island to lie in a rain-shadow creating arid conditions while the eastern side exhibits wet, lush permanent streams and thick greenery.

2.1 Environmental Settings

The central portion of Molokaʻi consists primarily of plateau lands that divide the east and west portions of the island.

This central region of Molokaʻi is quite arid, receiving only 15 to 60 cm (6 to 24 inches) of mean annual rainfall (Giambelluca et al. 1986). There are no permanent streams in the area although there are numerous gulches that collect water in times of heavy rain. There are several known freshwater springs along the shoreline. Significant amounts of rainfall end up as runoff rather than penetrating the soil, due to the fact that much of the surface area has been stripped of topsoil and vegetation. Periodic droughts have affected the region, and the area has reportedly experienced rainless periods for up to one year (Major and Dixon 1995:18). The region is known for experiencing strong trade winds that sweep over the land and erode soil. The region consists of large tracts of relatively level ground that has been the focus of large-scale agriculture during the twentieth century. The topography is varied, ranging from level plains to rolling hills and sea cliffs at the northern coastal boundary. Six hundred foot sea cliffs border the northeastern portion and the land transforms moving west, from cliffs to gentle sloping fields to protected beach access at Moʻomomi (Group 70 2005:7-1).

There are multiple soil types ranging from salty marsh lands near the coast to rocky and stony outcrops in the uplands. A majority of the land *makai* of Maunaloa Highway is subject to flooding.

The region's varied native ecosystems have been greatly altered over the last hundred years due to introduced species of grasses, shrubs, trees, and cultivated crops. Introduced vegetation

includes *kiawe* (*Prosopis pallida*.), *koa haole* (*Leucaena glauca*), lantana (*Lantana camara*), and Christmas berry *(Schinus terebinthifolius*). Native species present include *ʻilima* (*Sida fallax*.), *pili* grass (*Heteropogon contortus),* which was an important traditional thatching material), *maʻo* (native cotton, *Gossypium tomentosum*), and *wiliwili* trees (*Erythrina sandwicensis*).

3.0 TRADITIONAL ACCOUNTS AND MOʻOLELO

3.1 TRADITIONAL ACCOUNTS

The island of Molokaʻi is imbued with elaborate oral traditions that account for the pre-Contact and early post-Contact history of the island as well as its many colorful legends and myths. According to Pukui et al. (1976:156), Molokaʻi is also referred to as *Molokaʻi nui a Hina* (great Molokaʻi, child of Hina) and *Molokaʻi pule oʻo* (lit. Molokaʻi [of the] potent prayer). It has been documented that some Molokaʻi *kūpuna* disagree with the conventional spelling for Molokaʻi. According to Kirkendall and Cleghorn (2009:95), two interviewees suggested the correct spelling is "Molokai," although the conventional spelling since the resurgence of Hawaiian language classes in the 1970s and 1980s added the *ʻokina*.

The origin of Molokaʻi itself has many interpretations (Fornander 1916-1917, 1919-1920; Pukui et al. 1976; Kamakau 1991). In "The Song of Pakui," Molokaʻi Island is said to be born of Wākea, who is seen as the ancestor of all Hawaiians, and his third wife, Hina (Fornander 1919-1920:360). Another traditional account of the island's origin is told by the historian Kahakuikamoana. In the tradition of Opuukahonua, Hinanuiakalana birthed Molokaʻi with Kuluwaiea of Haumea as the father (Fornander 1916-1917:2). Alternatively, according to Fornander (1916-1917:12) some historians maintain that Wākea put his hands together and himself created the island. Yet another oral tradition holds that the islands were all magically grown from pieces of coral by a fisherman named Kapuheeuanui under the instruction of a priest named Lauliala'amakua (Fornander 1916-1917:22).

Beckwith (1976) writes of one of the early mythos of Molokaʻi in the story of Pahulu, the goddess who once ruled over Lānaʻi, Molokaʻi, and a portion of Maui. In her account of this tale,

> Pahulu was a goddess who came in very old times to these islands and ruled Lanai, Molokai, and a part of Maui. That was before Pele, in the days when Kane and Kanaloa came to Hawaii. Through her that "old highway" (to Kahiki), starts from Lanai. As Ke-olo-ewa was the leading spirit on Maui who possessed people and talked through them, so Pahulu was the leading spirit on Lanai. Lani-kaula, a prophet (kaula) of Molokai, went and killed off all the akua on Lanai. Those were the Pahulu family. Some say there were about forty left who came over to Molokai. The fishpond of Ka-awa-nui was the first pond they built on Molokai…Three of the descendants of Pahulu entered trees on Molokai. These were Kane-i-kaulana-ula (Kane in the red sunset), Kanei-ka-huila-o-ka-lani (Kane in the lightning), and Kapo. About four hundred trees sprang up in a place where no trees had been before, but only three of these trees were entered by the gods. The Lo family of Molokai, a family of chiefs and kahunas, are descended from Pahulu. Many of them are well-known persons today (Beckwith 1976:108).

Molokaʻi has also always been known as a center for learning, from the training of priests to the tradition of *hula*. Molokaʻi was known in pre-Contact times, as far back as the tenth century, as producing powerful *kāhuna* (Beckwith 1976:10,108; James 2001:121) and prophets (Summers 1971:13). In the story of Pahulu, "…About the time of Liloa and Umi, perhaps long before,

chiefs flocked to Molokai. That island became a center for sorcery of all kinds. Molokai sorcery had more *mana* (power) than any other. Sorcery was taught in dreams. All these Molokai aumakua were descendants of the goddess Pahulu…" Beckwith (1976:108). Though the exact location is not known, aspiring *kāhuna* were apprenticed at Kē'ie'ie in Mahana, which is in the Kalua'koi *ahupua'a*. According to James (2001), in the 12th century, Kaikololani, a warrior chief of Maui, brought his war fleet to Moloka'i and slaughtered scores of its people, which prompted the priests of Kē'ie'ie to deliver a deadly prayer, killing all warriors, save for Kaikololani, who returned to Maui to tell the tale of Moloka'i's great *kāhuna*. This story particularly upholds the island's poetic name of *Moloka'i pule o'o*. The famous sorcerer, prophet, and counselor, Lanikaula, was born in Puko'o and laid to rest in Keopukaloa, Moloka'i, sometime in the late-16th century. He is credited with killing all of the *akua* on Lāna'i (Beckwith 1976:108, 110-111). Moloka'i is also said to be the birthplace of the *hula* (Handy and Handy 1972:511; James 2001:121). It is said that a *wahine* from Moloka'i, named Laka, sometimes seen as a goddess or a manifestation of Kapo, was the creator of the *hula.* She is also credited with starting the first and most revered *hula* school at Mauna Loa, on the west end of Moloka'i.

Beckwith (1976) brings up some additional tales from pre-Contact Moloka'i, such as the story of Kao-hele, a noted runner from Moloka'i who was renowned for his remarkable skills. In the tale of Kao-hele, she outlines his feats, stating:

> Kao-hele, noted runner of Molokai, is pursued in vain by Kahekili's men when they come to make war on Molokai. They station relays, but he outdistances them all, hence the saying, "Combine the speed to catch Kaohele" (E ku'i ka mama i loaa o Kaohele). At one time chiefs and people are crowded at a famous cliff for the sport of leaping into the bathing pool below, and Kaohele, finding himself headed for this cliff and closely pursued, leaps across to the opposite bank, a distance of thirty-six feet. Kao-hele is runner and protector for four chiefs who live at the heiau of Kahokukano on Molokai and have a fishpond mountainward. He is killed by a slingstone in a battle with men from Hawaii but his chiefs escape (Beckwith 1976:339).

Although Moloka'i was typically subject to rule by O'ahu and Maui chiefs, who often fought for control over the small island, at times it was politically independent (Kirch 1985:7). The first recorded ruling chief of the island is Kamauaua, believed to have ruled sometime in the 13th century (Summers 1971:5; Fornander 1880). Later, there were a number of internal wars between chiefs of Ko'olau and Kona in the centuries that followed his victory. Though all failed to hold power for long, there were episodes of external conquest by chiefs of O'ahu, Maui, and Hawai'i (see Summers 1971 for details of these histories). Summers (1971) presents some of the genealogical information from the pre-Contact era and details the connections between Maui Island and Moloka'i which date back to the 16th century and Kihaapi'ilani.

There were a number of factors that gave Moloka'i a reasonable amount of importance within the larger sociopolitical system of pre-Contact Hawai'i. The island's central position, and because it was most often without a strong political center, caused Moloka'i to be a pawn in the 18th century pre-Contact wars of conquest. The island was a resource base for the support of armies and a staging area as they moved among the larger islands in the chiefly wars (Tuggle 1993a:10). An abundance of fish, as evidenced by the density of fishponds, was likely a lure to the island. Some of the most impressive *heiau* in all of Hawai'i were built facing the numerous fishponds along the southern coast, which indicates the importance of these fishponds to the

ruling chiefs in pre-Contact history. Another indicator is the presence of fine quality basalt which was extensively quarried on the western end of the island (ibid).

3.2 HISTORICAL ACCOUNTS

The first historical descriptions of Moloka'i are from Captain Cook. These descriptions were focused on the south western coast, as they harbored off of Kalaeloa, located near Kamalō Ahupua'a. They described a scene with shelter from the trade winds, little wood, and yams (Cook 1785). About a decade later, Captain Vancouver described Moloka'i's south shore and stated that the valleys appeared "verdant and fertile", with an abundant population and successful agriculture (Vancouver 1798: 201-203). William Ellis, an English Protestant missionary, arrived on Moloka'i in the early 19th century and provided further commentary on the environment and people of Moloka'i, indicating that there was little level topography, yet some areas evidence fertility, and estimated a population that exceeded Lāna'i's (Ellis 1917).

However, Moloka'i was known as the Lonely Isle in the early 1800s, since it was not a common destination for foreign ships at the same time as the other major islands were discovering the novelty of foreign goods. Early population estimates range from 3,000 to 8,000 around the turn of the century (DeLoach 1970:126). The large discrepancy is due to population fluctuations caused by war and the introduction of foreign disease, and the difficulty in traversing the countryside to obtain a reliable count. By the end of the 19th century, the population had decreased dramatically to approximately 2,500 as vast amounts of people moved to the city centers on the more populated islands (DeLoach 1970:133).

European interaction and influence on the indigenous population of Moloka'i began 31 years after Vancouver's sojourn around the island. Moloka'i was not immune to the influx of missionaries and other outsiders that came to the islands. The plantation and ranching era on Moloka'i are inexplicably intertwined due to the course of history which shaped the commercial ventures of the 1800s and 1900s. The first 130 years of western impact was a time of trial and error in pursuit of a suitable cash crop, which would allow the island to participate in Hawai'i's new commercial economy. The difficulty was mostly due to the lack of sufficient quantities of fresh water in areas of potential large-scale agricultural production. Because no monetary enterprise was a lasting success, the majority of the population maintained the old ways (DeLoach 1970:130). During this time, the island's population center shifted from the fertile east coast to the central south coast, and the land between Kalama'ula and Kūmimi was said to be the most populated (Summers 1971).

R. W. Meyer was, perhaps, one of the most innovative and influential individuals in the history of plantation/agriculture on Moloka'i. Meyer was a multi-lingual immigrant from Germany who arrived on Moloka'i in the 1840s. He married a local woman of Hawaiian and Samoan decent, and together settled in the uplands of Moloka'i, in Kala'e. His commercial ventures began with the introduction of a cattle ranch stocked with longhorn cattle, which he shipped to Honolulu (Judd 1936). Although Meyer's efforts at animal husbandry were less than successful, he was quite successful in horticulture. He grew a variety of crops including: coffee, corn, wheat, and potatoes. His crowning achievement was the construction of a horse drawn sugar

mill, which still stands, and has been restored. This unique sugar mill is on the National Register of Historic Places, thereby assuring R.W. Meyer a place in the early written histories of Molokaʻi (Kirkendall and Cleghorn 2009).

By the mid 19th century, Europeans were established on Molokaʻi, and able to purchase lands after the Māhele ʻĀina, which legislated private property ownership in the islands. However, Hawaiian royalty also expressed interest in the island. Kamehameha V was a frequent visitor, and purchased land from Hawaiians on Molokaʻi for his country home, Malama, located on the beach near Kaunakakai. The platform is still visible, although unmarked. The king also purchased cattle, which roamed the island at will due to their status as *kapu*. At his death, the estate of Kamehameha V (Lot Kapuāiwa) came to Charles R. Bishop through his wife, Bernice Pauahi Pākī Bishop. Through a *hui* action with individuals A.W. Carter, A.S. Hartwell, W.R. Castle, and J.B Castle, the group amassed approximately 70,000 acres of fee simple land (Cooke 1949; Judd 1936; Tuggle 1993b).

Perhaps one of the darker periods in the history of Molokaʻi occurred when the Hansen Disease Colony in Kalaupapa was fully active. The colony was established the mid-19th century, but remained in use well into to the modern era, even after treatment was available for the disease.

Between 1870 and 1900, several larger-scale sugar plantations were started on Molokaʻi. One was at Moanui, which burned down. Another mill operated at Kamalō, but evidence suggests that by 1900, neither were in operation. Remnants of the pier at Kamalō and stone ruins at Moanui are visible today. In 1898, the American Sugar Company incorporated and started a sugar plantation on the plains of Molokaʻi. Subsequently, the American Sugar Company constructed a harbor and pier, as well as a railroad from the end of the pier to Pālāʻau on the Hoʻolehua plateau. The initial property was on 750 acres of which 500 were planted in young sugar cane. Water, or lack thereof, proved to be a reoccurring theme for the plantation. To address this issue, the company excavated irrigation ditches and dug wells in the lowlands, with steam pumps of 10,000,000 gallon capacity to lift the water (Judd 1936). This rapid removal of water decimated the freshwater aquifer, and drew brackish and sea water inland to the fields. As this unfortunate event destroyed the cane crops, American Sugar Company was forced into economic demise (Kirkendall and Cleghorn 2009). Sugar cultivation attempts at Kamalō and Moanui were more successful, albeit, by a small margin.

Continued economic distress created a need for another economic outlet. By 1920, Molokaʻi Ranch comprised the chief economic venture on the island in the form of beef cattle. Its success came at the decline of sheep, honey, and taro exports. According to Cooke (1949), the total area devoted to cattle production and grazing included 89,428.811 acres, 64,104.811 of which were fee simple and 25,324 constituted leased Government lands.

However, the first 20 years of the 20th century were not without economic trouble. A severe drought threatened the entire operation in 1908 (Cooke 1949). George Paul Cooke, soon-to-be ranch manager, stated that only 13.94 inches of rain fell at Kualapuʻu; the lowest since Governmental recordation began. At least five hundred head of cattle were lost to thirst and

starvation. Ranch stockholders did not receive a positive dividend on their investments until ten years after the drought (Cooke 1949).

In 1918, a proposal by Hawaiian Pineapple Company Ltd. was submitted to lease these lands for pineapple production upon the expiration of government land leases in Hoʻolehua, Pālāʻau, and Kalamaʻula. In 1922, pineapple cultivation on Molokaʻi spread to the west end of the Kaluakoʻi *ahupuaʻa*. Lands above the five hundred foot elevation were leased to Libby, McNeill, and Libby for pineapple. Libby established a cable landing at Puʻu Kaiʻaka, north of Pāpōhaku Beach because of poor roads and transport systems. A few years later, Libby's expansion allowed for excavation and construction of a channel and wharf at Kaumanamana serving tug boats and barges, which was named "Kolo," as Kaumanamana proved difficult to pronounce (Cooke 1949).

The California Packing Company (CPC) obtained a lease to raise pineapples at Kalae and Puʻu o Hōkū at about the same general time frame (1919). In 1927, CPC lands expanded through additional lease agreements for lands at Nāʻiwa and Kahanui. Additionally, a CPC ranch employee camp was constructed at Kualapuʻu and the company took over ranch lands and the camp at Maʻālehu, renaming it Kīpū (Kirkendall and Cleghorn 2009).

In 1920, Molokaʻi Ranch, under G.P. Cooke, tried their hand at dairy farming as Mapulehu Dairy (Cooke 1949). The dairy cows were raised on corn and alfalfa, which proved to be successful. Raw milk from the Mapulehu Dairy was exported to Leahi Home (tuberculosis hospital) in Honolulu. This venture flourished for a number of years until 1933, when someone poisoned 16 of the cows with arsenic in the feed. The operation closed in Mapulehu, and moved to Kauluwai, which was in operation until at least 1949 (Cooke 1949).

The Hawaiian Homes Act was established in 1921, in a clear effort to allow native Hawaiians the opportunity to boost their standard of living by providing an economic outlet via homesteading (Kirkendall and Cleghorn 2009). Properties became available as homestead lands on Molokaʻi in Kalamaʻula Ahupuaʻa, which was initially called the Kalaniana'ole Settlement. Subsequently, other homestead areas were made available in Hoʻolehua and Pālāʻau Ahupuaʻa, on former Molokaʻi Ranch lands. Molokaʻi Ranch leased these lands primarily for the raising of pineapples. At this time, just 40 acre plots in Hoʻolehua were made available to applicants. In the spirit of self-sufficiency, homesteaders raised cattle, horses, sheep, chickens, pigs, and vegetables (Kirkendall and Cleghorn 2009). Seventy-nine homesteading families came to Molokaʻi in the first year deeming the program a success (DeLoach 1970:136). The island has since maintained a more traditional way of life than other islands thanks to its relatively low population of which a high percentage is native Hawaiian, and there is a strong sentiment against outside interference in land affairs.

4.0 HISTORIC BACKGROUND

The settlement patterns of Molokaʻi Island have been greatly influenced by this ecological diversity, and have been especially influenced by an uneven distribution of water resources, from prehistoric times up until present day. According to the first large-scale archaeological projects on Molokaʻi (Bonk 1954; Hammatt 1978; Kirch and Kelly 1975), the eastern fertile side of the island was likely the first to be populated. Initial settlement of the western portion of Molokaʻi was probably located along coastal areas that contained rich marine resources, such as Moʻomomi and Kawakiu Nui. The exact population of Molokaʻi before European arrival is impossible to know. However, early missionaries provide estimates of 8,000 to 8,700 in the early 1830s, and there are indicators that the population was likely a few thousand greater before their arrival (Summers 1971:3). The missionaries chose the southeastern coastal area of Kaluaʻaha, for their home upon their arrival in 1832, and it is reasonable to assume that they would have chose this area not only for its richness in subsistence resources, but also because a substantial population was already present and easily reached. The southern shoreline, with its 54 or more fishponds constructed onto the broad reef flat, would have been renowned for its plentiful bounty and was home to a large population (Summers 1971). Before the arrival of Western influence, Molokaʻiʻs subsistence economy was based on fishing, irrigated agriculture, gathering, and aquaculture in the form of man-made fishponds.

The traditional subsistence economy of the general area likely revolved around the cultivation of ʻ*uala* (sweet potato, *Ipomoea batatas*). As previously mentioned, the people of Pālāʻau and Kalamaʻula were known for their skills in sweet potato cultivation (Summers 1971:38). The volcanic soil was considered good for ʻ*uala* cultivation and rainfall during winter months would generally have provided ideal growing conditions. Numerous place names in the area reflect the importance of ʻ*uala*, such as Kualapuʻu (Sweet Potato Hill) and Puʻu Kapeʻelua (*peʻelua*, a caterpillar or army worm pest that feeds on the leaves of the ʻ*uala*). According to Summers (1971: 36), "In the old days, Hoʻolehua 2 was noted for growing sweet potatoes (Handy, 1940:157) and, on the plain where Molokaʻi Airport is now located, Kamehameha I is said to have trained his warriors (Cooke, 1949:112)."

4.1 TRADITIONAL HISTORY

There is a reference to Kalamaʻula and the general Kaunakakai area as a place of warrior encampments during the 18th century wars of conquest. Kamehameha I had a base camp at Kaunakakai, and it was from this camp that his troops prepared to launch for his conquest of Oʻahu. One of his chiefs, Keʻeaumoku, was encamped at Kalamaʻula at the same time (Kamakau 1961:43; 70-71; 159; 171-172). Another reference to the area made by Kamakau (1961:149; 388), is in regards to the reconciliation between Kamehameha I, and Kalola, the mother of Kīwalaʻō, the defeated chief of Hawaiʻi. After Kamehameha had successfully conquered Maui, he traveled to Molokaʻi to secure the allegiance of the islandʻs chiefs. At this time, he also met with Kalola, who was staying at Kalamaʻula, to persuade her to approve of his

taking her granddaughter, the sacred Keōpūolani, as his wife. Shortly after Kalola agreed to the taking of Keōpūolani, she died and is said to have been buried in a cave at Kalamaʻula.

Kalamaʻula was also known for its sweet potato plantations. A Hawaiian writer described the cultivation of sweet potatoes in a 1922 Ka Nūpepa Kūʻokoʻa:

> …In these land divisions (kalana) of Kalamaʻula and Palaʻau in early days there were sweet potatoes on all the rocky (ʻaʻa) high lands and from these places came the sweet potato eaters who knew potato cultivation… there are two favorites of the sweet potato consumers of Kalamaʻula and Palaʻau, the kala and the kalaponi (cited in Summers 1971:38).

Aside from dry land sweet potato cultivation, land use for the area likely centered on exploitation of marine resources and irrigated agriculture along stream bottoms and along the coastal plain. Rental receipts between the years of 1858 and 1861 show that rents collected by the *konohiki* of Kalamaʻula include payment for coconut trees, taro patches, a squid fishery and a fishpond (Hommon and Ahlo 1983:14-15). In a review of documented fisheries and fishing rights recorded in the Māhele ʻĀina, Maly and Maly (2003) compiled a list of claims to ocean resources and fishing rights for the entire state. Of the 123 claims filed on Molokaʻi, Kalamaʻula contained two of these claims, one of which was granted to the Crown. A listing of Molokaʻi ocean resource and fishing right claims is provided in Appendix C. Fishing remains an active form of subsistence in Kalamaʻula to this day (Tomonari-Tuggle 1990:9).

The Kamehameha coconut grove called Kapuāiwa is located along the shore, just southeast of the Kalanianaʻole Colony, and is believed to have been planted by Lot Kapuāiwa (Kamehameha V), grandson of Kamehameha I in the 1860s. The king maintained a home, Hale Malama, on the beach in nearby Kaunakakai and had a strong affection for the island. The grove originally consisted of approximately 1,000 coconut trees, covering an area of approximately 10 acres. The trees were to represent each warrior that served under his rule and provided shelter for a freshwater spring that was used for bathing by the *aliʻi* (Group 70 2005:5-9). As late as the 1920s, there were numerous freshwater springs known to be located within the coconut grove, but due to erosion, the shoreline has eroded and all but one of the springs can be observed flowing in the ocean (Bush et al. 2001:9). Several hundred descendants of the original trees now make up Kapuāiwa Grove.

The Kalanianaʻole homestead was developed in 1922. It was named after Prince Jonah Kūhiō Kalanianaʻole, its main promoter and supporter of the Hawaiian Homes Commission Act, which was a homesteading program enacted by the U.S. Congress in 1921. This program was created to place native Hawaiians, defined as "any descendant of not less than one-half part of the blood of the races inhabiting the Hawaiian Islands previous to 1778," on designated lands. The Kalanianaʻole homestead was to be a trial run for the concept of Hawaiian homesteading. In 1928, the homestead was deemed a success and plans were carried out to develop homesteads on all islands. During the first phase of development, twenty-two farm lots and thirty-three residential lots were established and in 1924, a second, larger phase was underway in what is now the Hoʻolehua-Pālāʻau Homesteads. By 1930, difficulties for farmers became apparent in the form of insect and pest problems, not to mention the high salinity in the spring water being pumped in for irrigation. It was soon realized that the area was not suitable for

agriculture and the agricultural leases were exchanged for land at Hoʻolehua (Tomonari-Tuggle 1990:11). The lots in the Kalaniana'ole homestead were then reserved for residential lots.

4.2 LAND COURT AWARDS

Private land ownership was established in Hawai'i with the Māhele 'Āina, also known as the Great Māhele of 1848. Crown and *ali'i* lands were awarded in 1848 and *kuleana* titles were awarded to the general populace in 1850 (Chinen 1958). Awarded lands in this process are referred to as Land Commission Awards (LCAs). Over time, government lands were sold off to pay government expenses. The purchasers of these lands were awarded Grants or Royal Patent Grants (Chinen 1958). LCAs offer the native and foreign testimonies recorded during the claiming process, which shed light on what the land use of the area was in the early historic period. This information can be used to predict the types of resources may still be present in the project area.

Research conducted on the LCAs indicates no LCAs were awarded within the current project area and only four LCAs wee claimed in the vicinity of the current project area. One claim (1861 by Kaea was not awarded) while the three remaining claims were filled and granted Royal Patent Numbers. Unfortunately, none of the testimonies contain specific information pertaining to the land use within these areas. The results are presented below in Table 1.

Table 1. Land Court Awards within Project Area

LCA No.	Claimant	Awarded	Royal Patent No.	Testimony	Claim
1861	Kaea	No	-		
7755	Kaluaokamano	Yes	6824	Native Register Vol. 7, pg 223 Native Testimony Vol. 10 pg. 360	½ of the *ahupua'a* of Kahananui [sic; this spelling is from the testimony in the Native Register]
11095	Kalino	Yes	6257	Native Register Vol. 7, pg. 327	An *'ili* called Mahana in Kalamaula, Cultivated the land for 8 years (ca. 10.00 acres)
11216:12	M. Kekauonohi	Yes	8132	Native Testimony Vol. 10 pg. 398	The *ahupua'a* of Naiwa

Two of the claims are large with Kaluaokamano being awarded ½ of the *ahupua'a* of Kahanui and M. Kekauonohi (the Great granddaughter of Kekaulike) being awarded the *ahupua'a* of Naiwa.

4.3 HISTORIC RANCHING

The introduction of large mammals such as cattle, sheep and deer, in the nineteenth century would have caused a profound change. In 1851, 200 cattle and 200 horses were roaming the island, and in 1852, the first sheep were introduced as Kamehameha IV and V intensified ranching throughout the latter half of the century (Major and Dixon 1995:40). Deer were introduced to the island by Kamehameha V in 1868, after which a thirty year *kapu* (taboo, in this case a royal prohibition on hunting) followed. Deer had become a common ingredient of the diet by the early twentieth century and have become thoroughly integrated into cultural lore and tradition (Major and Dixon 1995:25).

The Moloka'i Ranch ran herds of sheep and cattle over most of central and west Moloka'i and the Ranch's holdings in Kaluako'i, Pālā'au, and elsewhere in the island remained the largest bloc of land in private ownership on Moloka'i until May of 2008, when the Ranch ceased all its operations on the island. During the early Homestead days, 6,000+ acres covering much of the central and west parts of the island were divided into pasture land as part of the Pālā'au community pasture.

Although livestock were kept, agriculture was the focus of homesteading. The livestock never contributed as much to the economy as crops, especially the primary cash crop pineapple. For years, favorable contracts with Libby, McNeill, and Libby and the California Packing Corporation allowed Hawaiian Homesteaders to reap profits, causing an influx of Kalama'ula residential homestead lot holders to apply for and receive agriculture lots in Hoʻolehua.

In the late 19th Century, Rudolph Wilhelm Meyer, who managed Moloka'i Ranch for Charles Reed Bishop, began obtaining his own lands for pasturage. Meyer experimented with growing a diverse variety of cultivars within the next decade. Sugarcane became a major export for Hawai'i during this period and Meyer followed suit, cultivating sugarcane in 30 acres of his lands and building a small sugar mill of unique design in 1876 to process his cane into sugar and molasses. The Meyer Sugar Mill, although modest in size, is one of the last surviving 19th century sugar mills. Meyer continued sugarcane production, from field to mill, until 1890. By 1890, Meyer acquired 2,936 acres in Kala'e, which is less than a mile east (ca. 1.5 kilometer) of the Hoʻolehua-Pālā'au Homestead (Bluestone 1978).

Hoʻolehua was the first area to receive Hawaiian homesteads following the passage of the Hawaiian Homes Commission Act of 1920. Thirteen homesteaders settled in Hoʻolehua in February of 1923. Tomatoes, corn, watermelons, sweet potato and cucumbers were some of the first crops to be cultivated in the area. With the aid of irrigation water piped in from the windward side of the island, Moloka'i has been promoted as the "breadbasket of Hawai'i" (Major and Dixon 1995:28).

5.0 PREVIOUS ARCHAEOLOGY

5.1 PALAʻAU, HOʻOLEHUA, AND NĀʻIWA REGION

The archaeological record for Palaʻau, Hoʻolehua, and Nāʻiwa region of Molokaʻi is not well documented. There are no records in the SHPD library of any archaeological work or archaeological sites within the specific project areas. Summers (1971) documented four sites (No. 50-60-03-11A, -11B, -13, and -14), in the northeast corner of Hoʻolehua. However, there have been several archaeological surveys to the north, south, and east of the subject properties (Table 2). The sites identified during these investigations are shown in Figure 3 and Figure 4.

The operation of pineapple plantations in this region transformed much of the land, and probably impacted or destroyed a great deal of the archaeological features that may have survived ranching (Major and Dixon 1995:43). Ethnographic sources have suggested that surface artifacts such as adzes, slingstones, *ʻulu maika,* and other recognizable artifacts have likely been removed over the years by ranch personnel, thus depleting the surface archaeological record (Major and Dixon 1995:51).

The majority of archaeological, historical and environmental information for these areas is provided by Summers (1971), and also from an inventory survey report from the USAF Receiver Station in Pālāʻau, which was created by the Anthropology Department of the Bishop Museum (Major and Dixon 1995) for the National Park Service. This report examines not only the specific project areas, but provides a good synthesis of historical and archaeological data, often pointing out the lack of data, for the entire central region of Molokaʻi (i.e., the *ahupuaʻa* of Pālāʻau , ʻĪloli, Hoʻolehua, Nāʻiwa, and Kahanui).

Summers (1971) described six sites for Palaʻau.

Site -13, a *kahua maika,* is mentioned as an "old *kahua maika,"* located on a rise at a place called Akani.

Site -14, a *heiau*, is located east of the Hoʻolehua Cemetery at an elevation of 800 feet. The structure was first reported by Cartwright in 1922, but was in ruins by 1957 when only traces of paving and the remains of a wall with an upright stone could be seen.

Site -16, a *heiau*, was also first recorded by Cartwright in 1922 and is located on the west side of the mouth of Anahaki Gulch at an elevation of about 50 feet. The structure was a partially paved enclosure with a house site or shelter on the crest of the hill to the south.

Two *koʻa* are noted. One is at Naʻaukāhihi (Site -18) at the northern extremity of Naʻaukāhihi Point. The shrine is a small oval enclosure where numerous fish bones were observed upon it first being discovered. The other is on top of the hill at Puʻukapele (Site -15). This *koʻa* has probably been destroyed according to Major and Dixon (1995:48).

During their survey, Major and Dixon (1995) observed three mounds located atop Puʻukapele, but they appeared to be clearing mounds associated with antenna tower construction. Also, several house sites (Site -17) were seen at the coastal area of Kahinaokalani.

Table 2. Previous Archaeological Investigations in the Palaʻau-Hoʻolehua-Nāʻiwa Region

Reference	Location	Description and results
Phelps 1937	Island-wide	Included in the sites documented is a *koʻa* atop the hill Puʻukapele (recorded as Site 20 in Phelps 1937, and Site 15 in Summers 1971), and five features he referred to as agricultural shrines just north of the *koʻa*.
Summers 1971	Island-wide	A compilation of ethnographic, historic, archaeological and legendary material relating to Molokaʻi.
AECOS, Inc. 1980	Airport Area, Hoʻolehua	Found a complex of World War II bunkers, horseshoe-shaped revetments, earth covered Quonset huts, wood-lined causeways, roadways, and an alternate runway. Found a historic hunting site with seven structural features with one possible prehistoric wall.
Neller 1982	Northern coast of central Molokaʻi, including a portion of Pālāʻau	A brief aerial reconnaissance spanning several *ahupuaʻa* was conducted. Several "house sites" between Naʻaukāhihi and Kahinaokalani were observed. *Koʻa* were noted at Naʻaukāhihi and a photo was taken of the *heiau* at Anahaki (Summers Site 16).
Weisler 1987a	Kīpū	550 acres located immediately east of the easternmost portion of Subsistence & Supplemental Agriculture DHHL lands; three sites were relocated and rerecorded, Sites 109A, 109B, and 111.
Weisler 1987b	Kīpū	Inadvertently discovered cache of adze pre-forms from an area located 2 km northeast of Kualapuʻu were analyzed.
Weisler 1989b	Kīpū	Found new Site 885, a buried Traditional habitation layer, was revealed in several backhoe test trenches from 1.4 to 1.65 mbs. Cultural deposit included an oven feature, midden, charcoal, and one bifacially flaked core.
Griffin 1993	North central coast, near Anahaki	Site 995 was documented during a field visit. Features included a C-shape and a modified outcrop. One boulder with a pecked rectangular basin and several boulders with natural basins were interpreted as water catchments.
Major and Dixon 1995	Hoʻolehua	Found two sites - one pre-Contact and one historic; Features include three enclosures, one dump, and one isolate artifact; performed archival research on Pālāʻau and found an unpublished study by J. Pantaleo (n.d.) on Pālāʻau – site locations mapped with no additional info.
Hartzell 2000	North central coast Hoʻolehua	Same area as Major and Dixon (1995); recorded in detail known sites and found and recorded one new site on the property; one site is adjacent DHHL project area, Sites 843, -1623, and -1624; sites mostly pre-Contact with some historic.

Archaeological survey has shown that settlement of the north coast of central Molokaʻi was more concentrated between Kapalauoʻa and Kahinaakalani, than further east along the Pālāʻau shoreline. However, none of the previous investigations derived their data from systematic, intensive survey and are therefore unconvincing (Hommon and Ahlo 1983:51-55).

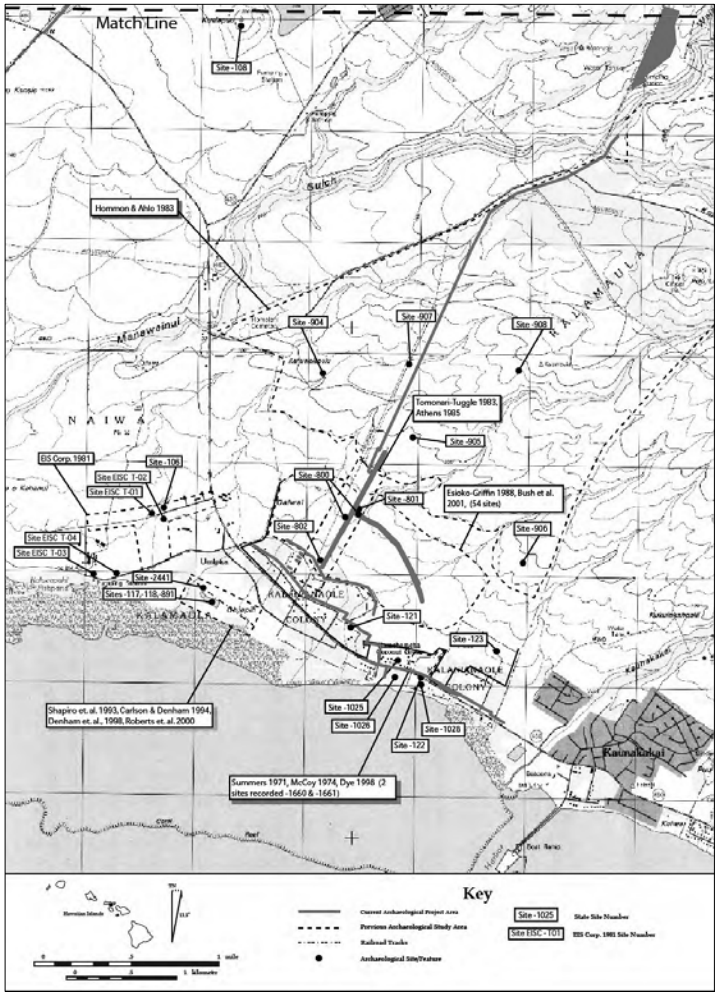

Figure 3. Previous archaeology and recorded sites in the southern portion of the study area

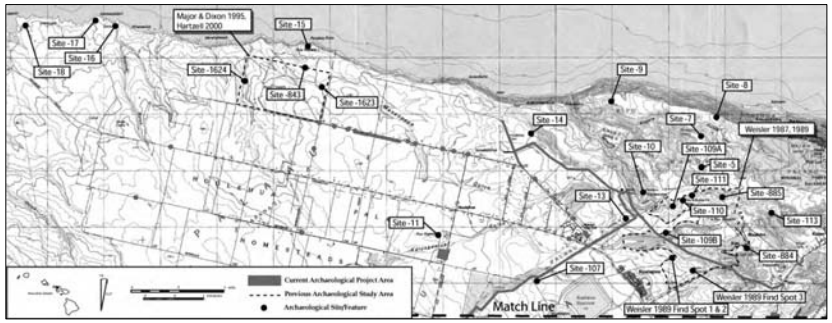

Figure 4. Previous archaeology and recorded sites in the northern portion of the study area.

Summers (1971:77-78) mentions only two sites for Pālāʻau, the first being the Pohoʻele or Pālāʻau Pond (Site -99). This was the largest of the Molokaʻi fishponds with a size of somewhere between 200 and 500 acres. The pond is now filled with mud but its walls were still visible in 1922 along with traces of an old-fashioned sluice gate. It is believed to have been built for Kamehameha I by Hoʻolepanui after he retired to Molokaʻi from Hawaiʻi. About 800 m to the west of Pohoʻele Pond (Site -99), is Hoʻolehua Fishpond (Site -98), which was a *loko ʻumeiki* (shore fishing pond) that extended to the western wall of Pohoʻele Pond. This site had six lanes leading to the sea (Summers 1971:77) during its pre-Contact and early post-Contact era use. However, in historic times, the pond was used by people of Pālāʻau Village for growing taro and for raising cattle (Summers 1971:77). In 1988, Pantaleo surveyed this same area and found at least 21 sites that were included in Pālāʻau 1 a map provided by Major and Dixon (1995:53), but no additional data was given. Several of these sites are within 500 m of Pālāʻau 1 parcels included in this study.

Near the Kualapuʻu Reservoir in Nāʻiwa Ahupuaʻa are two sites (No. -107 and -108) located by Summers (1971). The *hōlua* slide (Site -107) appears to be near or on the eastern boundary of the project area. This site is described as a slide on the south-southwest side of Kualapuʻu hill and was slightly visible in 1966 (Summers 1971:80). About 800 m to the southeast of Site -107 is the Kalakupale Heiau, also known as Palakupale Heiau (Site -108). This site was described as a small *heiau*.

Site -100 is a boundary stone which marks the point where the *ahupuaʻa* of Pālāʻau, Kaluakoʻi, Hoʻolehua, and Nāʻiwa meet. The stone was relocated in 1923 (Summers 1971). Three *heiau* are listed by Stokes (n.d.) that were "reported by natives but not seen," which were described as:

> Kahimakau, southern portion of Pālāʻau Manai, near Kalamaʻula
> Puʻunana
> Panuhu; for rain purposes; a female deity (as cited in Summers 1971: 78)

The *loʻi* built by Hoʻolepanui, the Big Island chief, in the late 1700s were never been mapped, and have likely suffered erosion and siltation among other destructive development (Major and Dixon 1995:53).

In 1980 and 1981, Environment Impact Study Corporation (EISC) conducted a survey in bordering Nāʻiwa Ahupuaʻa, approximately 1 km west of DHHL lands (EISC 1980, 1981). EISC surveyors were not able to relocate Summers (1971) Site -106, which consisted of at least seven anthropomorphic petroglyphs originally found in 1965 behind the chicken farm west of a small gulch. However, two new sites were discovered. The first site is described as a terrace located above west bank of stream on the *mauka* end of the study area that follows the slope for 10 m. It has a front retaining wall ca. 30 cm in height and 1-2 m wide.

Two *heiau* are listed for Hoʻolehua; one located on the east side of the crest of ʻEleuweuwe (Site -10) and one named Lepekaheo Heiau (Site -12), located on the boundary of Hoʻolehua and Pālāʻau, west of Kaluapeʻelua Gulch. Neither *heiau* are described in any detail nor is their current condition known. The "Caterpillar Stones" (Site -11A) are on top of the hill Puʻu Kapeʻelua, as is the "Stone at Puʻu Kapeʻelua," which is just south of the Caterpillar Stones.

The face of the stone has a hollowed out basin with several grooves cut into it, likely used for sharpening adzes or for collecting water.

Weisler (1987a) surveyed 550 acres located immediately east of the easternmost portion of the Hoʻolehua Ahupuaʻa. Within this survey area, three sites were relocated and rerecorded, Sites 50-60-03-109A, -109B, and 111. Summers (1971) wrote that sites -109A and B were reported by Cartwright fifty years prior (n.d.) as *heiau* but did not relocated them and believed that they were both destroyed. Site -109A was a large terrace found somewhat intact, but may have contained additional structures or features destroyed by bulldozing activities. What remained of it, a 4 m N/S by 13 m E/W terrace with a stacked and faced retaining wall, was mapped. Site -109B had more severe damage from pineapple cultivation activities. No structures remained, but artifacts and midden were collected in and around the supposed area that it once stood. Site -111, Na Imu Kalua Ua Heiau, was first recorded by W.T. Brigham in the late 19th century (Stokes 1909:27) and further described by stokes in the early 20th century (Stokes 1909). The site was revisited by Fowke in the early 1920s, where he measured its internal and external features (Fowke 1922) and measured again by Phelps in the late 1930s (Phelps 1937).

In 1987, Weisler examined an adze cache that came from an area located 2 km northeast of Kualapuʻu (Site 50-60-03-884). The site is situated on a small hill adjacent to an unnamed gulch, at the 400 m contour overlooking the saddle area and south coast of Molokaʻi. The cache of 11 adze preforms was purported to be buried approximately 1 m below surface and inadvertently discovered by the property owner while excavating a utility trench (Weisler 1987b). Several years later, Weisler (1989b) returns to the area that the adze cache was inadvertently discovered for testing. He records another site, 50-60-03-885, which consisted of a buried traditional habitation layer, which was found in several backhoe test trenches from 1.4 to 1.65 mbs. Found in this cultural deposit was an oven feature, midden, charcoal, and one bifacially flaked core (Weisler 1989b).

The most recent study performed in Hoʻolehua was Hartzell (2000), where she recorded in detail a total of three sites were identified in the property that continued into adjacent properties (to the north of the TMK). Two of the sites, -1623 and -1624, were first recorded in 1994 by Major and Dixon (1995). Site -1623, a complex that measures ca. 750 m N/S by 400 m E/W, is comprised of two enclosures and a historic artifact scatter. Site -1624 consists of two features, including an enclosure and an isolated basalt flake. This site measures ca. 100 m N/W by 80 m E/W. Site -843, the Puʻuka Pele complex, is composed of 37 individual features, including: 26 stacked and faced walls, five alignments, four enclosures, a depression, and a "prominent, massive natural boulder. This site, comprised of agricultural, habitation, erosion control, water diversion, and religious type features, measures nearly 250 m N/S by 400 m E/W.

5.2 KAHANUI AND KALAMA‘ULA REGION

The *ahupua‘a* of Kalama‘ula is, perhaps, one of the most archaeologically studied areas in Moloka‘i (Figure 3 and Figure 4). A total of 53 sites were recorded on DHHL lands. Table 3 provides a list of prior archaeological investigations performed in and around Kalama‘ula and Table 4 lists the archaeological sites found within the Kalama‘ula Ahupua‘a.

Following is a summary of the sites of Kahanui-Kalama‘ula region, according to Summers (1971:84-87). No less than five fishponds were recorded by Summers (Sites -117, -118, -119, -120 and -122). All of these ponds are now destroyed or buried under modern siltation and mangrove growth. In addition, a pool by the name of ‘Olo‘olo was recounted. This pool was fed by five springs and was used for bathing by the chiefs and by people who lived on the beach. It was well cared for until 1888 when a large rainstorm caused the pool to fill with mud. Years later, early homesteaders discovered one of the springs once again, and used it until the water became too brackish. Another spring is mentioned as being near the boundary of Kalama‘ula and Kaunakakai, which was developed for irrigation purposes by the Hawaiian Homes Commission.

Four *heiau,* are said to have once existed in Kalama‘ula. ‘Ōpae‘ula *heiau* (Site -121) was destroyed to build the pier at Kaunakakai in 1899. Pu‘upapai *heiau* (Site -123), built for human sacrifice, was dedicated to Kāne and Kanaloa. This *heiau* was dismantled about 1855, and the stones were used to build a pier for the American Sugar Co. It was rumored that the failure of the company may have been due to the sacrilege of tearing down the sacred structure. A third unnamed *heiau* (Site -126) is briefly mentioned as having been located about 1.3 miles NE of Pu‘u Luahine. Its condition is unknown. Ka‘anaopea *heiau,* was reported by natives to Fornander, but was not seen and its location is unknown.

It is believed that the only remaining *kahua maika* in the islands is in Kalama‘ula, just north of Pu‘u Luahine (Site -127). Another *kahua maika* (Site -124) once existed between Kauluwai and Mauna Hui. Summers also mentions an area *mauka* of Pu‘u Luahine where there are remains of house sites and stone walls on the ridges and in the small valleys (Site -128).

Systematic archaeological research in the general area began in 1983 with an intensive archaeological survey on DHHL land (Hommon and Ahlo 1983). The survey encompassed some 735 acres in south-central Moloka‘i. With the exception of approximately ten acres of privately owned land, this survey covered the entire landward portion of Kalama‘ula and also portions of Kamiloloa (east and west) and Makakupa‘ia (west). The survey was performed by Science Management, Inc. (Hommon and Ahlo 1983). The work was contracted for by the Pacific Division, Naval Facilities Engineering Command in conjunction with an evaluation of potential environmental impacts that might be occasioned by military use of the area. This intensive survey resulted in the identification of 71 archaeological sites.

Table 3. Previous Archaeological Investigations in the Kahanui-Kalama‘ula Region

Reference	Location (Ahupua‘a)	Description and Results
Summers 1971	Island-wide	A compilation of ethnographic, historic, archaeological and legendary material.
Environment Impact Study Corp. 1980, 1981	Nā‘iwa Industrial Park, (Nā‘iwa)	Two sites found: a terrace with possible clearance mounds nearby; and a stacked stone wall. No maps or photographs provided.
Hommon and Ahlo 1983	(Kalama'ula, Kapa'akea, Kamiloloa, and Makakupa'ia)	An intensive survey was conducted on 735 acres of Hawaiian Home Lands in the areas of future development from the 500 ft contour to the coast.
Tomonari-Tuggle 1983	(Kalama'ula)	Conducted along a waterline corridor of the access road to a water tank. Three sites consisting of a complex of walls, terraces, and cairns (Site 800), seven cairns (Site 801), and a cattle wall (Site 802).
Athens 1984, 1985	(Kalama'ula)	Data Recovery completed as a result of Tomonari-Tuggle 1983 Reconnaissance Survey. Excavations of features (Site 800) that were damaged or destroyed by waterline corridor; excavation results indicated that site occupation and use began ca. AD 1200.
Sinoto and Pantaleo 1992	Moloka'i Refuse Disposal Landfill (Kalama'ula)	Conducted on 40 acre parcel bordering several DHHL TMKs of concern. No surface remains were observed on the property due to prior disturbances from quarrying. No testing performed.
Shapiro et al. 1993	Maunaloa Borrow and ‘Ōhi‘apilo Pond (Kalama'ula)	A possible religious complex with multiple features was identified. Core samples were taken, which did not contain any cultural deposits or datable material.
Denham et al. 1998	‘Ōhi‘apilo Pond (Kalama'ula)	A subsurface section of a basalt and coral wall was discovered.
Dye 1998	Kulana ‘Ōiwi Multi-Services Center (Kalama'ula)	This survey was conducted of a 12 acre lot for Kaunakakai School. A petroglyph gallery and a limestone quarry with associated cultural deposits were found including concrete features, masonry structures, landscaping, and historic-period artifacts displaying a continuous archaeological record from early historic (late 1700s) to the present.
Cordy 2000	(Kalama'ula)	Large area just *mauka* of DHHL Residential lands in Kalama'ula. Nine new sites identified and two known sites were further examined. Sites include: a notched enclosure; possible small *heiau;* a field shelter complex comprised of a rectangular enclosure, paved area, stone mound, and rectangular mound.
Roberts et al. 2000	‘Ōhi‘apilo Fishpond (Kalama'ula)	Further detail about ‘Ōhi‘apilo Pond was obtained and a historic railroad grade was discovered – portions of sites disturbed during project construction.
Bush et al. 2001	(Kalama'ula)	Recommended by IARI Tomonari-Tuggle 1990 inventory survey findings. 13 sites were excavated of which two were recommended for preservation.

Table 4. Archaeological Sites Located on Select DHHL Lands in the Kahanui-Kalamaʻula Region (Note: SIHP – State Inventory of Historic Places)

SIHP No. 50-60-03-xxxx	Description	Possible Function	No. of Features	Reported Current Status	Easting	Northing	Report Author	Notes
802	Wall		1	Inventory	703393	2334934	Tomonari-Tuggle 1990	Believed to have been a possible boundary marker.
1700	Complex	Agriculture, Habitation	4	Inventory	702840	2335621	Tomonari-Tuggle 1990	Site includes one small enclosure (3 x 5 m), one stone pile, one stone alignment and one cupboard.
1701	Complex	Habitation	4	Inventory	702792	2335804	Tomonari-Tuggle 1990	Site includes one wall, two petroglyphs, and one shelter.
1702	Complex	Agriculture	6	Inventory	702889	2335712	Tomonari-Tuggle 1990	Site includes two terraces, one stone pile, one alignment, one modified outcrop, and one wall.
1703	Complex	Agriculture, Habitation	7	Inventory	702813	2335735	Tomonari-Tuggle 1990	Site includes one enclosure, two semi-enclosures, one terrace, one pile, one alignment, and one modified outcrop.
1704	Semi-Enclosure	Habitation	1	Inventory	702787	2335817	Tomonari-Tuggle 1990	Site consists of one semi-enclosure.
1705	Enclosure and Stone Mound	Agriculture, Habitation	2	Inventory	702849	2335839	Tomonari-Tuggle 1990	Site includes one enclosure and one pile.
1706	Complex	Agriculture, Habitation	4	Inventory	702896	2335786	Tomonari-Tuggle 1990	Site includes one enclosure, one pocket terrace, one pile and one alignment.
1707	Complex	Agriculture, Habitation, Ceremonial	6	Inventory	702986	2335727	Tomonari-Tuggle 1990	Site includes one enclosure, two semi-enclosures, one pile, and two alignments. One of the features is believed to be a shrine.
1708	Complex	Agriculture, Habitation	4	Inventory	703155	2335784	Tomonari-Tuggle 1990	Site includes 1 enclosure, 1 pocket terrace, one pile and one wall.
1709	Complex	Agriculture, Habitation	7	Inventory	703079	2335714	Tomonari-Tuggle 1990	Site includes one large enclosure (80 x 100 m), one pile, one alignment, one modified outcrop and three walls.
1710	Complex	Unknown	4	Inventory	702743	2335485	Tomonari-Tuggle 1990	Site consists of two pocket terraces, one pile and one wall.
1711	Complex	Agriculture, Habitation	6	Inventory	702996	2335547	Tomonari-Tuggle 1990	Site consists of an enclosure, a semi-enclosure, an *ahu*, two alignments, and a wall.
1712	Complex	Agriculture, Habitation	6	Inventory	703024	2335552	Tomonari-Tuggle 1990	Site consists of two enclosures and four alignments.
1713	Complex	Agriculture	5	Inventory	702860	2335497	Tomonari-Tuggle 1990	Site includes one enclosure, one pocket terrace, one pile, one alignment and one wall.
1714	Complex	Habitation, ceremonial	9	Inventory	703136	2335588	Tomonari-Tuggle 1990	Site includes two semi-terraces, two ahu, one pile, three alignments, and one feature with an uncertain function. One of the features is believed to be a shrine.
1715	Complex	Agriculture, Habitation	6	Inventory	703069	2335513	Tomonari-Tuggle 1990	Site includes two enclosures, two terraces, one pile, and one alignment.
1716	Complex	Habitation	9	Inventory	702971	2335275	Tomonari-Tuggle 1990	Site consists of two enclosures, five terraces, one alignment, and one wall and appears to have the most potential for being a permanent residential site. It was suggested that this site may have been the residence of Kalola, the mother of Keōpūolani and Kiwalaʻō, the defeated chief of Hawaiʻi.
1717	Complex	Habitation	6	Inventory	703104	2335316	Tomonari-Tuggle 1990	Site consists of one enclosure, two terraces, two piles, and one alignment.
1718	Complex	Habitation	3	Inventory	703010	2335297	Tomonari-Tuggle 1990	Site includes two terraces and one pile.
1719	Complex	Agriculture, Habitation	5	Inventory	703019	2335359	Tomonari-Tuggle 1990	Site includes two enclosures, one pile and two alignments.
1720	Complex	Agriculture, Habitation	12	Inventory	703136	2335487	Tomonari-Tuggle 1990	Site includes three semi-enclosures, three terraces, one pile, three alignments, and two walls.
1721	Wall/Auwai	Water	2	Inventory	703217	2335176	Tomonari-Tuggle 1990	Site consists of two walls. Sites 1721 and 1722 are believed to have served as erosion control structures but construction date is uncertain.
1722	Complex	Boundary, water	1	Inventory	703246	2335008	Tomonari-Tuggle 1990	Sites 1721 and 1722 are believed to have served as erosion control structures but construction date is uncertain.
1723	Modified Outcrop	Unknown	1	Inventory	703361	2335310	Tomonari-Tuggle 1990	Site consists of one modified outcrop.
1724	Complex	Agriculture	3	Inventory	703300	2335304	Tomonari-Tuggle 1990	Site consists of one pocket terrace, one pile and one alignment.
1725	Wall and Stone Mound	Unknown	2	Inventory	703296	2335261	Tomonari-Tuggle 1990	Site consists of one pile and one wall.
1726	Semi-Enclosure	Habitation	1	Inventory	703459	2335453	Tomonari-Tuggle 1990	Site consists of one semi-enclosure.
1727	Semi-Enclosure	Habitation	1	Inventory	703568	2335567	Tomonari-Tuggle 1990	Site consists of one semi-enclosure.
1728	Complex	Agriculture, Habitation	15	Inventory	703675	2335466	Tomonari-Tuggle 1990	Site consists of three enclosures, four semi-enclosures, four terraces, one pile, one alignment and two walls.
1729	Mounds	Agriculture?	3	Inventory	703606	2335203	Tomonari-Tuggle 1990	Site consists of three mounds.
1730	Mounds	Agriculture	1	Inventory	703652	2335175	Tomonari-Tuggle 1990	Site consists of one wall.
1731	Irrigation Flume		1	Preservation, data recovery	703664	2335271	Tomonari-Tuggle 1990 Bush *et al.* 2001	Site constructed as an irrigation ditch used by homesteaders in the 1920s. Mitigation of the eastern-most portion of this site changed from preservation to data recovery in order to accommodate lot preparation for lessees (Lot 93). As a result, a backhoe trench was dug to record stratigraphy.
1732	Mound	Unknown	1	Inventory	703760	2335054	Tomonari-Tuggle 1990	Site consists of one mound.
1733	Historic Scatter	Habitation	1	Inventory	703618	2334969	Tomonari-Tuggle 1990	Site is an historic habitation site with historic scatter.
1734	Stone Mound and Alignment	Agriculture	2	Inventory	704138	2335132	Tomonari-Tuggle 1990	Site consists of one stone mound and one alignment.
1735	Wall	Unknown	1	Inventory	703725	2334994	Tomonari-Tuggle 1990	Site consists of a wall.

SIHP No. 50-60-03-xxxx	Description	Possible Function	No. of Features	Reported Current Status	Easting	Northing	Report Author	Notes
1736	Modified Outcrop	Unknown	1	Inventory	703665	2334973	Tomonari-Tuggle 1990	Site consists of a modified outcrop.
1737	Boulder Concentration	Habitation	1	Inventory	703601	2335092	Tomonari-Tuggle 1990	Site consists of placed boulders.
1738	Mound Complex	Agriculture	6	Inventory	704039	2334770	Tomonari-Tuggle 1990	Site consists of six mounds.
1739	Mound	Unknown	1	Inventory	704098	2334720	Tomonari-Tuggle 1990	Site consists of one mound.
1740	Complex	Habitation	1	Data recovery complete	704157	2334822	Tomonari-Tuggle 1990 Bush *et al*.2001	Site includes one semi-enclosure and three mounds.
1741	Complex	Habitation	7	Data recovery complete	704429	2334664	Tomonari-Tuggle 1990 Bush *et al*.2001	Site includes one enclosure, three semi-enclosures and two platforms.
1742	Platform	Habitation	2	Data recovery complete	704489	2334673	Tomonari-Tuggle 1990 Bush *et al*.2001	Site was previously believed to be a possible *heiau* in 1990, however after further investigation by CSH in 2001, it was recorded as an historic water tank platform made of stone. Other feature is still designated as temporary habitation.
1743	Mound Complex	Agriculture	5	Data recovery complete	704250	2334537	Tomonari-Tuggle 1990 Bush *et al*.2001	Site includes five mounds.
1745	Mound	Agriculture	1	Data recovery complete	703987	2334373	Tomonari-Tuggle 1990 Bush *et al*.2001	Site consists of one stone mound
1746	Enclosure Complex	Agriculture	1	Data recovery complete	704216	2335013	Tomonari-Tuggle 1990 Bush *et al*.2001	Site consists of one large enclosure with interior alignments.
1747	Enclosure Complex	Agriculture	1	Data recovery complete	704144	2334567	Tomonari-Tuggle 1990 Bush *et al*.2001	Site is a large enclosure, defined by stacked rock walls.
1748	Enclosure	Habitation	1	Data recovery complete	704331	2334554	Tomonari-Tuggle 1990 Bush *et al*.2001	Site consists of low, tumbled down enclosing walls built off of bedrock boulders.
1750	Complex	Agriculture	6	Data recovery complete	703731	2334571	Tomonari-Tuggle 1990 Bush *et al*.2001	Site consists of mounds and one modified outcrop.
1751	Terrace and Mound	Agriculture	1	Data recovery complete	703845	2334449	Tomonari-Tuggle 1990 Bush *et al*.2001	Site is made of one terrace retaining wall.
1752	Complex	Habitation	1	Data recovery complete	703916	2334491	Tomonari-Tuggle 1990 Bush *et al*.2001	Only site in the project area with complex construction. Also, charcoal samples, substantial amount of midden, and the presence of numerous lithic artifacts indicate a prehistoric to early historic occupation.
1753	Complex	Historic Habitation, Burials	4	Preservation	703452	2334483	Tomonari-Tuggle 1990 Bush *et al*.2001	Two coffin burials were encountered. An accepted burial treatment plan approved preservation in place with an appropriate buffer. Site appears to have been used in several different phases, from pre-Contact to modern. Carbon dating analyses indicates a presence as early as A.D. 790-1030 but also includes dates of A.D. 1800 to present. A coastal *heiau* mentioned by Summers may have been located in the vicinity but was destroyed to build the pier at Kaunakakai.

In 1983, Tomonori-Tuggle performed a reconnaissance survey of an access road corridor for an upland Kalama'ula water tank (Tomonori-Tuggle 1983). Three sites were located during this survey. The first site (Site -800) consists of a complex of walls, terraces, enclosures, and cairns located at the nose of a low ridge forming the west boundary of one of the larger, dry gulches of the *ahupua'a*. This site covers an area of approximately 3.16 acres, mostly situated on a steep slope of the ridge sides between 130 and 150 feet above sea level. Site -801, which is located on the eastern side of the low ridge which forms the west boundary of a large, dry gulch in Kalama'ula, is comprised of seven cairns and a short, amorphous wall. This site covers approximately 0.11 acres (450 sq m) at about an elevation of 160 ft. The final site (Site -802), was described as a well constructed, boulder-faced, cobble-core historical cattle wall that had has been bisected by the dirt road leading from Kalaniana'ole Colony to the water tank, ca. 125 m (410 ft) *mauka* of the old gate separating the homesteads from the community pasture area. Several years later, Athens (1985) mapped the sites and performed six test excavations at Site -800, an enclosure and terrace complex – originally recorded by Tomonori-Tuggle (1983). Site -801 was also revisited. Athens found additional features at Site -800 and cultural deposits in the site that were very likely prehistoric.

A large brush fire in 1988 prompted a one-day field inspection by Estioko-Griffin (1988) of a large portion of the DHHL subdivision. Numerous sites were located and described. Estioko-Griffin (1988) recorded 21 sites within the DHHL Kalama'ula subdivision. From this inspection, an inventory survey was recommended. Subsequently, an archaeological inventory survey of approximately 300 acres in the *ahupua'a* of Kalama'ula was undertaken for the Department of Hawaiian Home Lands in the fall of 1989 (Tomonari-Tuggle 1990). A total of 54 sites were identified and mapped and two previously recorded sites (No. 50-60-03-800 and -802) were re-surveyed (Tomonari-Tuggle 1983; Athens 1984, 1985) (Figure 3). Features in 16 sites were test excavated. Coastal sites were described as being low intensity agriculture, short-term, low intensity, and intermittent habitation in nature. Identified sites were located within 75 of the 184 residential lots surveyed. Over a decade later, Bush et al. (2001) conducted data recovery on the Kalama'ula Residence Lots (Unit I), which is covered the eastern half of the area studied by Estioko-Griffin (1988) and Tomonori-Tuggle (1990). Detailed mapping and excavation of sites -1731, -1740, -1743, -1745, -1748, and -1751 through -1753. Sites were found to be largely temporary habitation or agricultural from the pre-Contact to historic era. Artifacts consisted of a variety of lithics, tools, fishing gear, and manuports. Midden, in the form of various marine shell, bone, and *kukui* were also collected from most sites excavated. In addition, two coffin burials were discovered in Site -1753, which were preserved in place (Bush et al. 2001).

Located on DHHL lands are two lots (TMK 2-5-2-012 and 030) that were extensively studied by Dye (1998). The historic Kaunakakai School House (Site 50-60-06-1661) is located on these lots, which was built in the early 1920s. Also within this property is a pre-Contact petroglyph gallery and limestone quarry (Site 50-60-06-1660) that has at least five anthropomorphic, zoomorphic, and geometric petroglyphs as well as three major quarry features. Both sites exhibit traditional and historic features. During the 1996 survey of the entire lot, 29 surface features were identified, 17 of which were traditional, 10 were historic, and two were undetermined. Traditional features included stone mounds, U-shaped enclosure, enclosure, modified outcrop, cobble paving, stone terrace, and earthen terrace. Mapping and testing of the features was performed in 1997, where nine features were mapped and three controlled test

excavations, two test trenches, shovel test pit, and eight backhoe trenches were performed. The test excavation in Site -1660 revealed numerous cultural layers and features such as hearths. The excavations also yielded a variety of traditional cultural materials, such as a perforated pig tooth, bone pick, hammerstone, volcanic glass, and basalt debitage as well as bone and shell midden. Also retrieved from the test units were three historic artifacts. Excavations in Site -1661 to determine the nature of some mound features, particularly to indicate the presence or absence of human remains. No burials were encountered. Some historic artifacts were found, but no traditional artifacts.

Possible clearance mounds accompany the terrace. The second site consists of a stacked stone wall situated on a high point of the ridge above the stream between two large natural outcrops. The wall is located ca. 90 m east of the first and measures 1 m long and 0.4 m tall. These sites were not mapped, photographed, nor given site numbers.

Cordy (2000) surveyed a large area just *mauka* of DHHL Lands on east side of Kalamaʻula. Nine new sites were identified in the upland end of the survey area and two previously identified sites were further examined. Site -996, identified as a notched enclosure, possible small *heiau*, originally found by Collins (1994), lies less than 1300 ft east north-east of lands. Site -2448 is a complex that lays ca. 2500 feet to the east of the project area and is comprised of a rectangular enclosure with a separate paving area, stone mound, and a rectangular mound. This site is interpreted as a field shelter.

Several archaeological investigations have been performed in the ʻŌhiʻapilo Wetlands, which is located less than 100 m south of several DHHL residential lots (Shapiro et al. 1993; Denham et al. 1998; and Roberts et al. 2000). A total of 8 core samples were retrieved from several areas in ʻŌhiʻapilo Pond (Site 50-60-03-891) by Shapiro (1993), where the stratigraphic profile of the pond was observed through these samples. No evidence of the pond being manmade or altered for use as a fish pond was found during this study, however, a single volcanic glass flake was found.

In 1998, Denham et al. (1998) performed paleoenvironmental investigations for the ʻŌhiʻapilo Wetland Enhancement project, which entailed excavating a stratigraphic test trench and auguring 13 sediment cores in the area of ʻŌhiʻapilo Pond. The pollen, diatom, and shell within the excavated and extracted sediments provided general paleoenvironmental data to uphold the previously determined configuration of pond features, such as walls and alignments. Although some charcoal flecking was observed, no artifacts, midden, or datable charcoal were observed. A few years later, Roberts et al. (2000) performed archaeological monitoring, in which additional data about ʻŌhiʻapilo Pond was obtained and a historic railroad grate was discovered (Site -2441).

6.0 METHODS

The archaeological survey was conducted during four separate phases: between October 24-26, 2011, between November 13-16, 2012, between September 21-30, 2015, and between November 9-13, 2015. Paul L. Cleghorn, Ph.D., served as Principal Investigator with James McIntosh, B.A., Kimberley Mooney, B.A., Reid Yamasato, B.A., Caleb Fechner, B.A., and Brendan Cote, B.A., conducting the field survey. The survey crew was assisted in the field by Bill South, Larry Sagario, and John Ocampo of the Department of Hawaiian Home Lands.

The four separate phases of archaeological investigations were necessary due to project changes to the proposed improvements to the DHHL water system. Archaeological investigations for this project consisted of pedestrian surface survey and formal documentation of identified archaeological sites, as well as subsurface test excavations at several sites in order to clarify site function and age.

During the first phase of investigations, the initial pedestrian survey was conducted. At that time the project area consisted of five discontinuous project areas. GIS shape files supplied by PBR Hawaiʻi were initially used to guide the survey team in the project areas and were loaded onto a handheld Trimble GeoXH global positioning system (GPS) unit used by the field crew. Mr. Larry Sagario greatly assisted the survey team by indicating the areas where the buried pipelines were located. The space between the archaeologists during the surface survey varied depending on vegetation and terrain. Portions of the project areas were fenced in areas in which the team walked the entire area to identify any surface sites. Other portions of the project areas were long corridor shaped areas, with no physical boundary demarcations. As a result in these areas, the team spread out ca. 30-35 m (ca. 100 feet) apart, to provide ample coverage of the corridor. Vegetation density was low in most areas and consisted mostly of trees making it easy to see under the vegetation canopy. The archaeologists surveyed each area moving from east to west through the property. When an archaeological site was encountered, it was assigned a temporary site number (i.e., T-001) and it was flagged with labeled pink flagging.

During the second phase of fieldwork, the previously identified sites were formally recorded, mapped, and photographed. Basic measurements (length/width/height) were recorded for each feature along with construction methods and materials. The location of each site was recorded with the Trimble GeoXH gps unit. Representative photographs were taken with a digital camera documenting construction techniques and site condition.

In addition, two sites were excavated during the second phase of fieldwork in order to provide additional information on the possible age, chronology, and function of the site. All soil was screened through ¼" mesh screen and any cultural material identified was collected. Each stratigraphic soil layer was described following USDA nomenclature and Munsell color notations. Documentation also included digital photographs of each layer and level. Upon completion of each excavation, at least one wall of the test unit was drawn in profile. When documentation of the test unit was complete, the unit was backfilled with the same material excavated from the test unit.

Due to project changes to the proposed improvements to the DHHL water system, a third phase of archaeological investigations was required. This third phase consisted of an additional pedestrian survey of a total of seven discontinuous project areas. GIS shape files were again supplied by PBR Hawai'i to guide the survey team in the project areas and were loaded onto a handheld Trimble GeoXH gps unit used by the field crew. Again, the space between the archaeologists during the surface survey varied depending on vegetation and terrain. Portions of the project areas were fenced in areas in which the team walked the entire area to identify any surface sites. Other portions of the project areas were long corridor shaped areas, with no physical boundary demarcations. As a result in these areas, the team spread out ca. 30-35 m (ca. 100 feet) apart, to provide ample coverage of the corridor. Vegetation during the third phase of fieldwork was drastically different from the previous phases. Due to an increase in precipitation over the previous several months, vegetation throughout the seven project areas was extremely dense and overgrown. As during the previous survey, all newly identified archaeological sites were recorded in detail.

During the fourth phase of archaeological fieldwork, two additional sites were excavated in order to provide additional information on the possible age, chronology, and function of the sites. All soil was screened through ¼" mesh screen and any cultural material identified was collected. When documentation of the test unit was complete, the unit was backfilled with the same material excavated from the test unit.

All field records (descriptions, notes and photographs) and recovered cultural materials (artifacts, midden, etc.) resulting from the inventory survey were transported to Pacific Legacy's O'ahu laboratory for processing, identification and detailed analysis. Analysis of recovered materials included sorting, cleaning, identifying, measuring, labeling, and temporary curation. No human bone was recovered from the test excavation.

7.0 FIELD INVESTIGATIONS

7.1 Survey Results

The current archaeological inventory survey identified a total of 14 previously unidentified archaeological sites and relocated three previously recorded sites within the project areas (Table 5, Table 6, and Figure 5). In addition, one isolated find was also identified. The findings summarized in this section are organized by project area.

Table 5. New Archaeological Sites Identified During Inventory Survey

Site No. (50-60-03-xxxx)	Site Type	Function	Period
2516	Platform	Habitation	Pre-Contact or early post-Contact
2517	Enclosure	Windbreak/Hunting Blind	Historic
2518	Mound	Agriculture	Pre-Contact or early post-Contact
2519	Mounds (n=3)	Agriculture	Pre-Contact or early post-Contact
2520	Concrete Water Trough	Ranching	Historic
2521	Concrete Tank Stands	Ranching	Historic
2565	Terraces (n=3)	Habitation	Pre-Contact or early post-Contact
2566	Terrace	Agriculture	Historic
2567	Modified Outcrop	Habitation	Pre-Contact or early post-Contact
2568	Alignment	Stone Tool Production	Pre-Contact or early post-Contact
2569	Stone Edged Depressions (n=5)	Military Training	Historic Military
2570	Concrete slab	Ranching	Historic
2571	Bridge Foundations (n=2)	Transportation	Historic
2572	Artifact Scatter	Stone Tool Production	Pre-Contact or early post-Contact

Note: SIHP – State Inventory of Historic Places

Table 6. Previously Recorded Archaeological Sites Identified During Inventory Survey

Site No. (50-60-03-xxxx)	Site Type	Function	Period
800	Complex	Habitation/Agriculture	Pre-Contact or early post-Contact
801	Cairns	Possible Burials	Pre-Contact or early post-Contact
802	Wall	Ranching	Historic

Note: SIHP – State Inventory of Historic Places

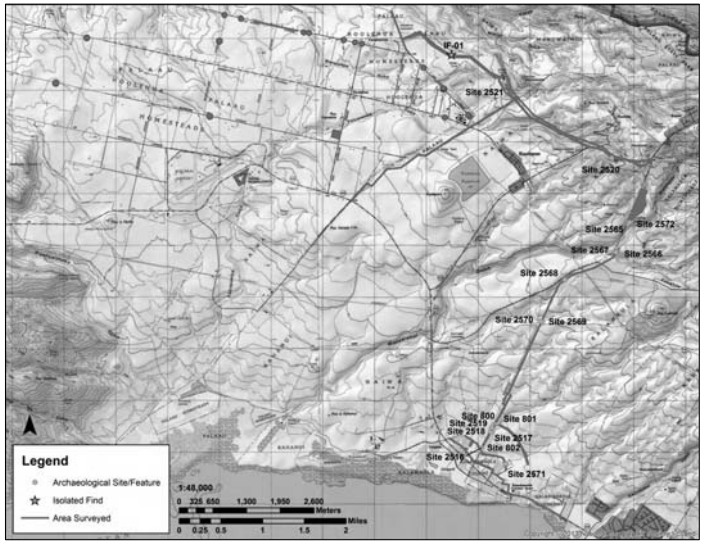

Figure 5. Archaeological sites identified during inventory survey.

7.1.1 Project Area 1 - Well Site Improvements

A small portion of Project Area 1 consists of a small fenced-in parcel, ca. less than 1 acre in size containing a 0.1 MG tank, two wells, two booster pumps and a corrugated metal shed (Figure 6 and Figure 7). No date of construction has been established for the shed which measures ca. 6 m long, 5 m wide and 4 m high and was likely used as an old pump house (Figure 8). No traditional archaeological sites are present within this parcel.

The main portion of Project Area 1 consists of a 25-acre area identified for a one-megawatt solar system by DHHL (Figure 9 and Figure 10). A total of two new archaeological sites were identified during the survey of Project Area 1 (1-F Energy System Modifications) located in Kalama'ula. Both sites are situated at the southwest end of the 25-acre area (Figure 11).

Figure 6. Project Area 1, wells, booster pumps and generators (view south).

Figure 7. Project Area 1, well locations and tank (view north).

Figure 8. Project Area 1, corrugated metal shed (view west).

Figure 9. Overview of northern portion of Project Area 1 (1-F Energy System Modifications) (view south).

Figure 10. Overview of southern portion of Project Area 1 (1-F Energy System Modifications) (view south).

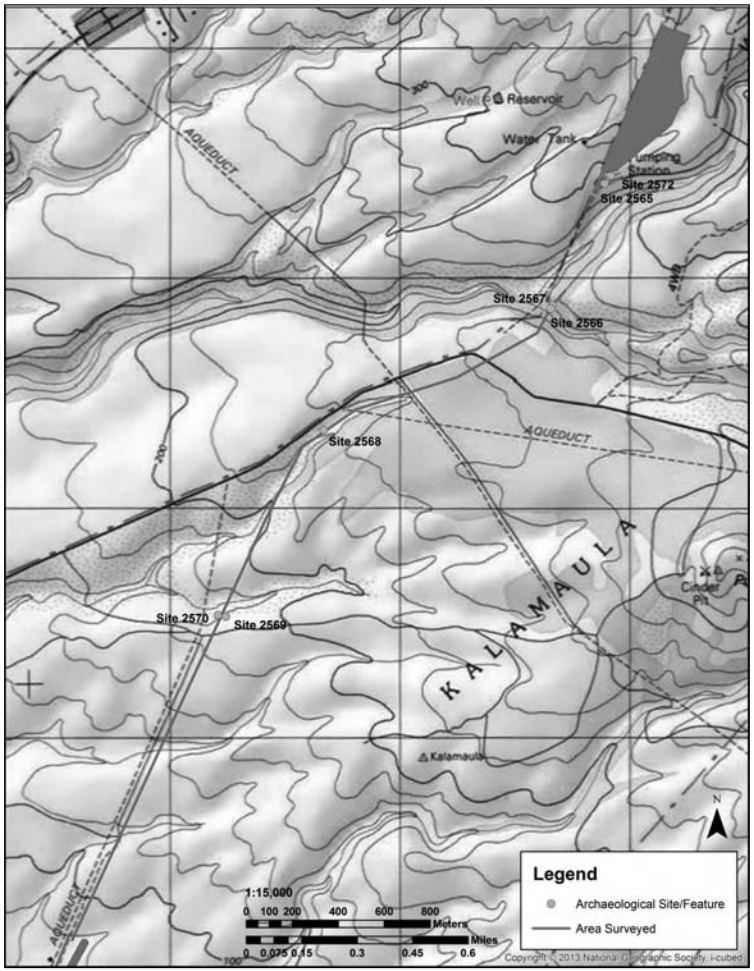

Figure 11. Archaeological sites identified within Project Area 1 and northern portion of Project Area 2.

7.1.1.1 Site 50-60-03-2565

Site 2565 consists of a small complex of three terraces located on the southwest slope of a ridge situated at the southwest end of Project Area 1 (1-F Energy System Modifications) in Kalamaʻula (Figure 12). The site is located between two barb wire fences that converge to form a point demarcating the southwest end of Project Area 1. The terraces are situated on an approximately 28˚ southwest facing slope ca. 40 m upslope to the northeast of the gulch floor. Vegetation in the area consists of Christmas berry, *kukui*, and *wiliwili* trees, lantana, and a variety of grasses. The site tag is located on the southeast end of the Feature A, terrace.

Feature A consists of a stone terrace with stone retaining wall located on the north side of Site 2565 approximately 7.0 m northeast (47˚) of Feature B (Figure 13). Feature A is the largest and most formal of the three terraces. The stone retaining wall is roughly L-shaped and is constructed of small to medium subangular and rounded basalt boulders and large cobbles that have been loosely stacked between one to three courses in height along the southeast and southwest edges of the terrace. The northeast and northwest edges of the terrace blend into the hillside. The interior surface of the terrace consists of an uneven stone fill constructed of small subangular and rounded basalt boulders and medium to large cobbles. Feature A measures ca. 3.4 m long (northwest to southeast) by 2.5 m deep (northeast to southwest) and 0.6 m high along the southwest edge. Feature A is in fair condition, but portions of the stone retaining wall have partially tumbled down slope. A piece of rusted metal wire is located at the southeast end of the terrace. No other cultural material was observed. Feature A appears to have functioned as a traditional pre-Contact or early post-Contact habitation feature based on the traditional style of construction and proximity of the feature in regards to the ridgeline and nearby gulch.

Feature B consists of a small soil terrace with stone retaining wall located 7.0 m southwest (227˚) of Feature A (Figure 14). The stone retaining wall is roughly linear in shape and is constructed of small to medium subangular and rounded basalt boulders and large cobbles that have been loosely stacked between one to three courses in height along the west edge of the terrace. The east edge of the terrace blends into the hillside. The interior surface of the terrace consists of slightly eroded soil that gently slopes to the south. Feature B measures ca. 1.7 m long (north to south) by 1.0 m deep (east to west) and 0.6 m high along the west edge. The terrace is in fair to poor condition. Portions of the stone retaining wall have partially tumbled down slope. Feature B appears to have functioned as a traditional pre-Contact or early post-Contact agricultural feature, likely utilized for the planting of traditional crops based on the traditional style of construction and proximity of the feature in regards to the ridgeline and nearby gulch.

Feature C consists of a small stone terrace with stone retaining wall located ca. 2.5 m southeast (110˚) of Feature B (Figure 15). A barbed wire fence that is oriented roughly northeast to southwest is located ca. 4.0 m east of the terrace. The stone retaining wall is roughly linear in shape and is constructed of small to medium subangular and rounded basalt boulders and large cobbles that have been loosely stacked between one to two courses in height along the southwest edge of the terrace. The northeast edge of the terrace blends into the hillside. The interior surface of the terrace consists of an uneven stone fill constructed of small subangular and rounded basalt boulders and medium to large cobbles. A rough stone alignment is located at the rear of the stone fill ca. 1.2 m from the face of the terrace. The alignment is oriented east to west and consists of subangular and rounded basalt cobbles. The alignment measures ca. 1.6

m in length and marks the rear of the stone fill. Feature C measures ca. 2.7 m long (northwest to southeast) by 1.5 m deep (northeast to southwest) and 0.3 m high along the southwest edge. The terrace is in fair condition, but portions of the stone retaining wall have partially tumbled down slope. A medium sized Christmas berry tree is growing out of the west end of the terrace. Feature C also appears to have functioned as a traditional pre-Contact or early post-Contact agricultural feature, likely utilized for the planting of traditional crops based on the traditional style of construction and proximity of the feature in regards to the ridgeline and nearby gulch.

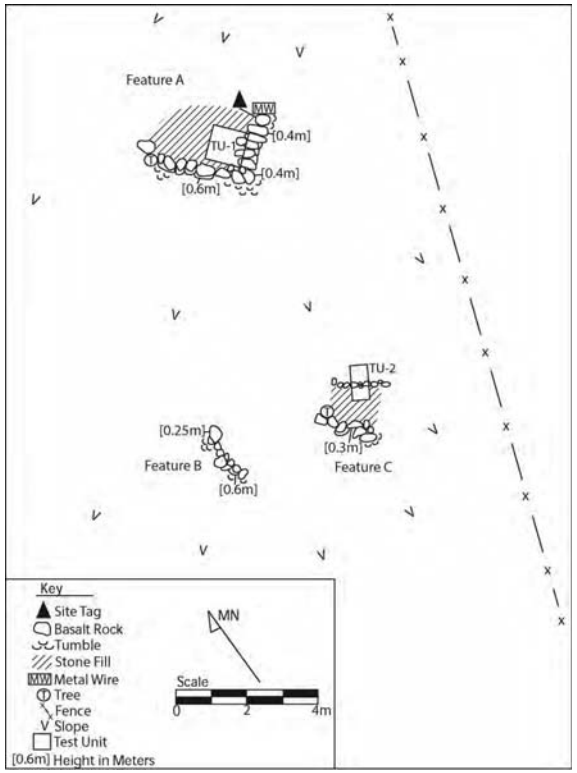

Figure 12. Plan view map of Site 2565.

Figure 13. Site 2565, Feature A, terrace (view east).

Figure 14. Site 2565, Feature B, terrace (view east).

Figure 15. Site 2565, Feature C, terrace (view northwest).

7.1.1.2 Site 50-60-03-2572

Site 2572 consists of a traditional surface artifact scatter located along a ridge top situated at the southwest end of Project Area 1 (1-F Energy System Modifications) in Kalamaʻula (Figure 16, Figure 17, Figure 18). A barbed wire fence with a metal gate runs northeast to southwest through the site. The vegetation along the top of the ridge is relatively sparse and mostly consists of grass, lantana, and a few unidentified trees. Vegetation on the slopes of the ridge is much denser and includes Christmas berry and *kukui* trees. The site tag is located in the western portion of the site within the densest concentration of traditional artifacts.

Site 2572 consists of a traditional artifact scatter including a variety of basalt and volcanic glass artifacts. The basalt artifacts identified consist of one broken basalt adze (collected) (Figure 19, Figure 20, Figure 21), two basalt hammerstones (collected) (Figure 22, Figure 23, and Figure 24, Figure 25), two basalt flakes with polish (collected) (Figure 26, Figure 27, and Figure 28, Figure 29), numerous basalt flakes, and unmodified water worn basalt cobbles and pebbles. The basalt flakes range in size from 1.3-7.5 cm long by 0.7-4.9 cm wide by 0.2-3.0 cm thick. The volcanic glass artifacts identified consist of a volcanic glass core, and numerous volcanic glass flakes and shatter. The volcanic glass flakes range in size from 0.6-2.1 cm long by 0.3-1.3 cm wide by 0.1-0.8 cm thick. A particularly dense concentration of artifacts is located near the western end of the site. Despite the amount and variety of traditional artifacts at Site 2572, no stone structural

features were identified. The artifact scatter measures approximately 90 m long (northeast to southwest) by 22 m wide (northwest to southeast). Table 7 summarizes the artifacts collected from Site 2572.

Site 2572 is in fair condition. Site 2572 appears to have functioned as an activity area during the pre-Contact period. The types of artifacts observed at Site 2572 suggest that the site was specifically utilized for the production of both basalt and volcanic glass stone tools.

Table 7. Artifacts Collected from Site 2572

Artifact	Length (cm)	Width (cm)	Thickness (cm)
Broken Basalt Adze	7	4	1.75
Basalt Hammerstone (A)	6.5	3.5	2.2
Basalt Hammerstone (B)	10	6.8	3.5
Basalt Flake with Polish (A)	2.1	1.7	0.9
Basalt Flake with Polish (B)	1.8	2.2	0.5

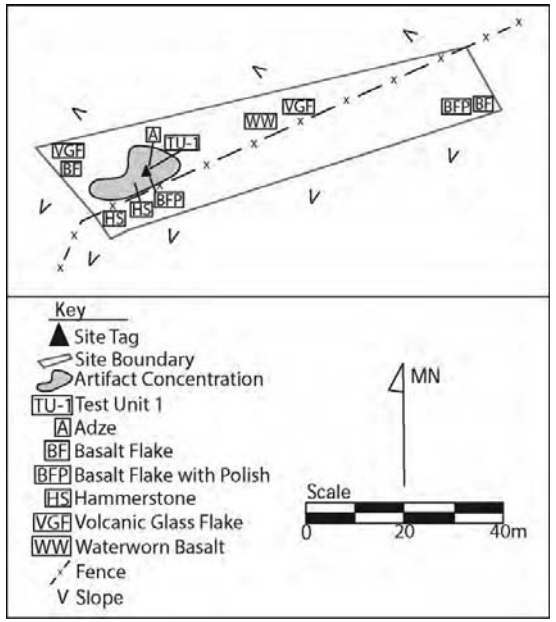

Figure 16. Plan view map of Site 2572.

Figure 17. Site 2572 (view southwest).

Figure 18. Site 2572 (view east).

Figure 19. Site 2572, Broken Basalt Adze, front.

Figure 20. Site 2572, Broken Basalt Adze, back.

Figure 21. Site 2572, Broken Basalt Adze, side.

Figure 22. Site 2572, Basalt Hammerstone (A).

Figure 23. Site 2572, Basalt Hammerstone (A).

Figure 24. Site 2572, Basalt Hammerstone (B).

Figure 25. Site 2572, Basalt Hammerstone (B).

Figure 26. Site 2572, Basalt Flake with Polish (A).

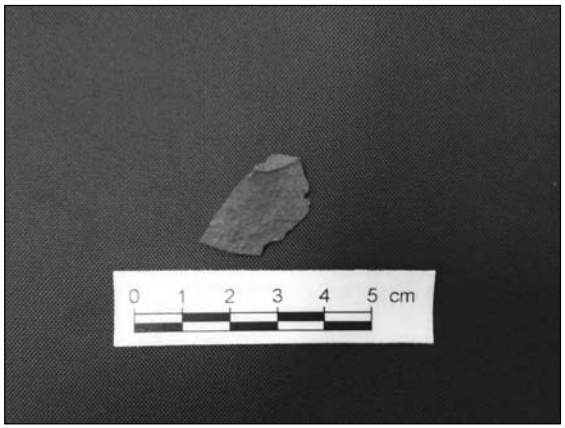

Figure 27. Site 2572, Basalt Flake with Polish (A).

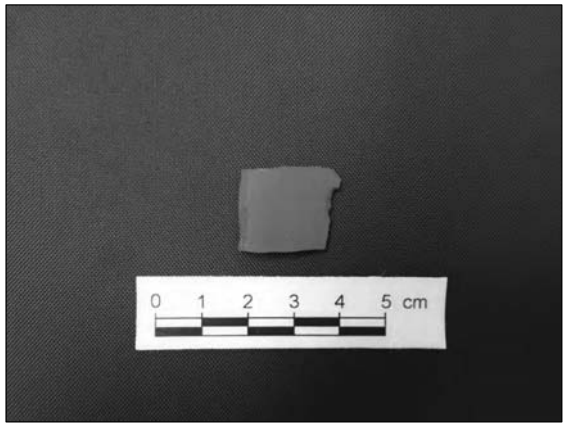

Figure 28. Site 2572, Basalt Flake with Polish (B).

Figure 29. Site 2572, Basalt Flake with Polish (B).

7.1.2 Project Area 2- Kalamaʻula Improvements

The main portion of Project Area 2 consists of a long linear corridor that extends *mauka/makai* (Figure 30 and Figure 31). The southern portion of the corridor extends along an existing dirt road that provides access to an existing water tank at Kalamaʻula. The topography of the area is gently rolling hills containing abundant soil but is quite rocky. At the southern end a second corridor extends along another dirt road to the east. The second corridor is also a dirt road that extends to the east. This road connects to the existing DHHL homes on Kahiwa Street. The area appears to have been partially cleared in the past perhaps for the establishment of DHHL house lots. Several surveyors' pins were observed during the survey which may represent property pins. The southernmost portion of Project Area 2 consists of active and abandoned residential streets and a segment of Mauna Loa Highway identified for water system improvements (Figure 32 and Figure 33).

A total of 10 new archaeological sites were identified during the survey of Project Area 2 (2516 through 2519 and Site 2566 through 2571), along with three previously recorded sites (800 – 802) (Figure 11 and Figure 34). The abandoned pipeline that formerly operated from the Kalamaʻula tank was also documented, but was outside of the project area and not recorded. The pipeline is cast iron pipe measuring ca. 4 inches in diameter extending *mauka/makai* on the ground surface. It is not known when the pipeline was constructed or abandoned; however, there were a series of concrete blocks placed over segments of the pipe likely to secure it. On one of the blocks the concrete was inscribed with the date "Dec 10, 1940" (Figure 35). It can be safely stated that the pipeline construction predates the 1940 date and was abandoned later.

Figure 30. Overview of northern portion of Project Area 2 (view west).

Figure 31. Overview of central portion of Project Area 2 (view north).

Figure 32. Overview of southern portion of Project Area 2 (view west).

Figure 33. Overview of southern portion of Project Area 2 (view west).

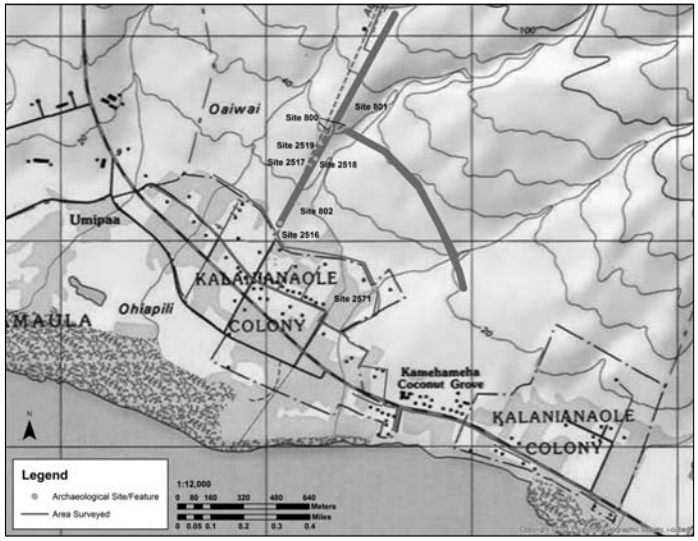

Figure 34. Archaeological sites identified within the southern portion of Project Area 2.

Figure 35. Concrete block securing abandoned iron waterline inscribed with the date "Dec 10, 1940" with an "X".

7.1.2.1 Site 50-60-03-2516

Site 2516 is a roughly rectangular stone filled and stone edged platform located on the west side of the dirt access roadway along the *makai* end of the survey at Haʻena Street (Figure 36, Figure 37). This small platform measures 3.5 m long, 2.8 m wide, and 0.7 m high. It is constructed of stacked basalt, small to medium, sub-angular boulders and is filled with small to large sub-angular basalt cobbles. Two large waterworn cobbles are on the surface of the platform. No artifacts, midden or human skeletal remains were observed. The terrain is gently to level areas of open soil areas with large basalt boulders scattered throughout the terrain. Vegetation consists of *kiawe* trees and fountain grass. Nearby evidence of modern use consists of recent trash and debris. A test unit was placed in the stone platform to determine its function. The results of the excavation are presented below in Section 7.2.

Figure 36. Site 2516, stone platform (view east).

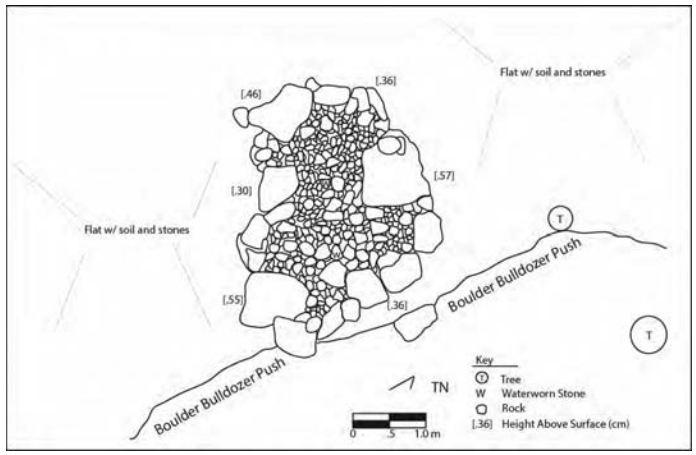

Figure 37. Plan view map of Site 2516.

7.1.2.2 Site 50-60-03-2517

Site 2517 is a low, irregular shaped enclosure constructed of basalt boulders and incorporating natural basalt outcropping (Figure 38, Figure 39). The site is situated on a low-flat rise located ca. 12 m west of the *mauka/makai* dirt access road. Overall, the site measures 8.8 m long, 3 m wide and ca. 0.4 m high. The walls are loosely stacked medium sized sub-angular basalt cobbles and boulders between one and two courses in height which forms an irregular shaped enclosure. The function of the site is not determined, however, given the sites poor construction, location on the ridge and the number of deer tracks in the vicinity, it would serve well as a windbreak or hunting blind. A cast-iron waterline is located 3 m to the west of the site. No artifacts, midden or human remains were observed.

Figure 38. Site 2517, windbreak or possible hunting blind (view northwest).

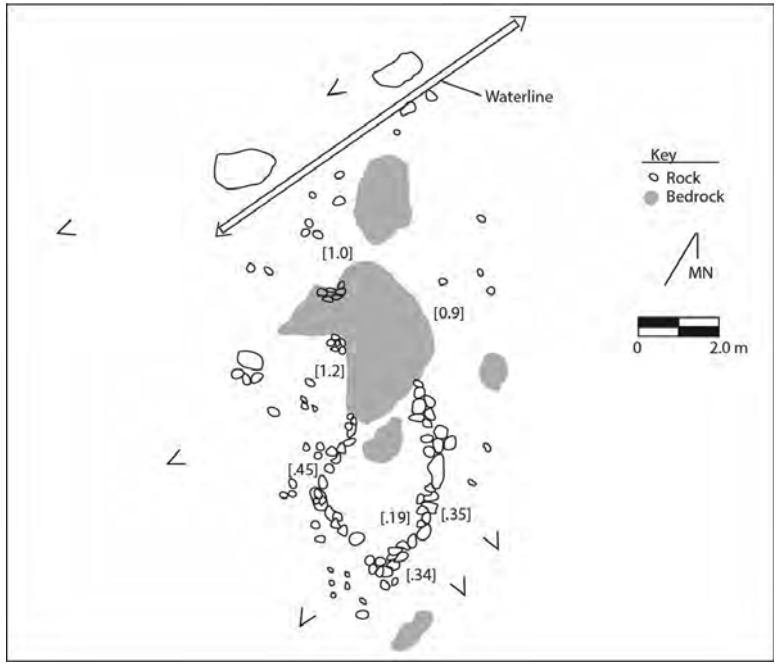

Figure 39. Plan view map of Site 2517.

7.1.2.3 Site 50-60-03-2518

Site 2518 is a small stone mound located midway upslope along the existing *mauka/makai* dirt road (Figure 40 and Figure 41). The ground surface in the vicinity consists of exposed bedrock and small areas of soil. The mound is roughly oval shaped and is situated 5.0 m west of the dirt access road. It measures 1.9 m long, 1.6 m wide and 0.50 m high. No surface cultural material was observed in the area. The mound is constructed of loosely piled small to medium subangular basalt boulders and is in fair condition. No artifacts, midden or human skeletal remains were observed. The age of construction is unknown and the mound most likely functioned as a clearing mound.

Figure 40. Site 2518, stone mound (view north).

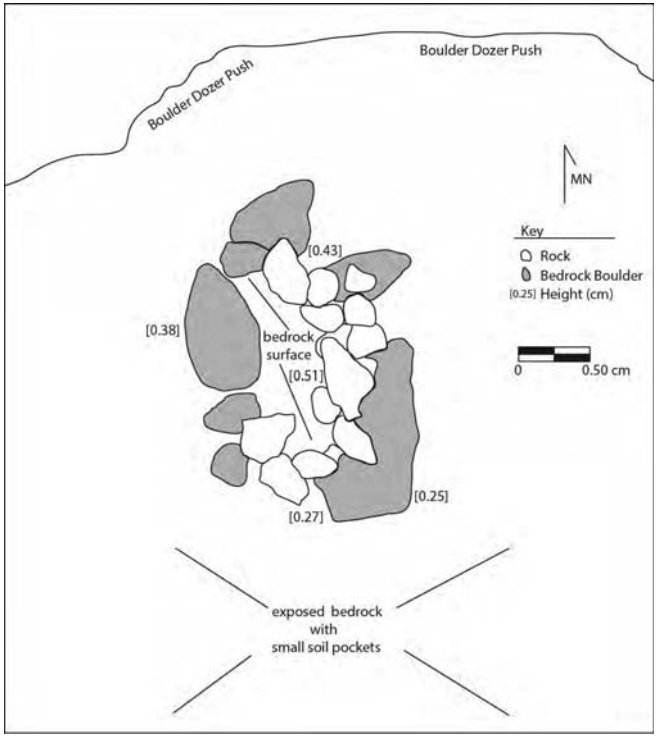

Figure 41. Plan view map of Site 2518.

7.1.2.4 Site 50-60-03-2519

Site 2519 is comprised of three stone mounds located to the west of the *mauka/makai* dirt road and approximately 100 m south of Site 800, previously recorded by Tuggle (Figure 42). The site is situated on a low flat rocky ridge with pockets of soil. Each mound is constructed of sub-angular basalt cobbles and boulders piled on bedrock.

Feature A is roughly circular in shape and measures 1.2 m long, 1.0 m wide and 0.55 m high (Figure 43). Two pieces of charred wood was present on top of the features indicating the area had previously been burned. A test unit was placed in Feature A to determine its function. The results of the excavation are presented below in Section 7.2.

Feature B is a roughly circular small stone mound located ca. 4.5 m at 321° from Feature A (Figure 44). It measures 1.0 m by 0.85 m and is 0.55 m high.

Feature C is a small roughly circular stone mound located approximately 3.5 m at 200° from Feature B. It measures 1.1 m long, 1.1 m wide and 0.37 m high. There is a small amount of stacking (2 courses) along the east side of the feature.

All features are in relatively poor condition. No artifacts, midden or human remains observed in the area. These mounds are likely clearing mounds.

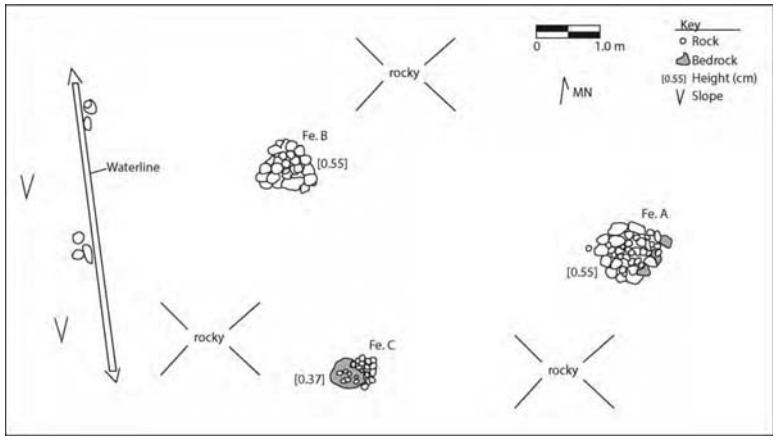

Figure 42. Plan map of Site 2519.

Figure 43. Site 2519, Feature A, stone mound.

Figure 44. Site 2519, Feature B, stone mound.

7.1.2.5 Site 50-60-03-800

Site 800 (Figure 45 and Figure 46) was originally recorded by Tomonari-Tuggle (1983) for a roadway corridor study. This site consists of two large enclosures, walls, terraces and cairns covering ca 3.16 acres (Tomonari-Tuggle 1983:9) located atop a low ridge. Site 800 was interpreted as a possible residential and/or agricultural complex. This site was located within the proposed road corridor and mapping and excavations were one of the recommendations by Tomonari-Tuggle as mitigation for the proposed road. Athens (1985) subsequently returned to the site and mapped and excavated six units within the site. He identified pre-Contact deposits at the site.

Figure 45. Site 800 (view north).

7.1.2.6 Site 50-60-03-801

Site 801 was also identified by Tomonari-Tuggle for the same project mentioned above, however, it was outside of the proposed road corridor (Figure 46, Figure 47, Figure 48). Located immediately uphill from Site 800, this site contained "seven cairns and a short amorphous wall" (Tomonari-Tuggle 1983:13) covering ca. 0.11 acres. Site 801 was interpreted as a possible burial complex. Tomonari-Tuggle recommended mapping for the site but no excavations. Athens (1985) subsequently mapped the site.

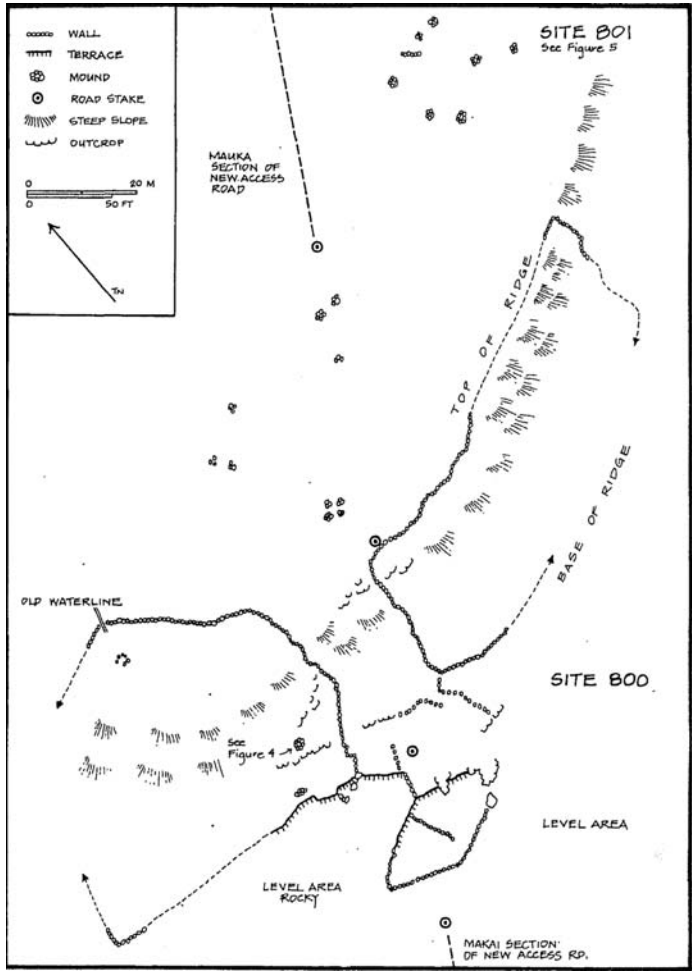

Figure 46. Sites 800 and 801 site map as recorded by Tomonari-Tuggle (1983). Note location of proposed *mauka/makai* roadway at time of recording.

Figure 47. Site 801, stone mounds (view east).

Figure 48. Site 801, stone mounds (view south).

7.1.2.7 Site 50-80-06-802

This site consists of a large well-constructed wall extending roughly parallel to the slope and measuring ca. 125 m in length, 0.5 m high and 1.0 m high (Figure 49, Figure 50, and Figure 51). The wall is constructed of faced basalt boulders with cobble fill. The wall was bisected by the existing dirt road. Site 802 was interpreted as a cattle wall and no further work was recommended since the wall had already been impacted by a dirt roadway.

Figure 49. Site 802, cobble filled cattle wall (view west).

Figure 50. Previously documented Site 802 (view southeast).

Figure 51. Site 802, close-up of wall segment (view south).

7.1.2.8 Site 50-60-03-2566

Site 2566 consists of a single soil terrace with a long linear stone retaining wall located on the floor of a tributary of Kuhuaawi Gulch situated at the north end of Project Area 2 (2-B Kalamaʻula Transmission Main and Lateral Replacements) in Kalamaʻula (Figure 52, Figure 53, Figure 54). The terrace is located approximately 16 m down slope to the southwest (205˚) of the Site 2567, modified outcrop. Site 2566 is situated on the northeast side of the bottom of the gulch approximately 1.5 m above the streambed floor. The terrace is oriented roughly northwest to southeast running parallel to the stream. Vegetation in the area consists of *koa haole*, *kukui*, *wiliwili*, and Christmas berry trees, lantana, and a variety of grasses. The site tag is located on the northwest end of the terrace.

The stone retaining wall is constructed of small to large subangular and rounded basalt boulders set and loosely stacked between one to two courses in height. In some areas the retaining wall incorporates basalt outcrops. The northwest end of the terrace terminates at a basalt outcrop, while the southeast end of the retaining wall resembles more of an alignment and blends into the soil slope with no distinct end. The northeast edge of the terrace blends into the hillside. The interior surface of the terrace consists of slightly eroded soil that gently slopes to the northwest. There are several stones laying on the surface of the terrace, but these appear to have tumbled down from the hillside. Overall, the terrace measures ca. 26.5 m long (northwest to southeast) by 3.0 m deep (northeast to southwest) and 0.6 m high along the southwest edge.

A modern aluminum kettle with a bake-light handle was found near the center of the terrace. The base of the kettle is embossed with "ALUMINUM WHISTLING TEA KETTLE, 2 ½ QT., MADE IN THE U.S.A." The kettle does not appear to be contemporaneous with the terrace. No other cultural material was observed. Site 2566 is in fair condition. The alignment of stones forming the retaining wall of the terrace is clearly visible, although many of the stones appear to have tumbled down slope.

Site 2566 appears to have functioned as an agricultural terrace constructed and utilized during the historic period based on the relatively large size and style of construction.

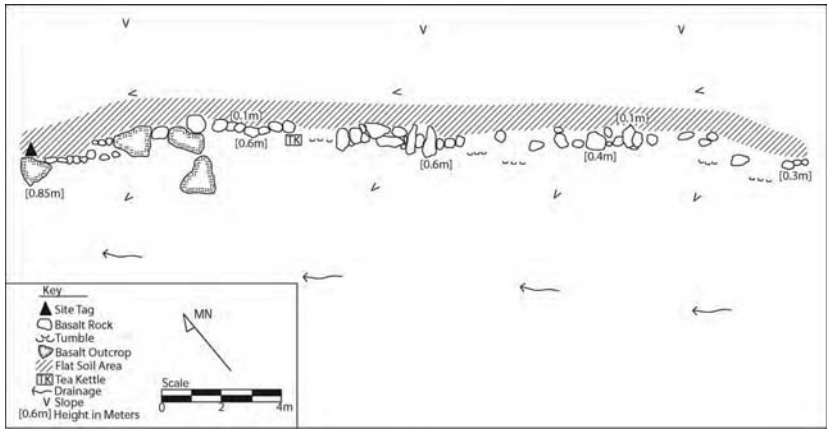

Figure 52. Plan view map of Site 2566.

Figure 53. Site 2566, overview of terrace (view west).

Figure 54. Site 2566, terrace (view north).

7.1.2.9 Site 50-60-03-2567

Site 2567 consists of a small modified outcrop located on the north side of a tributary of Kuhuaawi Gulch situated at the north end of Project Area 2 (2-B Kalamaʻula Transmission Main and Lateral Replacements) in Kalamaʻula (Figure 55, Figure 56). The modified outcrop is located approximately 16 m upslope to the northeast (25˚) of the Site 2566, terrace. Site 2567 is situated on an approximately 40˚ southwest facing slope ca. 20 m above the bottom of the gulch. There are several other basalt outcrops in the vicinity and there is also a large basalt cliff face located ca. 10 m upslope to the north. Vegetation in the area consists of *koa haole*, *kukui*, *wiliwili*, and Christmas berry trees, lantana, and a variety of grasses. The site tag is located at the center of the modified outcrop.

The modified outcrop consists of a large basalt outcrop with a large subangular basalt boulder situated on top. At the northwest corner of the large boulder, a small alignment of small to medium basalt boulders extends to the northeast. The small area between the large boulder and the small alignment has been partially filled in with medium to large subangular basalt cobbles and several small subangular basalt boulders. The modified outcrop forms a small, relatively level area of soil immediately upslope to the northeast. Overall, the modified outcrop measures ca. 2.1 m long (northeast to southwest) by 1.6 m wide (northwest to southeast) and ranges in height between 0.2 m along the northwest edge to 2.2 m in maximum height from the ground

surface to the top of the large basalt boulder at the southwest edge of the feature. The small flat soil area located immediately upslope from the outcrop measures ca. 1.0 m long by 1.0 m wide.

No cultural material was observed at Site 2567. The modified outcrop is in fair condition. The majority of the modified outcrop appears to be intact, although it is likely that several stones have tumbled down slope.

Site 2567 appears to have functioned as a traditional pre-Contact or early post-Contact temporary habitation feature based on the style of construction and proximity of the feature in regards to the nearby gulch. The modified outcrop was likely constructed in order to modify the natural hillside to form a small relatively level area for temporary occupation.

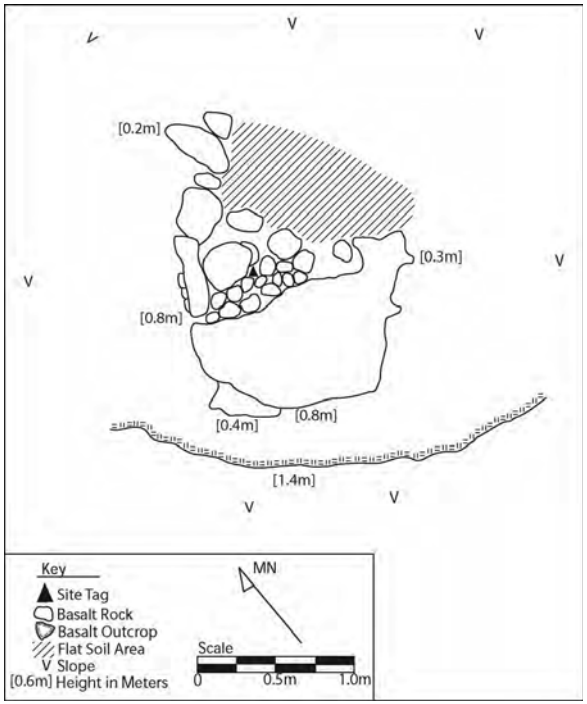

Figure 55. Plan view map of Site 2567.

Figure 56. Site 2567, modified outcrop (view east).

7.1.2.10 Site 50-60-03-2568

Site 2568 consists of a stone alignment located towards the north end of Project Area 2 (2-B Kalamaʻula Transmission Main and Lateral Replacements) in Kalamaʻula (Figure 57, Figure 58, Figure 59). The alignment is located on the west side of a north to south running gulch approximately 35 m southeast of a dirt access road. The alignment is situated on an exposed basalt outcrop located ca. 20 m above a dry streambed. The surrounding area consists of a gentle to moderate (20˚) south facing slope with areas of eroding and decaying basalt rocks and outcrops. Vegetation in the area consists of a variety of low grasses and scattered *kiawe* trees. The site tag is located at the east end of the stone alignment.

The stone alignment is situated on top of an exposed bedrock outcrop. The outcrop measures ca. 10.5 m long (east to west) by 6.3 m wide (north to south). The alignment is oriented roughly east to west and consists of approximately 17 flat basalt slabs. It measures ca. 3.0 m in overall length. The basalt slabs range in size from ca. 0.17 to 0.44 m long by 0.13 to 0.32 m wide by 0.03 to 0.07 m thick. A small area to the north of the alignment appears to have been cleared of stone and debris for ca. 0.8 m. Approximately 1.0 m north of the alignment are the remnants of what may have been a second parallel stone alignment, although it is too jumbled and inconsistent to record as an alignment.

A variety of both traditional and historic cultural material was observed at Site 2568. A basalt core (A) is located ca. 1.7 m north of the alignment (Figure 60). The core measures ca. 0.07 m long by 0.06 m wide by 0.06 m thick. At least three flake scars are visible on the surface of the core. A second basalt core (B) is located ca. 2.0 m south of the alignment (Figure 61). This core measures ca. 0.09 m long by 0.06 m wide by 0.03 m thick. At least three flake scars are visible on the surface of the core. Approximately 1.7 m southeast of the second basalt core is a basalt flake situated at the base of the outcrop. The flake measures ca. 0.08 m long by 0.07 m wide by 0.01 m thick. Cortex is visible on the dorsal surface of the flake. Also scattered around the outcrop are several dense basalt water worn pebbles and cobbles. None of these show any signs of battering indicating use as a hammerstone, but several are broken. No other water worn stones were observed in the vicinity. In addition, several historic clear glass bottle fragments are located upslope to the north of the alignment, although it is unlikely that they are directly associated with the alignment.

Site 2568 appears to have functioned as an activity area during the pre-Contact or early post-Contact period. The function of the alignment may have been to provide a break or gap in the activity areas. The types of traditional artifacts observed suggest that the site was specifically utilized for the production of basalt stone tools.

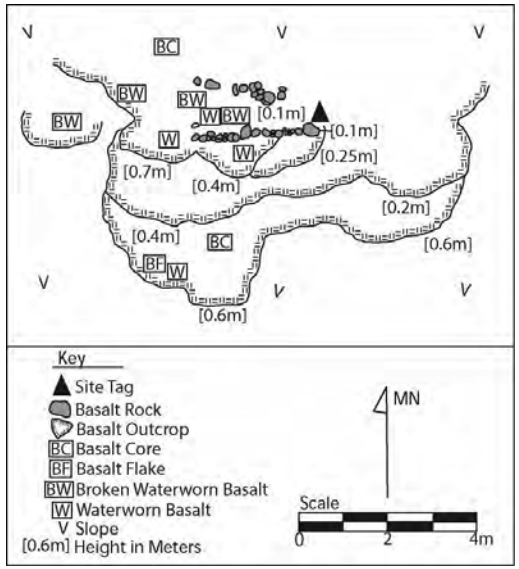

Figure 57. Plan view map of Site 2568.

Figure 58. Site 2568, alignment (view east).

Figure 59. Site 2568, alignment (view northwest).

Figure 60. Site 2568, Basalt Core (A).

Figure 61. Site 2568, Basalt Core (B).

7.1.2.11 Site 50-60-03-2569

Site 2569 consists of five stone edged depressions located on the south side of a small gulch towards the north end of Project Area 2 (2-B Kalamaʻula Transmission Main and Lateral Replacements) in Kalamaʻula (Figure 62). The site is situated at the top of a north facing (20°) slope. The depressions are all roughly situated along the same contour line near the top of the slope. Vegetation in the area consists of a variety of low grasses and scattered *kiawe* and *koa haole* trees. The site tag is located at the north edge of Feature A.

Feature A consists of a stone edged depression located at the east edge of Site 2569 (Figure 63). The soil depression is edged with basalt cobbles that have been stacked between two to three courses high. The center of the depression consists of mostly soil although several cobbles have tumbled in. Feature A measures ca. 3.8 m long (east to west) by 2.8 m wide (north to south). Along the exterior, Feature A measures ca. 0.65 m high. The interior of the depression measures ca. 0.6 m deep. At least 17 fired blank shell casings are located down slope just outside the depression to the north. These shell casings are marked with "LCG8" and "LCC8" on the bottom. Just outside the depression to the southeast are two chain fed clips with unspent blank rounds (Figure 64). These are labeled with "LC86" on the base. Feature A appears to have been constructed during the historic military period for training purposes.

Feature B consists of a small stone edged depression located ca. 6.0 m southwest of Feature A (Figure 65). The depression is edged with basalt cobbles and small basalt boulders between one to three courses high. The interior consists of soil with several cobbles that have tumbled in. The feature measures ca. 2.2 m long (east to west) by 2.1 m wide (north to south). Along the exterior, Feature B measures ca. 0.3 m high. The interior of the depression measures ca. 0.5 m deep. A single *kiawe* tree is growing out of the northeast side of the feature. No shell casings or other cultural material was observed at this depression. Feature B appears to have been constructed during the historic military period for training purposes.

Feature C consists of a shallow stone edged depression located ca. 6.0 m southwest of Feature B (Figure 66). The depression is edged with basalt cobbles and small basalt boulders between one to two courses high. The interior consists of soil with several cobbles that have tumbled in. The feature measures ca. 2.1 m long (east to west) by 2.0 m wide (north to south). Along the exterior, Feature C measures ca. 0.3 m high. The interior of the depression measures ca. 0.1 m deep. Several fired shell casings were found outside of the depression. Feature C appears to have been constructed during the historic military period for training purposes.

Feature D consists of a stone edged depression located ca. 8.0 m west of Feature C (Figure 67). The depression is edged with basalt cobbles and small basalt boulders between three to four courses high. The interior edge of the rear southeastern wall is well constructed. The interior consists of soil with several cobbles that have tumbled in. Feature D measures ca. 3.3 m long (east to west) by 3.0 m wide (north to south). Along the exterior, Feature D measures ca. 0.55 m high. The interior of the depression measures between ca. 0.5 to 1.0 m deep. Several fired and unfired shell casings were observed within the interior of the depression. Feature D appears to have been constructed during the historic military period for training purposes.

Feature E consists of a stone edged depression located ca. 10.0 m southwest of Feature D, at the southwest edge of Site 2569 (Figure 68). The depression is edged with basalt cobbles and small to medium basalt boulders between one to three courses high. The interior consists of soil with several cobbles that have tumbled in. Feature E measures ca. 3.0 m long (east to west) by 2.5 m wide (north to south). Along the exterior, Feature E measures ca. 0.35 m high. The interior of the depression measures ca. 0.7 m deep. Several fired shell casings were observed within the interior of the depression. Feature E appears to have been constructed during the historic military period for training purposes.

Site 2569 is in fair condition overall. The only cultural material observed consisted of both fired and unfired shell casings. All of the shell casings appear to be similar in origin and markings and are all blanks indicating historic military training use. Site 2569 appears to have functioned as a military training area constructed and utilized during the historic military period.

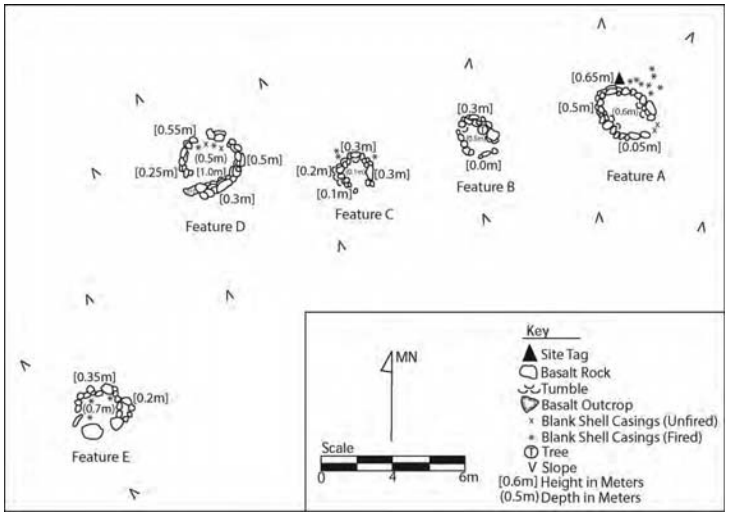

Figure 62. Plan view map of Site 2569.

Figure 63. Site 2569, Feature A, stone edged depression (view south).

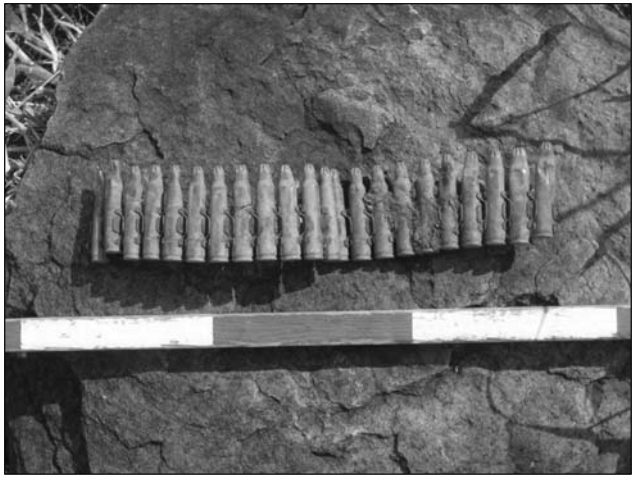

Figure 64. Site 2569, Feature A, close up of unfired blank shell casings.

Figure 65. Site 2569, Feature B, stone edged depression (view southeast).

Figure 66. Site 2569, Feature C, stone edged depression (view northeast).

Figure 67. Site 2569, Feature D, stone edged depression (view southeast).

Figure 68. Site 2569, Feature E, stone edged depression (view northeast).

7.1.2.12 Site 50-60-03-2570

Site 2570 consists of a single rectangular concrete slab located on the south side of a small gulch towards the north end of Project Area 2 (2-B Kalamaʻula Transmission Main and Lateral Replacements) in Kalamaʻula (Figure 69, Figure 70). The site is located approximately 20 m down slope to the northwest from Site 2569. The concrete slab is situated on a north facing (20˚) slope ca. 7 m east of an existing ranch access road. Vegetation in the area consists of variety of low grasses and scattered *kiawe* and *koa haole* trees. The site tag is located at the southeast corner of the concrete slab.

Overall, the concrete slab measures ca. 6.1 m long (northeast to southwest) by 4.27 m wide (northwest to southeast) and 0.1 m thick. The concrete slab is relatively flat with a shallow trough-like drain along the northwest edge that measures ca. 0.2 m wide by 0.05 m deep. This shallow trough flows into a separate perpendicular concrete drainage trough that flows down hill to the northwest and measures ca. 1.0 m long by 0.3 m wide and 0.09 m deep (Figure 71). Overtime, water flowing down this concrete drainage has created a large hole in the ground at the base of the soil slope measuring ca. 1.0 m in diameter and 1.6 m deep. There are no markings indicating a date of construction or specific function of the concrete slab. The presence of the trough-like drains and the location of the site only ca. 7 m east of an existing ranch access road suggest that the function of the concrete slab is likely related to cattle ranching in the vicinity. Site 2570 is located on land currently leased by the Cattle Association.

Site 2570 is in fair condition. The edges of the slab are partially broken and overgrown with vegetation, but overall the slab and drainage features are relatively intact. No cultural material was observed at Site 2570. The concrete slab is likely associated with historic cattle ranching (animal husbandry) in the area and was constructed and utilized during the historic period.

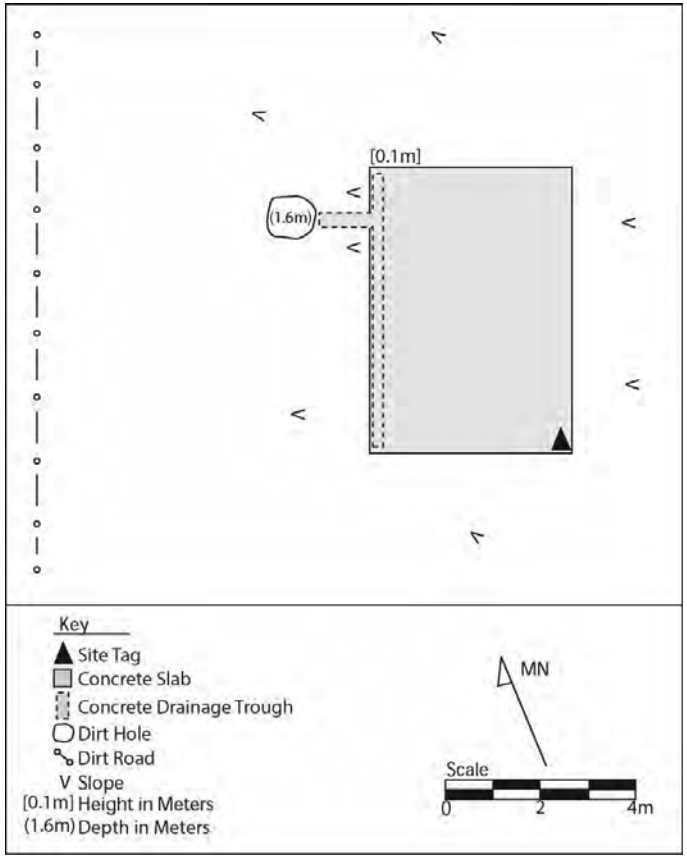

Figure 69. Plan view map of Site 2570.

Figure 70. Site 2570, concrete slab (view northeast).

Figure 71. Site 2570, concrete drainage trough (view south).

7.1.2.13 Site 50-60-03-2571

Site 2571 consists of two mortared basalt bridge foundations located in a small shallow drainage situated at the south end of Project Area 2 (2-B Kalamaʻula Transmission Main and Lateral Replacements) in Kalamaʻula (Figure 72). The site is located approximately 4 m southwest of an existing dirt access road. Vegetation in the area consists of a variety low grasses and scattered *kiawe* and *koa haole* trees. The site tag is located at the southwest end of Feature A.

Feature A consists of a mortared basalt bridge foundation located along the north side of the small drainage (Figure 73). Feature A is the larger of the two foundations and is constructed of rounded basalt boulders and cobbles set in place with mortar. The eastern end of Feature A curves to the north. Overall, Feature A measures ca. 4.8 m long. The base of the foundation measures ca. 0.58 m wide and the top measures ca. 0.4 m wide. Feature A measures ca. 1.4 m in maximum height along the southern edge. On the top surface of the foundation are two vertical metal bars with screw threads and bolts on top. These bars measure ca. 0.27 m high and were likely used to secure wood planks.

Feature B consists of a mortared basalt bridge foundation located on the south side of the small drainage ca. 8.3 m southeast of Feature A (Figure 74). It is constructed of rounded basalt boulders and cobbles set in place with mortar. Feature B measures ca. 2.0 m long. The base of the foundation measures ca. 0.50 m wide and the top measures ca. 0.4 m wide. Feature B measures ca. 1.1 m in maximum height at the western end. Like Feature A, on the top surface of the foundation are two vertical metal bars with screw threads and bolts on top. These bars measure ca. 0.27 m high and were likely used to secure wood planks. A portion of an old wooden fence is attached to the east side of Feature B.

Site 2571 is in fair condition and appears to be mostly intact. No cultural material was observed at the site. Site 2571 appears to have functioned as the foundation for a small bridge crossing the drainage. It was likely constructed and utilized during the historic period.

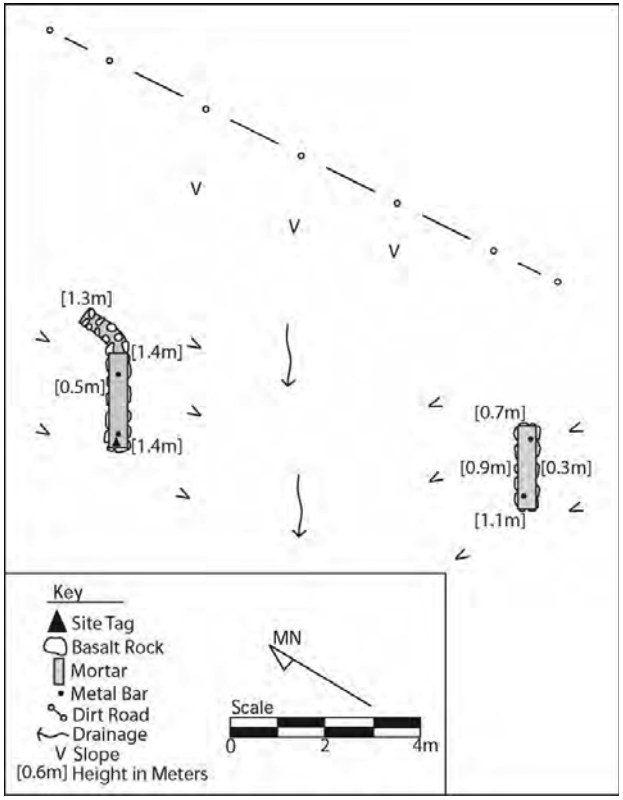

Figure 72. Plan view map of Site 2571.

Figure 73. Site 2571, Feature A, bridge foundation (view east).

Figure 74. Site 2571, Feature B, bridge foundation (view south).

7.1.3 Project Area 3 - Kauluwai Tank and Transmission Improvements
Project Area 3 is comprised of a ca. 2.08 mile long (11,000 linear feet) corridor extending between the tank at Kauluwai and the tanks at Hoʻolehua (Figure 75, Figure 76, Figure 77). An unnamed gulch north of Kualapuʻu was crossed during the survey. Like much of the surrounding area, the gulch appears to have been utilized for pineapple cultivation or perhaps small scale farming by the plantation works.

During the Project Area 3 survey, two new archaeological sites were identified within the proposed corridor, Site 2520 (a water trough) and Site 2521 (concrete tank stands) (Figure 78).

Figure 75. Overview of eastern portion of Project Area 3 (view west).

Figure 76. Overview of central portion of Project Area 3 (view north).

Figure 77. Overview of central portion of Project Area 3 (view west).

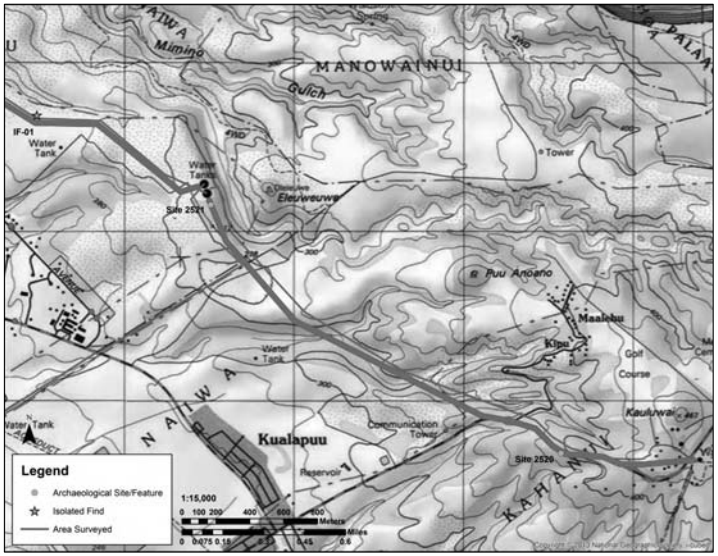

Figure 78. Archaeological sites identified in Project Area 3.

7.1.3.1 Site 50-60-03-2520

Site 2520 is a concrete watering trough located on the south side of Kalae Highway (Figure 79, Figure 80) and situated on a flat level area within a stand of ironwood trees. The trough measures 5.0 m long, 0.85 m wide, and 0.42 m high with the walls measuring 0.12 m thick. The trough was fed by a 1 inch galvanized steel pipe on the northeast corner. Although no date of construction has been established for this site, given the construction style and techniques, it appears that the site dates from mid-1900. It is in fair to good condition. The active DHHL 8-inch waterline is 2 m to the south of the feature.

Figure 79. Site 2520, historic cattle trough (view west).

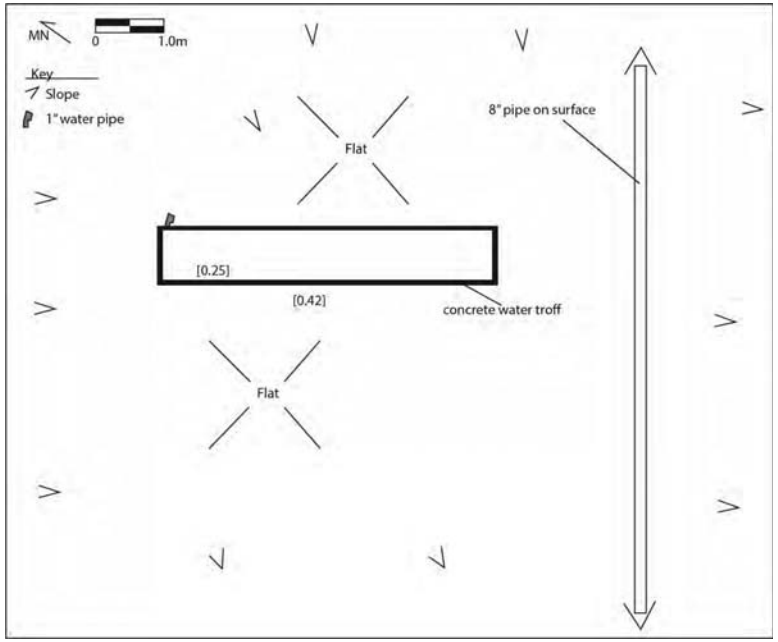

Figure 80. Plan view map of Site 2520.

7.1.3.2 Site 50-60-03-2521

Site 2521 is a series of long concrete stands (Figure 81, Figure 82, Figure 83, Figure 84) that were used to support water tanks that formerly existed in the area. The concrete stands resemble concrete parking barricades which, according to Mr. Larry Sagario, were stands that were used to support wooden water tanks that formerly existed on the area. Four separate sets of tank stands were recorded a short distance from the now existing 3.5 MG tanks at Hoʻolehua. Each set of stands measures ca. 5.0 m long, 3.7 to 5.9 m wide, and 0.3 m wide. It is not known when these stands were constructed but were likely abandoned after the larger Hoʻolehua tanks became operational in the 1930s.

Figure 81. Site 2521, concrete tank stands.

Features A and B each contains five concrete stands while Feature C has four and Feature D has six. It would appear that one of the stands from Feature C was moved approximately 3.0 m to the west and is now situated within Feature D. Four concrete blocks (each measuring 0.4 X0.5 m in size) is present within the center of the features. The blocks appear to have been disturbed and form no clear pattern or function.

Figure 82. Site 2521, concrete tank stands as reported by Mr. Larry Sagario.

Figure 83. Site 2521, concrete tank stands, view to east.

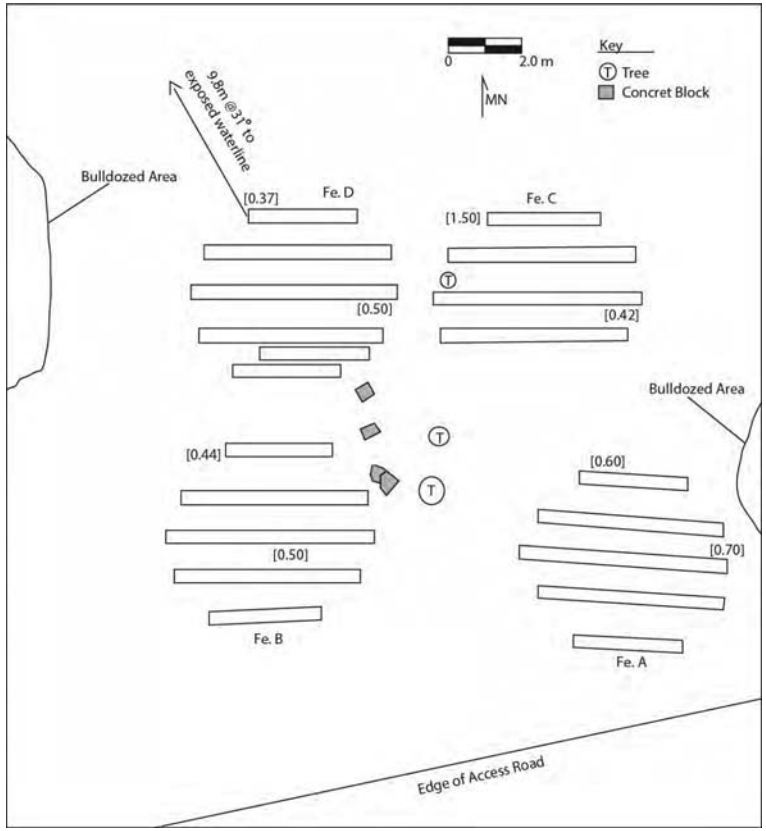

Figure 84. Plan view map of Site 2521.

7.1.4 Project Area 4 - Hoʻolehua Tank Site Improvements

A portion of Project Area 4 consists of a large fenced in parcel containing two massive, 3.5 MG concrete tanks (Figure 85, Figure 86, Figure 87). The tanks were constructed in the 1930s and supply water to the greater Hoʻolehua area (Hoʻolehua Homesteads). Given their approximate age, the tanks appear to be in good condition and serve the important function of supplying water to the Hoʻolehua area. No traditional archaeological sites were observed during the surface survey of Project Area 4.

Figure 85. Entryway and ladder separating the two 3.5 MG tanks.

Figure 86. Two 3.5 MG tanks located within Project Area 4.

Figure 87. Roof of the 3.5 MG tank at Hoʻolehua.

Figure 88. Overview of southwestern portion of Project Area 4 (view northeast).

7.1.5 Project Area 5- Hoʻolehua Transmission and Fire Protection Improvements

Project Area 5 is comprised of a ca. 2 miles (11,000 linear feet) long stretch between the Hoʻolehua tanks, the Veteran's Cemetery, and Lihi Pali Avenue. This area was heavily disturbed by agricultural activities. Evidence of plowing and tilling was easily seeing under the canopy of Christmas berry and assorted vegetation (Figure 89). Black plastic sheet remnants and water lines were regularly observed during the survey. According to Mr. Larry Sagario nearly the entire area between the Hoʻolehua tanks and the Veteran Cemetery was previously planted in pineapple. Several fences were crossed during the survey and although no cattle was observed, water troughs and above ground irrigation lines were observed indicating the area is presently used for cattle and/or pasture.

Although no traditional or historic archaeological sites were observed during the survey of Project Area 5, one isolated find (*ʻulu maika*) was identified (Figure 78).

Figure 89. Abandoned pineapple field furrows (view east).

7.1.5.1 Isolated Find 1
IF-1 consists of an isolated sandstone *ʻulu maika* located on the surface of an abandoned agricultural field situated along Project Area 5 (5-A Hoʻolehua to Veterans' Cemetery to Lihi Pali Avenue Transmission Main) (Figure 78) in Hoʻolehua (Figure 90, Figure 91, Figure 92, Figure 93).

The *ʻulu maika* is discoidal in shape and measures ca. 6.5 cm in diameter by 2.9 cm thick. Several fragments of the artifact have been broken off, but the overall shape is still clearly visible. The *ʻulu maika* was collected from the field.

No surface archaeological features were observed in the vicinity of IF-1. It is likely that if any archaeological site was present in the area, it was destroyed during the modification of the landscape for commercial agriculture. The *ʻulu maika* appears to have been manufactured and utilized during the pre-Contact or early post-Contact periods. Halealoha Ayau posits that this isolated find may be down slope of the traditional makahiki grounds known a Naiwa (pers. comm. 1/20/2016).

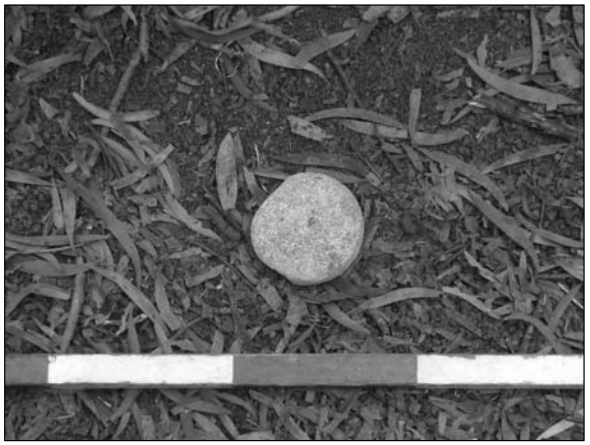

Figure 90. IF-1, close up of in situ *ʻulu maika*.

Figure 91. IF-1, *ʻulu maika*.

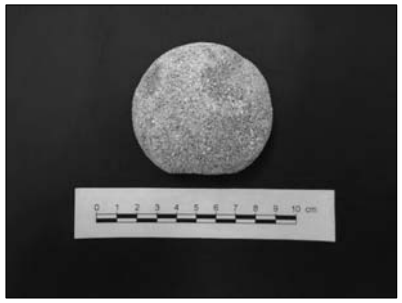

Figure 92. IF-1, *ʻulu maika*.

Figure 93. IF-1, *ʻulu maika*.

7.1.6 Project Area 6- Hoʻolehua Pressure Breaker Tank Facility Improvements
Project Area 6 consists of an approximately 1.5 mile (7, 920 linear feet) corridor extending from Farrington Highway to the intersection of Kūleʻa and Moʻomomi Avenue (Figure 94). Large portions of Project Area 6 consist of open pasture lands. No archaeological sites were identified during the survey of Project Area 6.

Figure 94. Overview of northeastern portion of Project Area 6 (view southwest).

7.1.7 Project Area 7- Hoʻolehua Maintenance Yard Improvements, and Scattered Valve and Hydrant Replacements
Project Area 7 consists of the Hoʻolehua Maintenance Yard and selected locations along active residential roads scattered throughout Hoʻolehu (Figure 95 and Figure 96).
No archaeological sites were identified during the survey of Project Area 7.

Figure 95. Overview of Hoʻolehua Maintenance Yard in Project Area 7 (view north).

Figure 96. One of the selected valve replacement locations in Project Area 7.

7.2 EXCAVATION RESULTS

Two test units were excavated at the newly identified sites; a 1 x 1 m unit was placed at Site 2516, Feature A (stone platform) and at Site 2519, Feature A (stone mound). Excavations were conducted at both sites in attempts to determine the function of each. The results for each are presented below.

7.2.1 Site 2516, Feature A, Test Unit 1

Test Unit 1 is a 1 x 1 m excavation placed within Feature A to determine the features function (Figure 97, Figure 98). Exaction began with the removal the feature fill or the rocks within the platform. A non-identifiable metal crown bottle cap was recovered beneath the first two courses of rocks that were removed. No other material was observed in the architectural fill.

Upon removing the rocks, excavation of soil began using a trowel and dustpan. All soil was screened through a ¼ inch mesh screen. Excavation continued using arbitrary 10 cm levels within the natural layers.

The first two levels of Layer I contained fragments of *kukui* nut (*Aleurites moluccana*), several fragments of non-weathered marine shell (Patellidae spp.), unidentifiable fish bone and non-human medium mammal bone, and coral fragments. No subsurface feature was present. Layer I, level 3 contained no cultural material. Likewise, no cultural material was recovered from Layer II.

Soil Descriptions

I	35-70 cmbs	Dark brown (7.5YR 3/4) silt, non-sticky, non-plastic; smooth boundary; moderate to weak peds; very fine granular structure; some few pebbles and cobbles, tree roots. Contains some cultural material within Levels 1 and 2.
II	69-92 cmbs	Brown (7.5YR 4/3) silt, non-sticky, non-plastic; smooth boundary; moderate to weak peds; very fine granular structure; few pebbles. Culturally sterile.

Figure 97. Site 2516, Test Unit 1, post-excavation (view east).

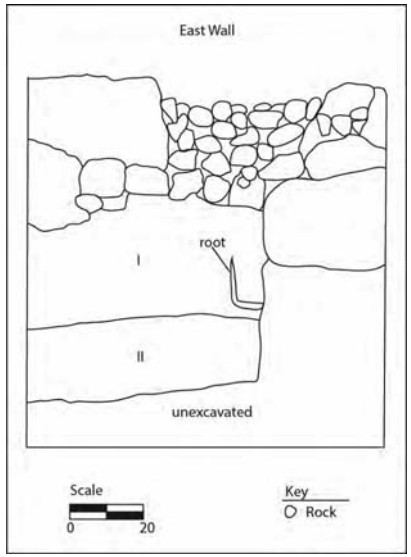

Figure 98. Soil profile of Site 2516, Test Unit 1.

7.2.2 Site 2519, Feature A, Test Unit 1
The excavation at Site 2519 consisted of the dismantling of Feature A (Figure 99). A string line was placed down the center of the feature and the east side was dismantled. The stone comprising the feature were piled directly on top of bedrock. A minimal amount of soil was recovered from amongst the rock fill. The soil collected was screened, no cultural material was recovered. The unit was terminated when excavation could no longer proceed through the bedrock. There was no soil profile to be recorded.

Figure 99. Site 2519, Feature A, Test Unit 1, pre-excavation (left) and post-excavation (right).

7.2.3 Site 2565, Feature A, Test Unit 1
Test Unit 1 consisted of a 1 m by 1 m excavation unit located on the southwest portion of the Site 2565, Feature A, stone terrace (Figure 100, Figure 101, Figure 102, Figure 103). The unit was oriented roughly northwest to southeast (330˚-150˚), but for ease of recording, the northwest unit wall was considered the north unit wall. The south edge of TU-1 abutted and slightly overlapped the interior of the southeast terrace wall in order to determine the construction of the wall itself. The west edge of TU-1 was located close to the interior of the southwest terrace wall, but did not abut it due to tumble of the wall. The datum for excavation was located at the northeast corner of the unit at 10 cm above surface.

Excavation was conducted using a trowel and dustpan. All of the excavated soil was screened through a ¼ inch mesh screen. The unit was excavated using arbitrary 5 cm levels within the natural layers.

The surface of TU-1 consisted almost entirely of an uneven stone fill including subangular and rounded basalt boulders and cobbles. The basalt was extremely weathered and brittle in nature. A small amount of grass, as well as small amounts of leaves and branches was also present on

the surface. No cultural material was observed on the surface of TU-1, although a piece of rusted metal wire was located just outside of the unit to the east.

Layer I consisted of a brown silty clay containing organic debris that filtered through the subangular and rounded basalt boulder, cobble, and pebble stone fill. No cultural material was encountered in Layer I, level 1 or level 2. Traditional cultural material began to be encountered in Layer I, level 3 and consisted of one basalt flake and several fragments of *kukui* nut shell (*Aleurites moluccana*). One of the *kukui* nut shell fragments was charred. Layer I, level 4 contained the majority of traditional cultural material recovered from TU-1 including one basalt core, six basalt flakes, one fragment of unidentified marine shell bivalve, fragments of *kukui* nut shell (*Aleurites moluccana*), and one charcoal sample. Layer I, level 5 contained the last of the traditional cultural material including three basalt flakes, fragments of *kukui* nut shell (*Aleurites moluccana*), and one charcoal sample. One of the fragments of *kukui* nut shell collected from Layer I, level 5 was submitted for radiocarbon dating in order to determine a date of occupation for the feature. The results of the radiocarbon dating are presented in Section 7.4. Layer I, level 6 through level 12 contained no cultural material, although one charcoal sample was collected from level 6. None of the charcoal samples were submitted for radiocarbon dating.

Layer II consisted of a yellowish brown silty clay containing subangular and rounded basalt cobbles and pebbles and decomposing basalt bedrock. No cultural material was collected from Layer II. Test Unit 1 terminated on top of decomposing bedrock at a maximum depth of ca. 96 cmbd.

Soil Descriptions

I	10-74 cmbd	Brown (10YR 4/3) silty clay; weak, very fine, granular structure; very friable, sticky, plastic consistency; abrupt, smooth boundary. Contains traditional cultural material.
II	68-96 cmbd	Yellowish brown (10YR 5/4) silty clay; weak, very fine, granular structure; very friable, sticky, plastic; contains decaying basalt bedrock. Culturally sterile.

Figure 100. Site 2565, Feature A, Test Unit 1, pre-excavation (view east).

Figure 101. Site 2565, Feature A, Test Unit 1, post-excavation (view east).

Figure 102. Site 2565, Feature A, Test Unit 1, post-excavation (view east).

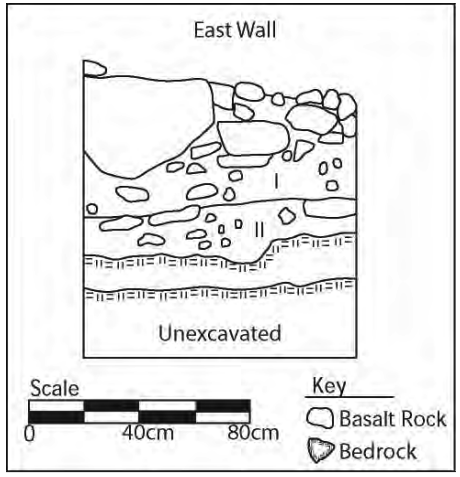

Figure 103. Soil Profile of Site 2565, Feature A, Test Unit 1

7.2.4 Site 2565, Feature C, Test Unit 2

Test Unit 2 consisted of a 1 m by 0.50 m excavation unit located on the central portion of the surface of the Site 2565, Feature C, stone terrace (Figure 104, Figure 105, Figure 106, and Figure 107). The unit is oriented roughly northeast to southwest (30˚-210˚), but for ease of recording, the northeast unit wall was considered the north unit wall. TU-2 bisected a small alignment of subangular and rounded basalt cobbles that ran roughly east to west across the center of the unit. The stone alignment marked the edge of the stone fill, so that the south half of the unit consisted of uneven stone fill including subangular and rounded basalt cobbles and the north half of the unit was almost entirely soil. The datum for excavation was located at the northeast corner of the unit at 10 cm above surface.

Excavation was conducted using a trowel and dustpan. All of the excavated soil was screened through a ¼ inch mesh screen. The unit was excavated using arbitrary 5 cm levels within the natural layers.

The surface of TU-2 consisted of uneven stone fill including subangular and rounded basalt cobbles on the south half of the unit and soil on the north half of the unit. The basalt was extremely weathered and brittle in nature. A small amount of grass, as well as small amounts of leaves and branches was also present on the surface. No cultural material was observed on the surface of TU-2.

Layer I consisted of a light yellowish brown silty clay containing subangular and rounded basalt cobble and pebble stone fill. Layer I, level 1 through level 10 contained no cultural material, although two charcoal samples were collected from Layer I, level 2. None of the charcoal samples were submitted for radiocarbon dating.

Test Unit 2 terminated on top of decomposing bedrock at a maximum depth of ca. 69 cmbd.

Soil Descriptions

I	10-69 cmbd	Light yellowish brown (10YR 6/4) silty clay; moderate, fine, granular structure; friable, sticky, plastic consistency. Culturally sterile.

Figure 104. Site 2565, Feature C, Test Unit 2, pre-excavation (view north).

Figure 105. Site 2565, Feature C, Test Unit 2, post-excavation (view north).

Figure 106. Site 2565, Feature C, Test Unit 2, post-excavation (view east).

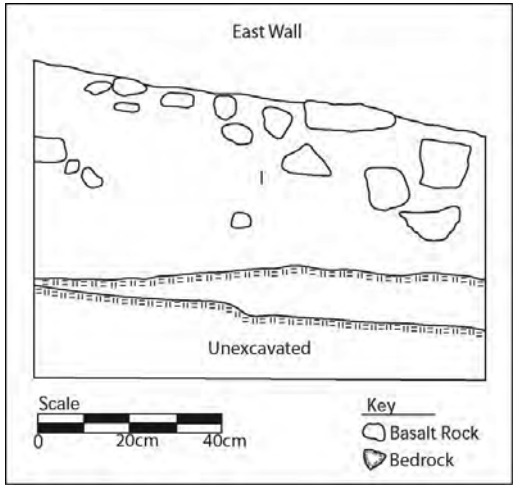

Figure 107. Soil Profile of Site 2565, Feature C, Test Unit 2.

7.2.5 Site 2572, Test Unit 1

Test Unit 1 consists of a 0.50 m by 0.50 m excavation unit located in the western portion of the Site 2572, surface artifact scatter (Figure 108, Figure 109, Figure 110, and Figure 111). The unit is oriented north to south (0˚-180˚). The unit is situated roughly in the center of the densest concentration of artifacts, although it was intentionally placed where no cultural material was visible on the surface of the unit. The datum for excavation was located at the northeast corner of the unit at 10 cm above surface.

Excavation was conducted using a trowel and dustpan. All of the excavated soil was screened through a ¼ inch mesh screen. The unit was excavated using arbitrary 5 cm levels within the natural layers.

The surface of TU-1 consisted mostly of soil with several loose subangular basalt cobbles and pebbles. A small amount of grass and small roots were also present on the surface. No cultural material was observed on the surface of TU-1.

Layer I consisted of a brown silty clay containing subangular basalt cobbles and pebbles. Traditional cultural material began to be encountered directly under the surface and the majority of material was collected from Layer I, level 1. Traditional cultural material recovered from level 1 included 37 volcanic glass flakes, five pieces of volcanic glass shatter, one basalt flake with polish, two basalt flakes, several fragments of *kukui* nut shell (*Aleurites moluccana*), and one charcoal sample. One of the fragments of *kukui* nut shell collected from Layer I, level 1 was submitted for radiocarbon dating in order to determine a date of occupation for the site. The results of the radiocarbon dating are presented in Section 7.4. The charcoal sample was not submitted for radiocarbon dating. Layer I, level 2 contained the last of the traditional cultural material including seven volcanic glass flakes and one basalt flake.

Layer II consisted of a dark yellowish brown silty clay and decomposing basalt bedrock. No cultural material was collected from Layer II. Test Unit 1 terminated on top of decomposing bedrock at a maximum depth of ca. 28 cmbd.

Soil Descriptions

I	10-26 cmbd	Brown (10YR 4/3) silty clay; weak, fine, granular structure; friable, slightly sticky, plastic consistency; abrupt, smooth boundary. Contains traditional cultural material.
II	21-28 cmbd	Dark yellowish brown (10YR 4/4) silty clay; weak, very fine, granular structure; friable, sticky, plastic; contains decaying basalt bedrock. Culturally sterile.

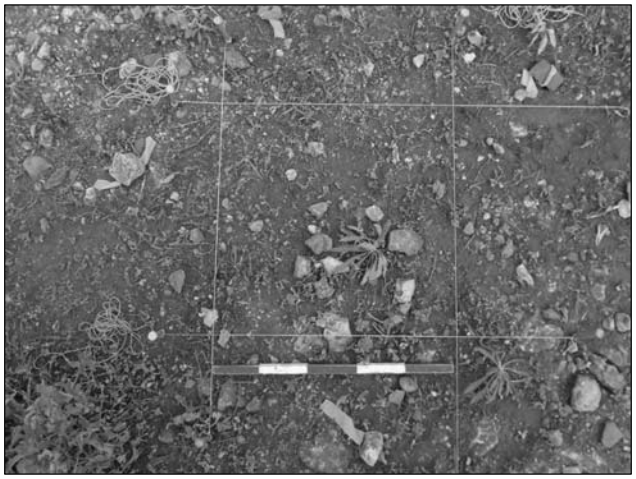

Figure 108. Site 2572, Test Unit 1, pre-excavation (view north).

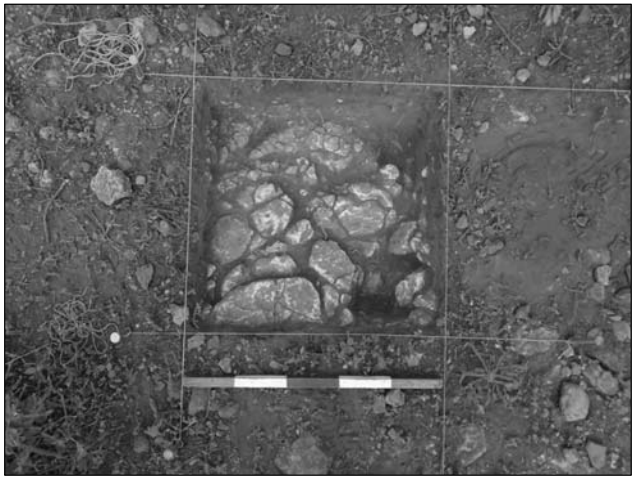

Figure 109. Site 2572, Test Unit 1, post-excavation (view north).

Figure 110. Site 2572, Test Unit 1, post-excavation (view north).

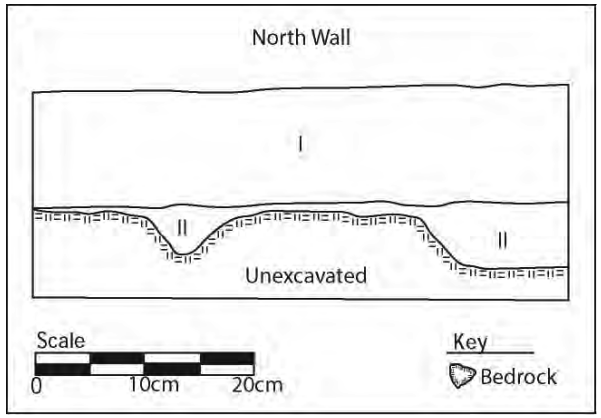

Figure 111. Soil profile of Site 2572, Test Unit 1

7.3 LABORATORY ANALYSES

7.3.1 Site 2516, Feature A, Test Unit 1

A variety of traditional cultural material consisting of manuports and midden were recovered from Test Unit 1. All of the cultural material was collected from Layer I. No cultural material was recovered from Layer II.

Manuport Analyses

A total of 5.0 grams of coral was collected from Layer I of Test Unit 1 (Table 8). Coral was collected from along the shoreline and brought inland for a wide variety of purposes.

Table 8. Manuport Table for Site 2516, Feature A - Test Unit 1

Layer	I	II	Totals	
Manuports	Wt.(g)	Wt.(g)	Wt.(g)	%
Coral	5.0		**5.0**	**100.0%**
Manuports Totals	5.0	0.0	**5.0**	**100.0%**

Midden Analyses

A total of 44.4 grams of midden was recovered from Layer I of Test Unit 1 (Table 9). The majority of this midden consisted of *kukui* nut shell (33.8 g; 76.1%), followed by marine shell (7.3 g; 16.4%), and finally non-human faunal bone (3.3 g; 7.4%).

Kukui endocarp (candlenut, *Aleurites moluccana*) dominated the majority of midden recovered from Test Unit 1. *Kukui* trees grew in the stream beads and upper reaches of the gulches. The meat from the *kukui* nuts were used as a food relish and also burned as a source of light.

The marine shell was made up entirely of non-weathered Patellidae spp. (limpet, *'opihi*). Patellidae spp. most frequently inhabit the splash zone along rocky shorelines. The marine habitats being exploited by the Native Hawaiian inhabitants appear to have been concentrated along the shoreline areas.

Bone material was relatively scarce and consisted of unidentifiable fish bone (2.3 g; 5.2%) and unidentifiable non-human medium mammal bone (1.0 g; 2.3%).

Table 9. Midden Table for Site 2516, Feature A - Test Unit 1

Layer	I	II	Totals	
Faunal Bone	Wt.(g)	Wt.(g)	Wt.(g)	%
Non-human Medium Mammal Bone	1.0		**1.0**	**2.3%**
Fish Bone	2.3		**2.3**	**5.2%**
Faunal Bone Totals	3.3	0.0	**3.3**	**7.4%**
Marine Shell	Wt.(g)	Wt.(g)	Wt.(g)	%
Patellidae spp. (limpet, '*opihi*)	7.3		**7.3**	**16.4%**
Marine Shell Totals	7.3	0.0	**7.3**	**16.4%**
Flora	Wt.(g)	Wt.(g)	Wt.(g)	%
Kukui Nut Shell (*Aleurites moluccana*)	33.8		**33.8**	**76.1%**
Flora Totals	33.8	0.0	**33.8**	**76.1%**
Midden Totals	44.4	0.0	**44.4**	**100.0%**

7.3.2 Site 2565, Feature A, Test Unit 1

A variety of traditional cultural material consisting of basalt artifacts and midden were recovered from Test Unit 1. All of the cultural material was collected from Layer I. No cultural material was recovered from Layer II.

Artifact Analyses

A total of 11 basalt artifacts were collected from Layer I of Test Unit 1 (Table 10). One basalt core was collected from Layer I, level 4 (Figure 112 and Figure 113). The core had several flakes removed from its dorsal surface and measured 10.0 cm long by 9.6 cm wide by 6.6 cm thick. A total of 10 basalt flakes were collected from Layer I. One basalt flake was recovered from Layer I, level 3. Six basalt flakes were collected from Layer I, level 4, and three basalt flakes were recovered from Layer I, level 5. The basalt flakes ranged in size from 1.0-3.4 cm long by 0.9-3.2 cm wide by 0.3-0.8 thick.

Midden Analyses

A total of 4.0 grams of midden were collected from Layer I of Test Unit 1 (Table 11). The majority of this midden consisted of *kukui* nut shell (3.8 g; 95%), followed by marine shell (0.2 g; 5%).

Kukui endocarp (candlenut, *Aleurites moluccana*) dominated the majority of midden recovered from Test Unit 1. The bulk of *kukui* consisted of broken uncharred fragments. A total of 0.2 g was collected from Layer I, level 3. A total of 3.3 g was collected from Layer I, level 4, and a total of 0.1 g was collected from Layer I, level 5. A small amount of charred *kukui* (0.2 g) was recovered from Layer I, level 3. One of the fragments of *kukui* nut shell collected from Layer I, level 5 was submitted for radiocarbon dating. The results of the radiocarbon dating are presented in Section 7.4. *Kukui* trees grew in the stream beads and upper reaches of the gulches. The meat from the *kukui* nuts were used as a food relish and also burned as a source of light.

Marine shell was extremely scarce and consisted of a single fragment of an unidentifiable bivalve (0.2 g) collected from Layer I, level 4.

Table 10. Artifacts Table for Site 2565, Feature A - Test Unit 1

Layer - level	I-1	I-2	I-3	I-4	I-5	I-6	I-7	I-8	I-9	I-10	I-11	I-12	II-1	II-2	II-3	II-4	II-5	II-6	II-7	Total	%
Traditional Artifacts																					
Basalt Core				1																1	9.09%
Basalt Flake			1	6	3															10	90.9%
Traditional Artifact Totals	0	0	1	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	100.0%

Table 11. Midden Table for Site 2565, Feature A - Test Unit 1

Layer - level	I-1	I-2	I-3	I-4	I-5	I-6	I-7	I-8	I-9	I-10	I-11	I-12	II-1	II-2	II-3	II-4	II-5	II-6	II-7	Totals	
Marine Shell	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	%
Unidentified Bivalve				0.2																**0.2**	**5.0%**
Marine Shell Totals	0.0	0.0	0.0	0.2	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	0.0	0.0	**0.2**	**5.0%**
Flora	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	Wt. (g)	%
Kukui Nut Shell (*Aleurites moluccana*)			0.2	3.3	0.1															**3.6**	**90.0%**
Kukui Nut Shell - Charred (*Aleurites moluccana*)			0.2																	**0.2**	**5.0%**
Flora Totals	0.0	0.0	0.4	3.3	0.1	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	0.0	**3.8**	**95.0%**
Midden Totals	0.0	0.0	0.4	3.5	0.1	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	0.0	**4.0**	**100.0%**

Figure 112. Site 2565, Feature A, TU-1, Basalt Core.

Figure 113. Site 2565, Feature A, TU-1, Basalt Core.

7.3.3 Site 2572, Test Unit 1

A variety of traditional cultural material consisting of volcanic glass and basalt artifacts and midden were recovered from Test Unit 1. All of the cultural material was collected from Layer I. No cultural material was recovered from Layer II.

Artifact Analyses

A total of 53 volcanic glass and basalt artifacts were collected from Layer I of Test Unit 1 (Table 12). The overall majority of artifacts consisted of volcanic glass flakes. A total of 44 (83%) volcanic glass flakes were collected from Layer I. A total of 37 volcanic glass flakes were collected from Layer I, level 1, and a total of seven volcanic glass flakes were collected from Layer I, level 2. Volcanic glass flakes ranged in size between 0.7-1.6 cm long by 0.5-1.1 cm wide by 0.2-0.8 cm thick. A total of five (9.4%) fragments of volcanic glass shatter were also recovered from Layer I, level 1.

A total of four basalt flakes (7.6%) were collected from Layer I. Three of the basalt flakes were recovered from Layer I, level 1. One of these basalt flakes exhibited polish on the dorsal surface and measured 2.2 cm long by 2.8 cm wide by 0.3 cm thick (Figure 114 and Figure 115). Only one basalt flake was collected from Layer I, level 2. Basalt flakes ranged in size from 1.4-2.3 cm long by 1.2-4.0 cm wide by 0.3-1.0 cm thick.

Table 12. Artifact Table for Site 2572, Test Unit 1

Layer - level	I-1	I-2	I-3	II-1	Total	%
Traditional Artifacts						
Basalt Flake with Polish	1				**1**	**1.9%**
Basalt Flake	2	1			**3**	**5.7%**
Volcanic Glass Flake	37	7			**44**	**83.0%**
Volcanic Glass Shatter	5				**5**	**9.4%**
Traditional Artifact Totals	45	8	0	0	**53**	**100.0%**

Figure 114. Site 2572, TU-1, Basalt Flake with Polish.

Figure 115. Site 2572, TU-1, Basalt Flake with Polish.

Midden Analyses

The only midden recovered from Test Unit 1 consisted of 1.2 g of *kukui* endocarp (candlenut, *Aleurites moluccana*) collected from Layer I, level 1 (Table 13). One of the fragments of *kukui* nut shell collected from Layer I, level 1 was submitted for radiocarbon dating. The results of the radiocarbon dating are presented in Section 7.4. *Kukui* trees grew in the stream beads and upper reaches of the gulches. The meat from the *kukui* nuts were used as a food relish and also burned as a source of light.

Table 13. Midden Table for Site 2572, Test Unit 1

Layer - level	I-1	I-2	I-3	II-1	Totals	
Flora	Wt.(g)	Wt.(g)	Wt.(g)	Wt.(g)	Wt.(g)	%
Kukui Nut Shell *(Aleurites moluccana)*	1.2				**1.2**	**100.0%**
Midden Totals	1.2	0.0	0.0	0.0	**1.2**	**100.0%**

7.4 RADIOCARBON DATING

Two samples of *Kukui* endocarp (*Aleurites moluccana)* were submitted to Beta Analytic Radiocarbon Dating Laboratory for dating. Accelerator mass spectrometry (AMS) radiocarbon dating was used. AMS dating at Beta Analytic includes $^{13}C/^{12}C$ analysis (d13C), so the samples were adjusted based on the measure of the ratio of stable isotopes $^{13}C/^{12}C$. The pretreatment for the AMS dating charred material samples consisted of acid/alkali/acid washes where the sample was first gently crushed and dispersed in deionized water. It was then given hot acid washes to eliminate carbonates, then alkali washes to remove secondary organic acids, then a final acid rinse to neutralize the solution prior to drying. During these serial rinses, mechanical contaminants such as associated sediments and rootlets were removed. The results of these analyses are summarized in Table 14 and discussed below. The full report from Beta Analytic is presented in Appendix A.

Beta Analytic, as part of their services offer the following disclosures about their laboratory and methods:

> Reported d13C values are for the material itself, not the AMS value. It was measured on the pretreated sample material in an IRMS. It is not the AMS value used to derive the correct Conventional Radiocarbon Age. The AMS d13C value includes fractionation effects from natural, laboratory and AMS induced sources and would not be applicable to the natural sample material.
>
> Beta does NOT use "satellite dating" (the practice of preparing individual AMS sample graphite in a remote lab and then sub-contracting to an AMS facility for the result). We do not participate nor believe in this practice. To do so would induce indeterminant error, eliminate chain of custody on quality control and create ambiguity in accountability to your results.
>
> All work was done in our own laboratory, on our own detectors and our own chemistry lines. This ensures we had complete chain of custody on quality control and allows us to be solely accountable to you. We can address any questions you have using complete and immediately available records and we always welcome your inquiries.
>
> Beta is a tracer-free AMS laboratory. No tracer radiocarbon (aka "labeled C14" or "artificial C14") used in biomedical or pharmaceutical samples is handled in our laboratory and AMS equipment. Tracer C14 is poison to radiocarbon dating samples both within the AMS and within the chemistry lab and will randomly produce falsely young ages.

Beta Sample 424924 from Site 2565 at 21 – 25 cmbs produced three age ranges at 2 sigma (95% probability): AD 1650 – 1690; AD 1730 – 1810; and AD 1920 - Post 1950. No historic artifacts were found in the Test Unit 1 excavation. A single piece of rusted metal wire was located just outside of the unit to the east, but it appears to be recent. No other artifacts were observed on the surface of Site 2565. Given that all of the artifacts recovered were traditional artifacts dating to either pre-Contact or early post-Contact times and the lack of any historic artifacts, suggest that the later age ranges obtained are not accurate. It appears very likely that the material analyzed dates to the period between 1650 to 1800.

Beta Sample 424925 from the surface of Site 2572 produced three ranges at 2 sigma (95% probability): AD 1640 – 1680, AD 1765 – 1800, AD 1940 – Post 1950. Again, given that no historic artifacts were observed or recovered, it seems reasonable that this sample dates from the period between AD 1640- 1800.

These two radiocarbon dates provide sound information that these site areas were being traditionally used during late pre-Contact and early post-Contact periods between AD 1640 and AD 1800.

Table 14. Radiocarbon Dating Results

Sample No.	SIHP No. (50-60-04-) & Provenience	Material	Measured Radiocarbon Age	d13C	^{13}C Conventional Age B.P.	Calibrated Age[1] (one sigma)	Calibrated Age[2] (two sigma)
Beta 424924	2565, Fea. A Test Unit 1 Layer I Level 5 21-25 cmbs Bag No. 015	*Kukui* endocarp (*Aleurites moluccana*)	200+/-30 BP	-25.4 o/oo	190 +/-30 BP	Cal AD 1665 to 1680 (Cal BP 285 to 270) Cal AD 1735 to 1800 (Cal BP 215 to 150) Cal AD 1935 to Post 1950 (Cal BP 15 to post 0)	Cal AD 1650 to 1690 (Cal BP 300 to 260) Cal AD 1730 1810 (Cal BP 220 to 140) Cal AD 1920 to Post 1950 (Cal BP 30 to Post 0)
Beta 424925	2572 Test Unit 1 Layer I Level 1 0 cmbs Bag No. 005	*Kukui* endocarp (*Aleurites moluccana*)	130+/-30 BP	-18.7 o/oo	230 +/- 30 BP	Cal 1650 to 1665 (Cal BP 300 to 285) Cal AD 1780 to 1795 (Cal BP 170 to 155)	Cal AD 1640 to 1680 (Cal BP 310 to 270) Cal AD 1765 to 1800 (Cal BP 185 to 150) Cal AD 1940 to Post 1950 (Cal BP 10 to Post 0)

8.0 SIGNIFICANCE AND ELIGIBILITY ASSESSMENTS, AND RECOMMENDATIONS

This development project is subject to the regulations associated with the National Register of Historic Places of 1966 (as amended) because the USDA is providing funding for this project. As such it is considered an "undertaking" as per 36 CTR 800. This project is also subject to Hawai'i Revised Statutes 6E.

8.1 SIGNIFICANCE ASSESSMENTS

Hawai'i Administrative Rules §13-284-6 stipulate that all identified historic properties must be assessed for their significance and states:

> To be significant, a historic property shall possess integrity of location, design, settling, materials, workmanship, feeling, and association and shall meet one or more of the following criteria:
>
> (a) That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b) That are associated with the lives of persons significant in our past; or
>
> (c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d) That have yielded, or may be likely to yield, information important in prehistory or history.
>
> (e) That have an important value to the Native Hawaiian people or to another ethnic group of the State due to associations with cultural practices once carried out or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts – these associations being important to the group's history and cultural identity.

The significance of each of the 17 sites identified during the current AIS is assessed in Table 15 below. All of the recorded sites, with the exception of Site 2517 (a probable historic wind break or hunting blind) are assessed as significant under Criterion (d). These 16 sites have either yielded or have the potential to yield information important to Hawai'i's history.

In addition, Site 801, a complex of cairns interpreted as possible burial facilities is also assessed as significant under Criterion (e) because of its cultural importance.

8.2 LISTING ELIGIBILITY ASSESSMENT

The National Historic Preservation Act of 1966 (as amended) authorizes the Secretary of Interior to expand and maintain a National Register of Historic Places (NRHP) that contains a listing of districts, sites, buildings, structures and objects significant in American history, architecture, archaeology, engineering and culture. A property may be listed in the NRHP if it meets criteria for evaluation defined at 36 CFR §60.4.

The Hawai'i Historic Places Review Board maintains a state register of historic places that consist of historic properties, including buildings, structures, objects, districts, areas, sites that are significant in the history, architecture, archaeology, or culture of the state, its communities, or the nation (HAR §13-198-2).

As part of assessing the significance of all cultural resources located within the APE, assessments were made regarding the eligibility of each cultural resource to be listed in either the HRHP or in the NRHP. These assessments, based on HAR §13-198-8 are presented below and summarized in Table 15.

None of the cultural resources recorded in the APE are eligible for listing on the NRHP. Eleven of the recorded sites are assessed as eligible for listing in the HRHP. Sites assessed as not eligible are:

2517 Historic windbreak/hunting blind
2520 Historic concrete water trough associated with ranching
2521 Historic concrete beams that supported wooded water tanks, associated with ranching
2569 Historic military training firing positions
2570 Historic concrete slab
2571 Historic concrete and boulder bridge supports

8.3 RECOMMENDATIONS

Table 15 indicates that no further work is recommended for 15 of the 17 recorded sites. Preservation is recommended for Site 2572, the large lithic scatter that was probably associated with stone adze manufacture. In addition, monitoring is recommended during initial grubbing for the solar farm so that in the event that additional subsurface lithic deposits are encountered, they can be recorded and documented. Preservation is also recommended for Site 801, the cluster of stone cairns that were interpreted as possible human burial facilities.

All collected materials must be properly curated. Hawai'i Administrative Rules § 16-276-6 states

> All collections, excluding human remains and grave goods, from public lands shall be placed in an acceptable archive to be designated by the SHPD. Arrangements shall be made with private landowners on the disposition of collections from their lands

Table 15. Significance Assessments

SIHP No. 50-60-03-xxx	Site Significance	Significance Justification	Determination of Effect	Recommendation	HRHP Listing Eligibility	NRHP Listing Eligibility
800	d	Interpreted and a possible traditional habitation and agricultural complex (Tomonari-Tuggle 1983) that was test excavated producing pre-Contact deposits (Athens 1985)	May be impacted by Project Area 2 improvements	No further work	eligible	not eligible
801	d, e	Complex of cairns interpreted as possible human burial facilities (Tomonari-Tuggle 1983)	Will not be impacted	Preserve	eligible	not eligible
802	d	Probably cattle wall that has been previously impacted by construction of a dirt road (Tomonari-Tuggle 1983)	May be impacted by Project Area 2 improvements	No further work	eligible	not eligible
2516	d	Traditional stone structure that may have functioned as a foundation for a pole and thatch structure dating to late pre-Contact to early post-Contact times	May be impacted by Project Area 2 improvements	No further work	eligible	not eligible
2517	Not significant	This site appears to be a historic wind break or hunting blind	May be impacted by Project Area 2 improvements	No further work	not eligible	not eligible
2518	d	This site is a possible traditional agricultural clearing mound.	May be impacted by Project Area 2 improvements	No further work	eligible	not eligible
2519	d	This site consists of three stone mounds. These appear to be possible traditional agricultural clearing mounds.	May be impacted by Project Area 2 improvements	No further work	eligible	not eligible
2520	d	Concrete water trough probably associated with historic ranching activities	May be impacted by Project Area 3 improvements	No further work	not eligible	not eligible
2521	d	Series of concrete beams that probably supported wooden water troughs associated with historic cattle ranching in the area.	May be impacted by Project Area 3 improvements	No further work	not eligible	not eligible
2566	d	Large probable agricultural terrace that likely dates to the historic era	May be impacted by Project Area 2 improvements	No further work	eligible	not eligible
2567	d	Modified outcrop that may have served as a foundation for a traditional pre-Contact or early post-Contact habitation structure	May be impacted by Project Area 2 improvements	No further work	eligible	not eligible
2568	d	This site is a probable lithic reduction sites area where basalt flakes were being produced.	May be impacted by Project Area 2 improvements	No further work	eligible	not eligible
2569	d	A cluster of five stone edged depressions containing shell casing and shell chain fed clips with unfired blank cartridges. These depressions were probably associated with military training in the area	May be impacted by Project Area 2 improvements	No further work	not eligible	not eligible
2570	d	Concrete slab probably associated with historic ranching activities	May be impacted by Project Area 2 improvements	No further work	not eligible	not eligible
2571	d	Mortared basalt boulder foundations for a possible bridge spanning a stream drainage	May be impacted by Project Area 2 improvements	No further work	not eligible	not eligible
2572	d	Large lithic scatter where basalt reduction activities took place that probably included the production of stone adze performs. This site probably dates to pre-Contact or early post-Contact times.	Will be avoided during the development of solar system (Project Area 1)	Preserve and monitoring during grubbing	eligible	not eligible

9.0 SUMMARY AND DISCUSSION

At the request of PBR Hawai'i, Pacific Legacy, Inc., conducted an archaeological inventory survey on various DHHL properties on the Island of Moloka'i for proposed Water System Improvements which will include actions to improve reliability and functionality of water delivery to the 2,400 users connected to the Ho'olehua Water System-PWS No 230. Proposed actions to the water system will occur at seven discontinuous project areas located in the *ahupua'a* of Pālā'au, Ho'olehua, Nā'iwa, Kahanui, and Kalama'ula in central Moloka'i. Water system improvements will consist of numerous upgrades ranging from replacing a water tank ladder to the installation of thousands of linear feet of new subsurface water lines and access roads.

Archaeological investigations were conducted between October 24-26, 2011, between November 13-16, 2012, between September 21-30, 2015, and between November 9-13, 2015. The four separate phases of archaeological investigations were necessary due to several changes to the proposed improvements to the DHHL water system. Archaeological investigations for this project consisted of pedestrian surface survey and formal documentation of identified archaeological sites, as well as subsurface test excavations at several sites in order to clarify site function and age.

A total of 14 new archaeological sites (Site 2516 through 2521 and Site 2565 through 2572) and three previously documented sites (Site 800 through 802) were identified within the project's area of potential effect (APE). One isolated find of a sandstone '*ulu maika* stone was also identified and collected. These sites included nine traditional Hawaiian pre-Contact or early post-Contact sites, seven historic sites, and one military site.

Archaeological sites were present within portions of three of the survey areas (Project Area 1 through 3). Four of the seven survey areas (Project Area 4 through 7) contained no identified archaeological sites.

Two new archaeological sites were identified in Project Area 1 (2565 and 2572). Test excavations were conducted at each of these sites, and radiocarbon dates were obtained. Site 2565 appears to have been utilized between AD 1650 and AD 1800 and Site 2572 appears to have been utilized between AD 1640 and AD 1800, so both of these sites date to pre-Contact or early post-Contact times.

The excavation at Site 2565 did not produce much cultural material – only 1 basalt core and 10 basalt flakes were recovered. While a fair quantity of *kukui* nut shell was found, one piece of which was radiocarbon dated, only one marine shell was recovered. The site was probably a temporary shelter where limited stone tool manufacture in the form of striking flakes from a basalt core took place. These flakes could have been used for various cutting and scraping tasks.

The excavation at Site 2572 was illuminating in that it showed that the extensive surface scatter of lithic material is not simply confined to the surface, but extends into the subsurface strata.

The surface of Site 2572 contained hammerstones, a broken basalt adze, basalt flakes with polish that probably were detached from stone adzes, and abundant basalt and volcanic glass flakes. The test excavation produced 49 pieces of volcanic glass, three basalt flakes, and 1 basalt flake with polish. The only midden recovered consisted of *kukui* nut shell, one piece of which was radiocarbon dated.

Both Sites 2565 and 2572 are assessed as significant under Criterion (d). Both sites were assessed as being eligible for listing in the HRHP. No further work is recommended for Site 2565. Preservation and monitoring are recommended for Site 2572. In addition, a corrugated metal shed was located at the well site compound in Project Area 1. The shed will not be impacted during the proposed improvements. The date of construction of the structure has not been determined. Should future work in this area occur, DHHL may have to evaluate the shed for potential significance.

A total of 10 new archaeological sites were identified during the survey of Project Area 2 (2516 through 2519 and Site 2566 through 2571), along with three previously recorded sites (800 through 802). Test excavations were conducted at Site 2516 and 2519. A variety of cultural material was recovered from the excavation at Site 2516 including a small amount of coral and a fair amount of midden. The midden recovered consisted of mostly of *kukui* nut shell, followed by marine shell, and faunal bone including non-human medium mammal bone and fish bone. This site is likely a traditional stone structure that may have functioned as a foundation for a pole and thatch structure dating to late pre-Contact to early post-Contact times. No cultural material was recovered from the excavation at Site 2519. This site is likely a series of three traditional agricultural clearing mounds dating to late pre-Contact to early post-Contact times.

Site 2516, 2518, 2519, 2567, and 2568 are probable pre-Contact or early post-Contact features given their appearance and construction methods. All of these sites appear to be significant under Criterion (d) and no further work is recommended. Site 2566, 2570, and 2571 are historic features that appear to be significant under Criterion (d) and no further work is recommended. Site 2566 is assessed as being eligible for listing in the HRHP. Site 2570 and 2571 are assessed as being not eligible for listing in the HRHP. Site 2569 is a historic military training site that appears to be significant under Criterion (d) and no further work is recommended. This site is assessed as being not eligible for listing in the HRHP. Site 2517 is a historic windbreak/hunting blind that appears to not be significant. No further work is recommended and the site is assessed as being not eligible for listing in the HRHP.

While no further work is being recommended for these sites, all of these sites appear to be far off the roadway and would not be impacted by the proposed project with the exception of Site 2518. Given that these sites do not appear to be in the area of impact, we recommend that they be preserved if at all possible. Site 2518 is adjacent to the existing roadway and may be impacted. It is recommended that this site be avoided during construction if possible. However, if this site cannot be avoided, it has undergone documentation and recording and its destruction would have a negligible effect on the archaeological record of Moloka'i.

Of the three previously identified sites, two (800 and 801) are pre-Contact or early post-Contact in age (complex and mounds) and one (802) is historic (cattle wall). Site 800 and 802 appear to

be significant under Criterion (d) and no further work is recommended. Both sites are eligible for listing in the HRHP. Site 801 appears to be significant under Criteria (d) and (e) and is recommended for preservation. The site is also eligible for listing in the HRHP.

Project Area 3 contained two historic era sites (2520 and 2521). Site 2520 is a historic concrete water trough and Site 2521 is associated with water tanks that formerly operated in the Hoʻolehua area. Both of these sites can easily be avoided during the construction activities associated with the new pipeline. No further work is recommended at these sites.

Although Project Area 4 contained no archaeological sites, two active 3.5 MG tanks comprising the Hoʻolehua tank farm (reportedly constructed in the 1930s) are present. It is unknown whether these tanks have been formally documented, but it is recommended that they undergo formal recordation. To the archaeologist they are impressive in size and are possibly significant for their architectural style and construction methods.

Finally, if any potentially significant resources (e.g., human remains) are discovered during the course of construction, work should halt and the State Historic Preservation Division should be contacted (808) 692-8015.

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APPENDIX A

RADIOCARBON DATING RESULTS

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December 8, 2015

Dr. Paul Cleghorn
Pacific Legacy, Incorporated
30 Aulike Street, #301
Kailua, HI 96734
USA

RE: Radiocarbon Dating Results For Samples DHHL T-001A 1, DHHL T-008 1

Dear Dr. Cleghorn:

Enclosed are the radiocarbon dating results for two samples recently sent to us. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable. The Conventional Radiocarbon Ages have all been corrected for total fractionation effects and where applicable, calibration was performed using 2013 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

Reported results are accredited to ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators here. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 program participated in the analyses.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result. The reported d13C values were measured separately in an IRMS (isotope ratio mass spectrometer). They are NOT the AMS d13C which would include fractionation effects from natural, chemistry and AMS induced sources.

When interpreting the results, please consider any communications you may have had with us regarding the samples. As always, your inquiries are most welcome. If you have any questions or would like further details of the analyses, please do not hesitate to contact us.

The cost of the analysis was charged to the VISA card provided. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

BETA ANALYTIC INC.
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MIAMI, FLORIDA, USA 33155
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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Paul Cleghorn — Report Date: 12/8/2015

Pacific Legacy, Incorporated — Material Received: 11/25/2015

Sample Data	Measured Radiocarbon Age	d13C	Conventional Radiocarbon Age(*)
Beta - 424924	200 +/- 30 BP	-25.4 o/oo	190 +/- 30 BP
SAMPLE : DHHL T-001A 1			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1650 to 1690 (Cal BP 300 to 260) and Cal AD 1730 to 1810 (Cal BP 220 to 140) and Cal AD 1920 to Post 1950 (Cal BP 30 to Post 0)			
Beta - 424925	130 +/- 30 BP	-18.7 o/oo	230 +/- 30 BP
SAMPLE : DHHL T-008 1			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1640 to 1680 (Cal BP 310 to 270) and Cal AD 1765 to 1800 (Cal BP 185 to 150) and Cal AD 1940 to Post 1950 (Cal BP 10 to Post 0)			

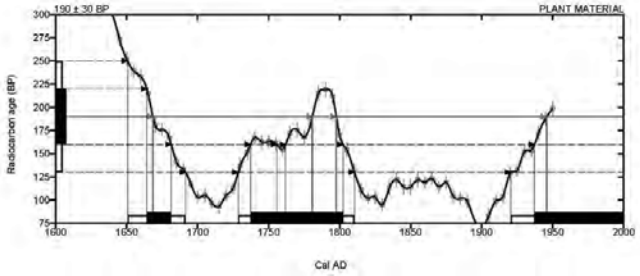
Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On *rare* occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -25.4 o/oo : lab. mult = 1)

Laboratory number	**Beta-424924 : DHHL T-001A 1**
Conventional radiocarbon age	**190 ± 30 BP**
Calibrated Result (95% Probability)	**Cal AD 1650 to 1690 (Cal BP 300 to 260)** **Cal AD 1730 to 1810 (Cal BP 220 to 140)** **Cal AD 1920 to Post 1950 (Cal BP 30 to Post 0)**
Intercept of radiocarbon age with calibration curve	Cal AD 1670 (Cal BP 280) Cal AD 1780 (Cal BP 170) Cal AD 1800 (Cal BP 150) Cal AD 1945 (Cal BP 5) Post AD 1950 (Post BP 0)
Calibrated Result (68% Probability)	Cal AD 1665 to 1680 (Cal BP 285 to 270) Cal AD 1735 to 1800 (Cal BP 215 to 150) Cal AD 1935 to Post 1950 (Cal BP 15 to Post 0)



Database used
INTCAL13

References
Mathematics used for calibration scenario
A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322
References to INTCAL13 database
Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887, 2013.

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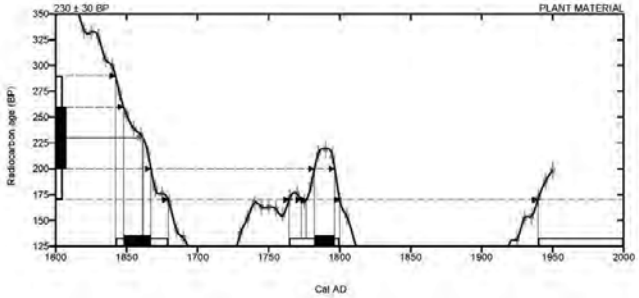
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -18.7 o/oo : lab. mult = 1)

Laboratory number	**Beta-424925 : DHHL T-008 1**
Conventional radiocarbon age	**230 ± 30 BP**
Calibrated Result (95% Probability)	**Cal AD 1640 to 1680 (Cal BP 310 to 270)** **Cal AD 1765 to 1800 (Cal BP 185 to 150)** **Cal AD 1940 to Post 1950 (Cal BP 10 to Post 0)**
Intercept of radiocarbon age with calibration curve	Cal AD 1660 (Cal BP 290)
Calibrated Result (68% Probability)	Cal AD 1650 to 1665 (Cal BP 300 to 285) Cal AD 1780 to 1795 (Cal BP 170 to 155)



Database used
INTCAL13

References
Mathematics used for calibration scenario
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The Radiocarbon Laboratory Accredited to ISO/IEC 17025:2005 Testing Accreditation PJLA #59423

Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990B and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation.

Report Date: December 08, 2015
Submitter : Dr. Paul Cleghorn

QA MEASUREMENTS

Reference 1	Expected Value:	96.7 +/- 0.5 pMC
	Measured Value:	96.9 +/- 0.4 pMC
	Agreement:	Accepted
Reference 2	Expected Value:	129.4 +/- 0.1 pMC
	Measured Value:	129.4 +/- 0.3 pMC
	Agreement:	Accepted
Reference 3	Expected Value:	2.2 +/- 0.2 pMC
	Measured Value:	2.2 +/- 0.1 pMC
	Agreement:	Accepted

COMMENT: All measurements passed acceptance tests

Validation: Darden Hood Date: December 08, 2015

Appendix E

LITERATURE REVIEW OF PREVIOUS ARCHAEOLOGICAL WORK

Pacific Legacy

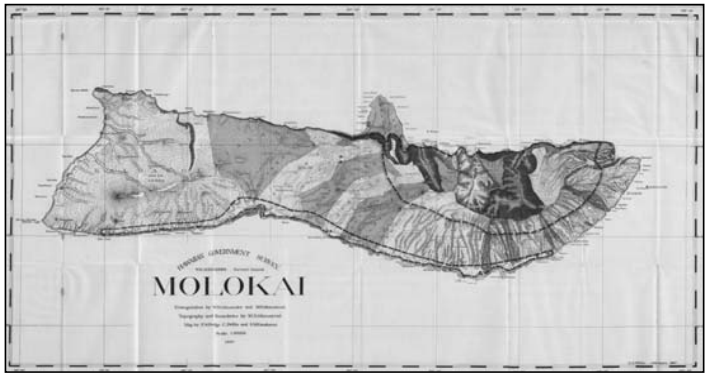
Historic Preservation

CULTURAL RESOURCES CONSULTANTS

Hawai'i Offices:
Kailua, O'ahu
Hilo, Hawai'i

California Offices:
Arnold
Berkeley
El Dorado Hills
Lancaster

LITERATURE REVIEW
OF PREVIOUS ARCHAEOLOGICAL WORK
WITHIN 8,955 ACRES OWNED BY
THE DEPARTMENT OF HAWAIIAN HOME LANDS
ON THE ISLAND OF MOLOKA'I



Pacific Legacy: Exploring the past, informing the present, enriching the future.

LITERATURE REVIEW
OF PREVIOUS ARCHAEOLOGICAL WORK
WITHIN 8,955 ACRES OWNED BY
THE DEPARTMENT OF HAWAIIAN HOME LANDS
ON THE ISLAND OF MOLOKA'I

Prepared by:
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Prepared for:
The Department of Hawaiian Home Lands
Hale Kalaniana'ole
91-5420 Kapolei Parkway
Kapolei, HI 96707

September 2011

ABSTRACT

Pacific Legacy conducted a literature review of previous archaeological work performed within 8,955 acres owned by the Department of Hawaiian Home Lands (DHHL) on the island of Molokaʻi 2011. Lands covered by this literature review were limited to those zoned as Residential, Subsistence Agriculture, and Supplemental Agriculture, which have the potential for development. The DHHL General Scope of Work called for the following: (1) a general background history of DHHL lands on Molokaʻi, including information on climate, topography, vegetation, soil classifications, the types of archaeological sites found in DHHL lands, as well as traditional and historic activities that may have occurred in these areas; (2) documentation of previous archaeological investigations carried out on DHHL Molokaʻi lands with an evaluation of the sufficiency of investigations; and (3) GIS data sets, resulting from the literature review, that describe and document the historic and cultural resources in the project areas.

To accomplish these goals, a comprehensive search of reports was conducted at the State Historic Preservation Division (SHPD) library, National and State Register of Historic Places, as well as academic and government websites. The end product is a synthesis of previous archaeological research performed in and around project boundaries, including a listing of archaeological sites within the project area, a supplemental list of sites within a mile of the project area or within DHHL lands, GIS data sets describing and documenting project area sites, tables and figures to illustrate findings, discussion of prior findings as predictive models for determining the potential for sites in the project areas, recommendations to mitigate disturbances to sites and potential sites, as well as environmental conditions and general history of ground disturbances from the past and present of each major land division.

TABLE OF CONTENTS

Frontispiece: Historic Map of Molokaʻi as drawn by Alexander and Monsarrat in 1897 for the Hawaiian Government Survey. This version of the map was used for the 1906 Report of the Governor of the Territory of Hawaiʻi to the Secretary of the Interior. It focuses on Public Lands, Homestead Settlement Tracts, Grazing Lands, Pineapple Lands, Sugar Plantations, Forest Reserves, Forest Lands, Wet Lands, etc. As noted on other island maps in the series: "...the Government lands are green." Image courtesy of Wikimedia Commons.

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

Under contract to the Department of Hawaiian Home Lands, Pacific Legacy conducted a literature review of 8,955 of the 25,899 acres owned by the Department of Hawaiian Home Lands (DHHL) on the island of Molokaʻi (Figure 1). Lands covered by this literature review were limited to those zoned as Residential, Subsistence Agriculture, and Supplemental Agriculture, which have the potential to be constructed upon. According to the Molokaʻi Island Plan (MIP), the total 8,995 acres of concern consist of 742 Residential acres, 2,138 Subsistence Agriculture acres, and 5,862 Supplemental Agriculture acres (Group 70 2005). Of these lands, 25 acres are located in ʻUalapuʻe Ahupuaʻa, 264 acres are located within Kapaʻakea, Makakupaʻia, and Kamiloloa Ahupuaʻa, 629 acres are located in Kalamaʻula and Pālāʻau Ahupuaʻa, and 8,055 acres are located in Hoʻolehua Ahupuaʻa.

The DHHL General Scope of Work called for the following: (1) a general background history of DHHL lands on Molokaʻi, including information on climate, topography, vegetation, soil classifications, the types of archaeological sites found in DHHL lands, as well as traditional and historic activities that may have occurred in these areas; (2) documentation of previous archaeological investigations carried out on DHHL Molokaʻi lands with an evaluation of the sufficiency of investigations; and (3) GIS data sets, resulting from the literature review, that describe and document the historic and cultural resources in the project areas.

The environments of the areas under review vary greatly and each has their own unique histories. The regions containing the DHHL lands will be explored individually. Some of the areas have undergone previous archaeological survey, such as Kalamaʻula, Kapaʻakea and Kamiloloa, while others such as Hoʻolehua, Pālāʻau, and ʻUalapuʻe have had little to no archaeological work.

After this introductory section, Section 2 presents a discussion of the methods followed in this study. This is followed by Section 3 that presents the general historical background of Molokaʻi. Descriptive information of each of the land sections studied is then presented in Sections 4-7:

Section 4 — ʻUalapuʻe
Section 5 — Kapaʻakea, Kamiloloa, and Makakupaʻia
Section 6 — Kalamaʻula
Section 7 — Hoʻolehua- Pālāʻau

Additionally, Appendices A-E can be found on the CD at the end of this volume and includes the following:

Appendix A — aerial aspects of each Residential TMK.
Appendix B —USDA and NRCS Web Soil Survey for each *ahupuaʻa*.
Appendix C — listing of Molokaʻi ocean resource and fishing right claims.
Appendix D — list of archaeological sites found within the select DHHL lands.
Appendix E — maps used to plot the approximate location of previously recorded archaeological sites.

Figure 1. DHHL lands with residential, subsistence and supplemental agriculture, and possible future residential lands highlighted (adapted from Group 70 2005:Figure 1.1).

2.0 METHODS

Pacific Legacy was contracted by the Department of Hawaiian Home Lands to complete a literature review of DHHL lands on the island of Moloka'i and produce GIS data sets that describes and documents the historic and cultural resources in the relevant project area — specifically, ca. 8,955 acres divided between the following *ahupua'a*: Ho'olehua, Pālā'au, Kalama'ula, Kapa'akea, Kamiloloa, Makakupa'ia, Kalaupapa, and 'Ualapu'e.

2.1 HISTORICAL AND ARCHAEOLOGICAL RESEARCH

The assessment of what cultural resources are potentially present on the subject 8,995 acres of DHHL lands in Moloka'i was accomplished by conducting archival research, reviewing previous archaeological investigations and recorded historic accounts. The source for these investigations was the State Historic Preservation Division (SHPD) libraries on O'ahu and Maui, which house a relatively complete collection of archaeological reports, as well as the Hawaiian and Pacific Collection in the State library collection, National and State Register of Historic Places, and academic and government websites.

Numerous documents that are listed in the SHPD library index are not actually present in either the Maui or O'ahu SHPD libraries. Furthermore, the most recent document to enter the library listing is nearly ten years old. Known missing references were obtained by directly contacting the archaeological firms and/or authors that were contracted to produce the reports. Unfortunately, there may be more recent reports that are not listed in the SHPD library index and therefore, currently unavailable.

No field survey of these areas was performed by Pacific Legacy. Descriptions of the land are summarized from archaeological reports, and historical research of the areas. Examination of reports from other surveys and excavations throughout Moloka'i (e.g., Summers 1971; Tuggle 1993a; Major and Dixon 1995; and Bush *et al.* 2001) helped develop a contextual understanding of the project areas, as well as synthesize what is known to date. These reports are the main sources of information for general descriptions and historical background summaries.

Certain conventions will occur throughout the report. Except for proper and place names, words from the Hawaiian language will be italicized, and their definitions will appear in parentheses following the first occurrence of each new word. Definitions and spellings will be taken from the 1986 edition of the *Hawaiian Dictionary* by Pukui and Elbert. Diacritical marks (i.e., glottal stops and macrons) will be used in cases where the Hawaiian names or words are known to utilize them for pronunciation and meaning, but will not be added in cases where the Hawaiian names or words are taken as direct quotes from documents that did not use them originally.

2.2 PLOTTING UTMS

Pacific Legacy extracted the relevant data from the reviewed reports in order to create GIS datasets (i.e., a shapefile each for points, lines, and areas) representing the approximate locations of previously recorded archaeological sites. The collected data varied from project area illustrations' showing hand-plotted site locations, to tables listing UTM coordinates for each feature of specific sites (see Appendices D and E). Every attempt was made to aggregate this data into a useful and accurate resource. No field work was performed during this project and none of the sites were physically visited.

The approximate locations of previously recorded archaeological sites were plotted in ESRI® ArcMap™/ArcGIS Desktop 9.3.1. The shapefiles created utilize a projection of North American Datum 1983 (NAD83)/UTM Zone 4N. Relevant shapefiles from the Hawai'i Statewide GIS Program and ESRI® ArcGIS Online were used as additional resources.

2.3 ISSUES ENCOUNTERED

Several issues affected the use of existing reports to plot archaeological site locations with UTM coordinates. The question of accuracy is an issue and it should be noted that there is a margin of error in all of the sites that were plotted. Detailed below is a list of the problems and issues Pacific Legacy encountered when using the various resources to plot the site locations manually:

- Lack of UTM Coordinates — GPS technology was not widely used in archaeology until the late 1990s and even then the accuracy of the UTM coordinates varied depending on the hardware used to record the points and the available satellite coverage.
- Differing Contour Lines — the current USGS maps for Moloka'i use 20 m intervals, GIS shapefiles available from the Hawai'i Statewide GIS Program are in 100/200/500 foot intervals, while maps from older reports often indicate contour lines at 50 foot intervals.
- Accuracy of Data —the accuracy of the older project locations and site locations is questionable. It is difficult to double-check locations because some of the maps and details of the project areas used in the older reports are hand-drawn rather than USGS topographical maps or aerial views, and potential reference points (e.g., roads, structures, etc.) may have changed.

While Pacific Legacy has made every effort to plot the previously recorded archaeological sites and features accurately, until an on-the-ground survey is conducted to confirm the UTM coordinates, these data should be viewed as estimated locations.

3.0 GENERAL DESCRIPION AND HISTORY OF MOLOKA'I

Located 26 miles southeast of O'ahu and nine miles northwest of Maui, Moloka'i is the fifth largest of the Hawaiian Islands. This elongated island is 38 miles long east to west, and is at most 10 miles wide and covers an area of 260 square miles with an approximate total of 88 miles of coastline. The Department of Hawaiian Home Lands manages approximately 26,000 acres, or 15% of the total land area of Moloka'i.

The island of Moloka'i was formed from the volcanic flows of two large shield volcanoes on the eastern and western ends of the island, and one much smaller one to the north. The younger and larger eastern volcano of the island rises much higher than the west, up to 1,515 m in elevation compared to only 421 m on the West End. A large plain between the two large volcanoes was created where the lava flows overlap. This area is commonly referred to as the Ho'olehua Plain. The eastern peaks tend to intercept the majority of the trade winds, along with the moisture they bring. This causes the lower western half of the island to lie in a rain-shadow creating arid, desert like conditions while the eastern side exhibits wet, lush permanent streams and thick greenery.

The settlement patterns of Moloka'i Island have been greatly influenced by this ecological diversity, and have been especially influenced by an uneven distribution of water resources, from prehistoric times up until present day. According to the first large-scale archaeological projects on Moloka'i (Bonk 1954; Hammatt 1978; Kirch and Kelly 1975), the eastern fertile side of the island was likely the first to be populated, whereas the arid central and western parts of Moloka'i were, until modern times, quite marginal and mostly uninhabited. The exact population of Moloka'i before European arrival is impossible to know. However, early missionaries provide estimates of 8,000 to 8,700 in the early 1830s, and there are indicators that the population was likely a few thousand greater before their arrival (Summers 1971:3). The missionaries chose the southeastern coastal area of Kalua'aha, for their home upon their arrival in 1832, and it is reasonable to assume that they would have chose this area not only for its richness in subsistence resources, but also because a substantial population was already present and easily reached. The southern shoreline, with its 54 or more fishponds constructed onto the broad reef flat, would have been renowned for its plentiful bounty and was home to a large population (Summers 1971). Before the arrival of Western influence, Molokai's subsistence economy was based on fishing, irrigated agriculture, gathering, and aquaculture in the form of man-made fishponds.

3.1 TRADITIONAL ACCOUNTS OF MOLOKA'I

The island of Moloka'i is imbued with elaborate oral traditions that account for the pre-Contact history of the island as well as its many colorful legends and myths. According to Pukui et al. (1976:156), Moloka'i is also referred to as *Moloka'i nui a Hina* (great Moloka'i, child of Hina) and *Moloka'i pule o'o* (lit. Moloka'i [of the] potent prayer). It has been documented that some Moloka'i *kūpuna* disagree with the conventional spelling for Moloka'i. According to Kirkendall

and Cleghorn (2009:95), two interviewees suggested the correct spelling is Molokai, meaning "the sea," although the conventional spelling since the resurgence of Hawaiian language classes in the 1970s and 1980s added the '*okina*.

The origin of Moloka'i itself has many interpretations (Fornander 1916-1917, 1919-1920; Pukui et al. 1976; Kamakau 1991). In "The Song of Pakui," Moloka'i Island is said to be born of Wākea, who is seen as the ancestor of all Hawaiians, and his third wife, Hina (Fornander 1919-1920:360). Another traditional account of the island's origin as told by the historian Kahakuikamoana. In the tradition of Opuukahonua, Hinanuiakalana birthed Moloka'i with Kuluwaiea of Haumea as the father (Fornander 1916-1917:2). Alternatively, according to Fornander (1916-1917:12) some historians maintain that Wākea put his hands together and himself created the island. Yet another oral tradition holds that the islands were all magically grown from pieces of coral by a fisherman named Kapuheeuanui under the instruction of a priest named Lauliala'amakua (Fornander 1916-1917:22).

Beckwith (1976) writes of one of the early mythos of Moloka'i in the story of Pahulu, the goddess who once ruled over Lāna'i, Moloka'i, and a portion of Maui. In her account of this tale,

> Pahulu was a goddess who came in very old times to these islands and ruled Lanai, Molokai, and a part of Maui. That was before Pele, in the days when Kane and Kanaloa came to Hawaii. Through her that "old highway" (to Kahiki), starts from Lanai. As Ke-olo-ewa was the leading spirit on Maui who possessed people and talked through them, so Pahulu was the leading spirit on Lanai. Lani-kaula, a prophet (kaula) of Molokai, went and killed off all the akua on Lanai. Those were the Pahulu family. Some say there were about forty left who came over to Molokai. The fishpond of Ka-awa-nui was the first pond they built on Molokai…Three of the descendants of Pahulu entered trees on Molokai. These were Kane-i-kaulana-ula (Kane in the red sunset), Kanei-ka-huila-o-ka-lani (Kane in the lightning), and Kapo. About four hundred trees sprang up in a place where no trees had been before, but only three of these trees were entered by the gods. The Lo family of Molokai, a family of chiefs and kahunas, are descended from Pahulu. Many of them are well-known persons today (Beckwith 1976:108).

Moloka'i has also always been known as a center for learning, from training of priests to the tradition of *hula*. Moloka'i was known in pre-Contact times, as far back as the tenth century, as producing powerful *kāhuna* (Beckwith 1976:10,108; James 2001:121) and prophets (Summers 1971:13). In the story of Pahulu, "…About the time of Liloa and Umi, perhaps long before, chiefs flocked to Molokai. That island became a center for sorcery of all kinds. Molokai sorcery had more mana (power) than any other. Sorcery was taught in dreams. All these Molokai aumakua were descendants of the goddess Pahulu…" Beckwith (1976:108). Though the exact location is not known, aspiring *kāhuna* were apprenticed at Kē'ie'ie in Mahana, which is in east central Kalua'koi Ahupua'a. According to James (2001), in the 12th century, Kaikololani, a warrior chief of Maui, brought his war fleet to Moloka'i and slaughtered scores of its people, which prompted the priests of Kē'ie'ie to deliver a deadly prayer, killing all warriors, save for Kaikololani, who returned to Maui to tell the tale of Moloka'i's great *kāhuna*. This story particularly upholds the island's poetic name of *Moloka'i pule o'o*. The famous sorcerer, prophet, and counselor, Lanikaula, was born in Puko'o and laid to rest in Keopukaloa, Moloka'i,

sometime in the late-16th century. He is credited with killing all of the *akua* on Lāna'i (Beckwith 1976:108, 110-111). Moloka'i is also said to be the birthplace of the *hula* (Handy and Handy 1972:511; James 2001:121). It is said that a *wahine* from Moloka'i, named Laka, sometimes seen as a goddess or a manifestation of Kapo, was the creator of the *hula*. She is also credited with starting the first and most revered *hula* school at Mauna Loa, on the west end of Moloka'i.

Beckwith (1976) brings up some additional tales from pre-Contact Moloka'i, such as the story of Kao-hele, a noted runner from Moloka'i who was renowned for his remarkable skills. In the tale of Kao-hele, she outlines his feats, stating:

> Kao-hele, noted runner of Molokai, is pursued in vain by Kahekili's men when they come to make war on Molokai. They station relays, but he outdistances them all, hence the saying, "Combine the speed to catch Kaohele" (E ku'i ka mama i loaa o Kaohele). At one time chiefs and people are crowded at a famous cliff for the sport of leaping into the bathing pool below, and Kaohele, finding himself headed for this cliff and closely pursued, leaps across to the opposite bank, a distance of thirty-six feet. Kao-hele is runner and protector for four chiefs who live at the heiau of Kahokukano on Molokai and have a fishpond mountainward. He is killed by a slingstone in a battle with men from Hawaii but his chiefs escape (Beckwith 1976:339)

This tale not only hints to the fitness and athleticism of Moloka'i's men, but how courageous and dedicated they are to their chiefs. Another tale is the "Legend of Kana and the rescue of Hina" that largely takes place on the island of Moloka'i (Beckwith 1976:464).

Although Moloka'i was typically subject to rule by O'ahu and Maui chiefs, who often fought for control over the small island, at times it was politically independent (Kirch 1985:7). The first recorded ruling chief of the island is Kamauaua, believed to have ruled sometime in the 13th century (Summers 1971:5; Fornander 1880). Later, there were a number of internal wars between chiefs of Ko'olau and Kona in the centuries that followed his victory. Though all failed to hold power for long, there were episodes of external conquest by chiefs of O'ahu, Maui, and Hawai'i (see Summers 1971 for details of these histories). Summers (1971) presents some of the genealogical information from the prehistoric era and details the connections obtaining between Maui Island and Moloka'i which date back to the 16th century and Kihaāpi'ilani.

There were a number of factors that gave Moloka'i a reasonable amount of importance within the larger sociopolitical system of pre-Contact Hawai'i. The island's central position, and because it was most often without a strong political center, caused Moloka'i to be a pawn in the 18th century pre-contact wars of conquest. The island was a resource base for the support of armies and a staging area as they moved among the larger islands in the chiefly wars (Tuggle 1993a:10). An abundance of fish, as evidenced by the density of fishponds, was likely a lure to the island. Some of the most impressive *heiau* in all of Hawai'i were built facing the numerous fishponds along the southern coast, which indicates the importance of these fishponds to the ruling chiefs in pre-Contact history. Another indicator is the presence of fine quality basalt which was extensively quarried on the western end of the island (ibid).

3.2 HISTORIC BACKGROUND OF MOLOKA'I

The first descriptions of Moloka'i are from Captain Cook. These descriptions were focused on the south western coast, as they harbored off of Kalaeloa, located near Kamola Ahupua'a. They described a scene with shelter from the trade winds, little wood, and yams (Cook 1785). About a decade later, Captain Vancouver described Moloka'i's south shore and stated that the valleys appeared "verdant and fertile", with an abundant population and successful agriculture (Vancouver 1798: 201-203). William Ellis, an English Protestant missionary, arrived on Moloka'i in the early 19th century and provided further commentary on the environment and people of Moloka'i, indicating that there was little level topography, yet some areas evidence fertility, and estimated a population that exceeded Lāna'i's (Ellis 1917).

However, Moloka'i was known as the Lonely Isle in the early 1800s, since it was not a common destination for foreign ships at the same time as the other major islands were discovering the novelty of foreign goods. Early population estimates range from 3,000 to 8,000 around the turn of the century (DeLoach 1970:126). The large discrepancy is due to population fluctuations caused by war and the introduction of foreign disease, and the difficulty in traversing the countryside to obtain a reliable count. By the end of the 19th century, the population had decreased dramatically to approximately 2,500 as vast amounts of people moved to the city centers on the more populated islands (DeLoach 1970:133).

European interaction and influence on the indigenous population of Moloka'i began 31 years after Vancouver's sojourn around the island. Moloka'i was not immune to the influx of missionaries and other outsiders that came to islands. The plantation and ranching era on Moloka'i are inexplicably intertwined due to the course of history which shaped the commercial ventures of the 1800s and 1900s. The first 130 years of western impact was a time of trial and error in pursuit of a suitable cash crop, which would allow the island to participate in Hawai'i's new commercial economy. The difficulty was mostly due to the lack of sufficient quantities of fresh water in areas of potential large-scale agricultural production. Because no monetary enterprise was a lasting success, the majority of the population maintained the old ways (DeLoach 1970:130). During this time, the island's population center shifted from the fertile east coast to the central south coast, and the land between Kalama'ula and Kūmimi was said to be the most populated (Summers 1971).

R. W. Meyer was, perhaps, one of the most innovative and influential individuals in the history of plantation/agriculture on Moloka'i. Meyer was a multi-lingual immigrant from Germany who arrived on Moloka'i in the 1840s. He married a local woman of Hawaiian and Samoan decent, and together settled in the uplands of Moloka'i in Kala'e. His commercial ventures began with the introduction of a cattle ranch stocked with longhorn cattle, which he shipped to Honolulu (Judd 1936). Although Meyer's efforts at animal husbandry were less than successful, he was quite successful in horticulture. He grew a variety of crops including: coffee, corn, wheat, and potatoes. His crowning achievement was the construction of a horse drawn sugar mill, which still stands, and has been restored. This unique sugar mill is on the National Register of Historic Places, thereby assuring R.W. Meyer a place in the early written histories of Moloka'i (Kirkendall and Cleghorn 2009).

Between 1870 and 1900, several larger-scale sugar plantations were started on Moloka'i. One was at Moanui, which burned down. Another mill operated at Kamalō, but evidence suggests that by 1900, neither were in operation. Remnants of the pier at Kamalō and stone ruins at Moanui are visible today. In 1898, the American Sugar Company incorporated and started a sugar plantation on the plains of Moloka'i. Subsequently, the American Sugar Company constructed a harbor and pier, as well as a railroad from the end of the pier to Pālā'au on the Ho'olehua plateau. The initial property was on 750 acres of which 500 were planted in young sugar cane. Water, or lack thereof, proved to be a reoccurring theme for the plantation. To address this issue, the company excavated irrigation ditches and dug wells in the lowlands, with steam pumps of 10,000,000 gallon capacity to lift the water (Judd 1936). This rapid removal of water decimated the freshwater aquifer, and drew brackish and sea water inland to the fields. As this unfortunate event destroyed the cane crops, American Sugar Company was forced into economic demise (Kirkendall and Cleghorn 2009). Sugar cultivation attempts at Kamalō and Moanui were more successful, albeit, by a small margin.

Continued economic distress created a need for another economic outlet. By 1920, Moloka'i Ranch comprised the chief economic venture on the island in the form of beef cattle. Its success came at the decline of sheep, honey, and taro exports. According to Cooke (1949), the total area devoted to cattle production and grazing included 89,428.811 acres, 64,104.811 of which were fee simple and 25,324 constituted leased Government lands.

However, the first 20 years of the 20th century were not without economic trouble. A severe drought threatened the entire operation in 1908 (Cooke 1949). George Paul Cooke, soon-to-be ranch manager, stated that only 13.94 inches of rain fell at Kualapu'u; the lowest since Governmental recordation began. At least five hundred head of cattle were lost to thirst and starvation. Ranch stockholders did not receive a positive dividend on their investments until ten years after the drought (Cooke 1949).

A proposal by Hawaiian Pineapple Company Ltd. was submitted to lease these lands for pineapple production upon the expiration of government land leases in Ho'olehua, Pālā'au, and Kalama'ula in 1918. In 1922, pineapple cultivation on Moloka'i spread to the west end of the *ahupua'a* of Kaluako'i. Lands above the five hundred foot elevation were leased to Libby, McNeill, and Libby for pineapple. Libby established a cable landing at Pu'u Kai'aka, north of Pāpōhaku Beach because of poor roads and transport systems. A few years later, Libby's expansion allowed for excavation and construction of a channel and wharf at Kaumanamana serving tug boats and barges, which was named "Kolo," as Kaumanamana proved difficult to pronounce (Cooke 1949).

The California Packing Company (CPC) obtained a lease to raise pineapples at Kalae and Pu'u o Hoku at about the same general time frame (1919). In 1927, CPC lands expanded through additional lease agreements for lands at Nā'iwa and Kahanui. Additionally, a CPC ranch employee camp was constructed at Kualapu'u and the company took over ranch lands and the camp at Ma'ālehu, renaming it Kīpū (Kirkendall and Cleghorn 2009).

In 1920, Moloka'i Ranch, under G.P. Cooke, tried their hand at dairy farming as the Mapulehu Dairy (Cooke 1949). The dairy cows were raised on corn and alfalfa, which proved to be

successful. Raw milk from the Mapulehu Dairy was exported to Leahi Home (tuberculosis hospital) in Honolulu. This venture flourished for a number of years until 1933, when someone poisoned 16 of the cows with arsenic in the feed. The operation closed in Mapulehu, and moved to Kauluwai, which was in operation until at least 1949 (Cooke 1949).

By the mid 19th century, Europeans were established on Molokaʻi, and able to purchase lands after the Mahele, which legislated private property ownership in the islands. However, Hawaiian royalty also expressed interest in the island. Kamehameha V was a frequent visitor, and purchased land from Hawaiians on Molokaʻi for his country home, Malama, located on the beach near Kaunakakai. The platform is still visible, although unmarked. At his death, the estate of Kamehameha V (Lot Kapuāiwa) came to Charles R. Bishop through his wife, Bernice Pauahi Pākī Bishop. Through a *hui* action with individuals A.W. Carter, A.S. Hartwell, W.R. Castle, and J.B Castle, the group amassed approximately 70,000 acres of fee simple land (Cooke 1949; Judd 1936; Tuggle 1993b). The king also purchased cattle, which roamed the island at will due to their status as *kapu*.

The Hawaiian Homes Act was established in 1921, in a clear effort to allow native Hawaiians the opportunity to boost their standard of living by providing an economic outlet via homesteading (Kirkendall and Cleghorn 2009). Properties became available as homestead lands on Molokaʻi in Kalamaʻula Ahupuaʻa, which was initially called the Kalanianaʻole Settlement. Subsequently, other homestead areas were made available in Hoʻolehua and Pālāʻau Ahupuaʻa, on former Molokaʻi Ranch lands. Molokaʻi Ranch leased these lands primarily for the raising of pineapples. At this time, just 40 acre plots in Hoʻolehua were made available to applicants. In the spirit of self-sufficiency, homesteaders raised cattle, horses, sheep, chickens, pigs, and vegetables (Kirkendall and Cleghorn 2009). Seventy-nine homesteading families came to Molokaʻi in the first year deeming the program a success (DeLoach 1970:136). The island has since maintained a more traditional way of life than other islands thanks to its relatively low population of which a high percentage is native Hawaiian, and there is a strong sentiment against outside interference in land affairs.

Perhaps one of the darker periods in the history of Molokaʻi is when the Leper Colony in Kalaupapa was fully active. The colony was initiated the mid-19th century, but remained in use well into to the modern era even after leprosy was later established as the treatable Hansen's disease. The story of over a thousand people brutally banished to die on a remote peninsula in Molokaʻi for contracting a misunderstood disease, is somewhat balanced by the enduring altruism of Father Damien and other attendees as well as the perseverance of those who suffered from the disease.

4.0 ʻUALAPUʻE

The *ahupuaʻa* of ʻUalapuʻe is located in the leeward, southeast portion of the island (Figure 2). The name ʻUalapuʻe translates to 'sweet potato mound.' The land was indeed known to be fertile, filled with sweet potato crops and taro *loʻi,* in a land where *loko* (fishponds) are prolific along the coastline. ʻUalapuʻe was also known as a place for collecting drinking water, though the freshwater spring is now located in a private residential lot and has been filled in with large stones (Wyban 1990:17). There is very little literature to be found in regards to ʻUalapuʻe history other than a 1990 plan report contracted by the Department of Planning and Economic Development, Molokaʻi Office, written by Carol Araki Wyban. This plan was developed using the traditional *ahupuaʻa* as a model for future planning to develop sustainable economic activities from shore to mountain. This plan uses ʻUalapuʻe Ahupuaʻa as a potential model for combining traditional and innovative sustainable practices. Several former ʻUalapuʻe residents were interviewed to talk about their memories. In these interviews, the most memorable landmark mentioned within ʻUalapuʻe Ahupuaʻa, was clearly the ʻUalapuʻe fishpond, which was referred to as a "sacred place" (ibid).

The DHHL owns 412 acres in ʻUalapuʻe, *mauka* of Kamehameha V Highway. ʻUalapuʻe currently contains no homesteads, however, it is one of the first priorities of the MIP to designate residential areas within the *ahupuaʻa*. The proposed residential development in ʻUalapuʻe is located approximately 12-13 miles east of the island's main town, Kaunakakai, and will provide seventy-four 10,000-square foot residential lots on 25 acres, to be developed in two phases. Phase 1 will consist of developing nine acres on the east side of the land division, and will provide twenty-seven 10,000 square foot lots. Phase 2 will consist of forty-seven 10,000 square foot lots on 16 acres along the west side. This phase will commence upon completion of the first phase (Group 70 2005: ES-5-6,14). A total of eight Tax Map Key (TMK) parcels are located in the proposed ʻUalapuʻe DHHL development (Table 1). The 2005 Island Plan map of ʻUalapuʻe also indicates a fourth lot as a possible future residential area, TMK (2)-5-6-002:025 (Figures 2-3). Appendix A provides aerial aspects of each Residential TMK.

Table 1. ʻUalapuʻe Lands Zoned Residential by TMK Number

DHHL Residential TMKs
(2)-5-6-002:001
(2)-5-6-002:024
(2)-5-6-002:025
(2)-5-6-002:026
(2)-5-6-002:027
(2)-5-6-002:034
(2)-5-6-002:036
(2)-5-6-006:017

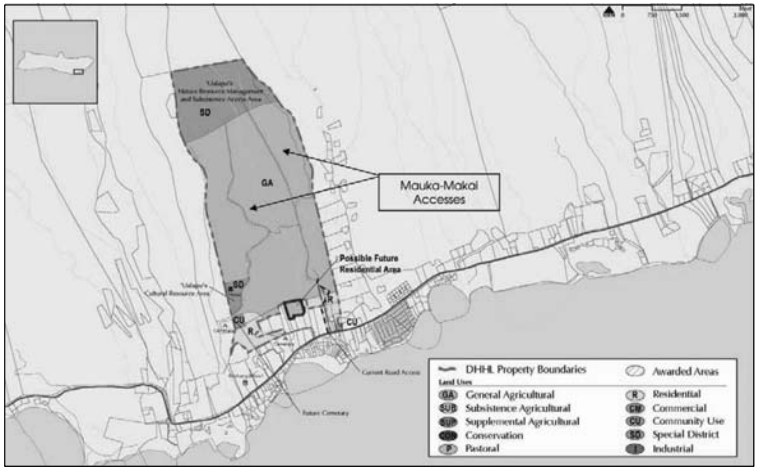

Figure 2. ʻUalapuʻe Parcel with proposed land uses (from Group 70 2005: Figure ES.3).

Figure 3. Current ground conditions of ʻUalapuʻe (courtesy of Google Earth).

4.1 CLIMATE

This area of Molokaʻi is largely sheltered from the prevailing northeast tradewinds, which are responsible for the majority of rainfall in the Hawaiian Islands. The area receives between 75 and 100 centimeters (30 - 40 inches) of rain per year, with the majority of the precipitation occurring between the months of November to April (Juvik and Juvik 1983:62). The average temperature for coastal areas ranges from 72 to 75° F (22 -24° C).

4.2 SOILS AND TOPOGRAPHY

The soils within the ʻUalapuʻe project area are mostly composed of silty clays with various specific associations and slopes ranging from flat to 35 percent. Rough mountainous land is also present in the area (Foote et al. 1972:26, 45, 92, 93, 119, and Map 80). The area is interspersed by the deep ravines of Kahananui Gulch, Kiʻinohu Gulch, and Moʻomuku Gulch. The steep isolated plateaus and valleys that make up most of the area, make development challenging. Because soil is poorly drained over soft weathered rock, the land is characterized as agriculturally unproductive (Group 70 2005: 3-1; Figures 4-8). A detailed Custom Soil Resource Report for the Residential areas of ʻUalapuʻe Ahupuaʻa was generated using the U.S. Department of Agriculture (USDA) and Natural Resources Conservation Service (NRCS) Web Soil Survey and is provided in Appendix B.

Figure 4. County DWS water tank above ʻUalapuʻe (from Group 70 2005:3-1).

Figure 5. *Mauka* region of ʻUalapuʻe (from Group 70 2005:3-3).

Figure 6. *Mauka* region of ʻUalapuʻe from Kamehameha V Hwy (from Starr and Starr 2011).

Figure 7. Residences adjacent to DHHL parcel in ʻUalapuʻe (from Group 70 2005:3-6).

Figure 8. Entrance to existing ʻUalapuʻe Cemetery (from Group 70 2005:3-9).

4.3 VEGETATION

According to Wyban (1990:51) human activity has caused exotic plant species to almost entirely replace native ones below an elevation of 600 m (1970 feet). At an elevation between 20 to 200 m (65-655 feet), the vegetation is characterized by mixed shrub land associated with Hoolehua silty clay, consisting of grasslands and low statured shrubs.

4.4 TRADITIONAL ACCOUNTS

According to the Center for Oral History (2011), ʻUalapuʻe, was home to fishermen and farmers, and now also to county workers, homemakers, and others, mostly native Hawaiians, who grew up on *kuleana* lands that were inhabited by their ancestors for generations. It further states that the coastal areas were abundant with marine resources, including clams, *limu* (seaweed), *awa* (milkfish), *ʻōʻio* (bonefish), mullet, *ʻōpae* (shrimp), and crab.

Summers (1971) lists several pre-Contact accounts of ʻUalapuʻe. In 1867, Kaepuu describes this land as being, "a good land, one filled with taro patches and also a pond." He further states that Makaolehua is the wind of the *ahupuaʻa* (Summers 1971:121). Another account relayed by Monsarrat (n.d.:90) of ʻUalapuʻe is that there is a *lele* (sacrificial altar, stand, or alternatively a land sub-division) in Wailau called Halekoki (as cited by Summers 1971:121).

The *ahupuaʻa* has been credited with also containing a life-giving fresh water source. Cooke (1949: 152), states that the most famous spring of ʻUalapuʻe is known in legends as Loʻipūnāwai. According to Cooke (1949), many people would die of thirst in search for this spring and many others would die from drinking too much of the water once it was found.

4.5 HISTORIC BACKGROUND

Several accounts of the demography within and surrounding ʻUalapuʻe Ahupuaʻa during the historic era were recorded. According to Summers (1971:3) the majority of Molokaʻiʻs population was spread between the *ahupuaʻa* of Kalamaʻula and Kūmimi, Kona District. The highest density of people in this area was located within the 8 mile stretch of lands between the *ahupuaʻa* of Keawanui and Kūmimi, which includes ʻUalapuʻe Ahupuaʻa. Further, missionaries in the early 19th century claimed that there were about 3,300 people living within a few miles of Kaluaʻaha, the *ahupuaʻa* neighboring ʻUalapuʻe Ahupuaʻa, representing the greatest population for the district of Kona (*The Missionary Herald* 1836:18, as cited by Summers 1971:3). Fornander (1880:73) wrote of lands surrounding Kalamaʻula as being an example of dense population with "over a thousand able bodied men" responding to the chief's trumpet-shell before Kamehameha's death (as cited by Summers 1971:3-4). Thus, the population of ʻUalapuʻe Ahupuaʻa and surrounding lands was noted as being dense and comprised of healthy individuals from the early historic period.

The environment surrounding ʻUalapuʻe Ahupuaʻa in historic times was noted as being conducive in supporting a large population. Coulter (1931:20) stated that in 1853, "The rainfall

of the south-eastern part of the island afforded sufficient water in the stream valleys for their lower flood plains to be used for wet land agriculture…" and that "Fish were easily procurable on most of the eastern half of the south coast…the coast line and shallow off-shore water on the coral reefs are environmental features suitable for building many fishponds." (as cited by Summers 1971:3). Captain George Vancouver in 1792 made some observations from the perspective of Kalaeloa Harbor, which is located ca. 1.5 miles (2.6 km) to the west of ʻUalapuʻe Ahupuaʻa (Figure 3), stating that Molokaʻiʻs eastern land:

> …rises rather abruptly from the sea, towards the lofty mountains in the center of the east part of Morotoi [Molokaʻi]; and though the acclivity was great, yet the face of the country diversified by eminences and valleys, bore a verdant and fertile appearance. It seemed to be well inhabited, in a high state of cultivation, and presented not only a rich but a romantic prospect. To the westward of these cliffs, the shores terminated in the former direction, by a low point of land, called by the natives Crynoa [Kalaeloa], and from thence they stretch N. 85 W. 8 leagues to the west point of the island. From Crynoa the country assumes a dreary aspect. The mountains, forming the eastern part of the island, gradually descend to the westward, and like those of Mowee [Maui], terminate on a low isthmus, which appears to divide the island into two peninsulas. These however bear no proportion to each other; the easternmost, which is far the largest is composed of very high land, but the westernmost does not rise to any elevation, beyond that of a mean height. The country from Crynoa rises from the sea by an ascent, uninterrupted with chasms, hills, or vallies, this uniform surface, on advancing to the westward, exhibited a gradual decrease in the population; it discovered an uncultivated barren soil, and a tract of land that gave residence only to a few of the lower orders of the islanders, who resort to the shores for the purpose of taking fish, with which they abound. Those so employed are obliged to fetch their fresh water from a great distance; none but what is brackish being attainable on the western parts of Morotoi. (as cited by Summers 1971:21).

This account not only describes the land of ʻUalapuʻe and bordering *ahupuaʻa* as being ideal in topography for agriculture and aquaculture supporting a dense and thriving populace, but also the relative bleakness of lands to the west. As suggested by Wyban (1990:24), the existence of ceremonial features, springs for water source, and fishponds, indicate the general area was well used in pre-Contact times.

In a review of documented fisheries and fishing rights recorded in the Mahele ʻĀina, Maly and Maly (2003) compiled a list of claims to ocean resources and fishing rights for the entire state. Of the 123 claims filed on Molokaʻi, ʻUalapuʻe contained nine of these claims, one of which was granted to the Crown. A listing of Molokaʻi ocean resource and fishing right claims is provided in Appendix C.

Moore and Kennedy (1994) collected testimonies from two long-time *kamaʻāina* of ʻUalapuʻe during their archaeological inventory survey and testing on a property located less than 200 m south/*makai* of residential lots in the *ahupuaʻa*. Ms. Cecilia Kapuni, 78 years old at the time of the interview, resided in the area since 1931. Her husband's family lived in this area for generations before her arrival and told her several interesting stories about the locale. Ms. Kapuni recalled:

> According to my father-in-law, there were many homes…that extended to the back of Kilohana School. The people would get their water from Loʻipunawai Spring that was filled in during the 1970s.
>
> According to my father-in-law, a powerful *kahuna* lived there. There was a rock slab on the property that relieved him of his backaches. I've never seen the rock though (Moore and Kennedy 1994:10).

This testimony upholds the occurrence of Loʻipūnāwai Spring in ʻUalapuʻe as well as the presence of respected *kahuna* that Molokaʻi is renowned for.

4.6 PREVIOUS ARCHAEOLOGY

A total of six archaeological sites are located in ʻUalapuʻe Ahupuaʻa (Figure 9, Table 2), however, the only available study conducted in the *ahupuaʻa* of Ualapuʻe was by Catherine C. Summers (1971), who largely compiled earlier ethnographic, historic, and archaeological investigations on the entire island of Molokaʻi into one book: *Molokaʻi: A Site Survey.* Only one systematic archaeological investigation was conducted in the entire *ahupuaʻa* of ʻUalapuʻe, which was an inventory survey with subsurface testing (Moore and Kennedy 1994).

The archaeological inventory survey and testing performed by Moore and Kennedy (1994) was conducted on a 4.4 acre property located less than 200 m *makai* of residential ʻUalapuʻe TMK's (Figure 9). Although nine surface structures, including four platform-like stone structures, two enclosures, a wall, stone alignment, and small stone pile were identified, only two sites were defined (Sites 50-60-04-1625 and -1626). Site -1625 is described as a partial enclosure, measuring approximately 30 m long by 15 m wide. This structure has been noted as possibly the remains of an animal pen seen on the 1934 Tax Map. As the pen was recorded 60 years prior to the inventory survey, the site is at least historic in age. Testing of Site -1625 yielded 4.5 grams of marine shell midden, 1 gram of coral, as well as glass, metal, and ceramic totaling 19 grams that were interpreted as modern cultural material. Site -1626 consists of two wall stone wall segments, each measuring 50 m long and up to 1.5 m wide, that border the northern corner of the property. Portions of the wall exhibit facing on front and back as well as cobble core filling. These wall segments are interpreted as a possible LCA boundary wall. Both sites -1625 and -1626 were deemed "not significant" by Moore and Kennedy (1994).

Several other studies were conducted in the neighboring *ahupuaʻa* of Kaluaʻaha, less than 500 feet east of DHHL Residential lands, which provide insights on the potential for encountering archaeological sites as well as what types of sites may be encountered in the project area. Table 3 lists archaeological investigations conducted in and around the *ahupuaʻa* and a list of archaeological sites recorded within the *ahupuaʻa* is provided in Table 3 and a full list of archaeological sites found within the ʻUalapuʻe, Kapaʻakea, Kamiloloa, Makakupaʻia, Kalamaʻula, Hoʻolehua, Pālāʻau 1 and 2 *ahupuaʻa* is provided in Appendix D.

Figure 9. Archaeological sites in ʻUalapuʻe Ahupuaʻa.

Table 2. Archaeological Sites Found on Select DHHL Lands Within the ʻUalapuʻe Ahupuaʻa

SIHP No.	TMK	Description	No. of Features	Reported Current Status	Easting	Northing	Report Author	Notes
181	5-6-006:017	Heiau, Kalauono-kukui	No data	Preserved, NHRP & NHLD #66000304	724729.371394	2330903.22722	Summers 1971; National Park Service 2011	Reported by Summers (1971) as being in Kahanui Ahupuaʻa; part of Hōkūkano-ʻUalapuʻe Complex; appears on the boarder or within ʻUalapuʻe.
183	5-6-002:027	Kahua Maika, of Kaʻakeke	No data	Destroyed	725613.424565	2330595.348	Summers 1971	Reported to be approximately 1000 yards in length and was straight like a ditch; Summers (1971:105, Figure 45) has it mapped in two locations.
184	5-6-003:035	Pond, Helemahana	No data	Filled in	725156.004019	2330023.57232	Summers 1971	3.3 acres in area; used commercially in 1931; reported to have two *mākāhā.*
185	5-6-001:001	Pond, Helemahana	No data	Still in use, modern clearing of vegetation and rubbish	725314.3419	2330230.29122	Summers 1971	22.25 acres in area; silted-in and overgrown with vegetation in areas; had two *mākāhā ;* renown for the "fatness" of its mullet in the 19th century.
1625	5-6-002:007	Partial Enclosure	1	Disturbed, not significant	725102.140348	2330306.62185	Moore and Kennedy 1994	Likely a remnant of Historic Pen seen on 1934 TMK map.
1626	5-6-002:007	Wall Segments	2	Disturbed, not significant	725089.801676	2330435.57464	Moore and Kennedy 1994	Likely remnants of the LCA wall.

Table 3. Previous Archaeological Investigations in ʻUalapuʻe Ahupuaʻa and Vicinity

Reference	Location	Description and Results
Summers 1971	Island-wide	A compilation of ethnographic, historic, archaeological and legendary material relating to Molokaʻi.
Barrerra 1983	Kaluaʻaha Estates, *Ahupuaʻa* of Kaluaʻaha	Three stone mounds, an earthen mound, stone wall, two midden scatters, and historic ceramic scatter found. Testing revealed a cultural deposit. (Site 50-60-05-531)
Athens 1985	Kaluaʻaha Estates, *Ahupuaʻa* of Kaluaʻaha	Found midden and lithic scatter during survey and encountered a cultural layer during testing that contained a single hearth. No dates, but site is described as prehistoric based on cultural materials. Attributed to Site 50-60-05-531.
Moore and Kennedy 1994	*Ahupuaʻa* of ʻUalapuʻe	Identified nine surface structures, including four platform-like stone structures, two enclosures, a wall, stone alignment, and small stone pile. Testing yielded modern cultural material beneath the structures tested, save for a partial enclosure and wall, which dated to >68 years before present. State site numbers were assigned: 50-60-04-1625 and -1626. These sites were considered "not significant" and not slated for preservation or further investigation.

Summers (1971) describes 24 sites that occur near or within ʻUalapuʻe Ahupuaʻa (Figure 10). A group of eight sites nearest to the project area are collectively called the Hōkūkano-ʻUalapuʻe Complex, comprised of six *heiau* and two fishponds, that were entered into the National Register of Historic Places (NRHP) in 1966 and designated as a National Historic Landmark (NHLD) in 1962 (National Register No. #66000304; National Park Service 2011). The four sites located within ʻUalapuʻe Ahupuaʻa include a famous *kahua maika* (Site No.50-60-04-183), which is a place for the ancient Hawaiian *maika* game similar to bowling. This particular course was built into a groove or ditch, making it a difficult for the players to roll the ʻ*ulu maika*, or smooth disc-shaped game stone straight. It is said that Kamehameha I visited this site in 1812 to see the most skilled players. Unfortunately, this *kahua maika* is now filled in. The second site is the Halemahana Pond (Site -184), a small traditional Hawaiian fishpond that was used commercially in the early 20th century, but is now filled in. The third site is the Puʻukuhe Heiau, whose exact location is not recorded. The fourth site is ʻUalapuʻe fishpond (Site -185), known for its large mullet in the 19th century and abundance of clams in the early 20th century. It is believed that the abundance of marine life may be due to the numerous freshwater springs that feed into the pond. ʻUalapuʻe fishpond is believed to hold great potential for gathering information about prehistoric agriculture/subsistence and religion practices

Additional sites were recorded in the adjoining land divisions and include numerous fishponds and *heiau*. Kalauonakukui Heiau (Site -182), according to the MIP (Group 70 2005:3-4) and USGS East Molokai Map (1983), is located in the *ahupuaʻa* of ʻUalapuʻe. Summers (1971:105, Figure 45), however, has this site mapped on the boundary of ʻUalapuʻe and Kahananui Ahupuaʻa. This *heiau* is located directly north of the first priority residential area and the land surrounding it is designated as Special District. Kalauonakukui Heiau is considered an agricultural *heiau,* dedicated to the *akua* (god), Lono. It has been measured as 125 feet in length, 85 feet in width, and 6 feet in height.

In 1983, William Barrera performed an archaeological survey and test excavations in a 5 acre lot, which is located less than 500 feet east of several residential lots in the project area [TMK (2)-5-6-002-001, 027, and 036] (Barrera 1983) (Figure 3). Three stone mounds, two noted as possibly burials or habitation platforms, an earthen mound, a stone wall, at least two midden scatters, and a historic ceramic scatter were observed (Site 50-60-05-531). A total of ten test units were excavated in the site. Test units were excavated in two of the stone mounds. One test unit contained cultural material, where Historic glass and ceramics were found directly under the stone mound (ground surface), and an ashy cultural layer containing midden was found at 10-15 cmbs. Another test unit was excavated in one of the midden scatters, which revealed more midden, coral, basaltic glass, and charcoal. Several other features were tested, revealing more midden deposits that all appear to be ca. 30 cm thick. Barrera (1983) did not date charcoal, but based on artifacts and midden, suggests most cultural deposits are prehistoric.

Several years later, Stephen Athens (1985) found a large (136 sq. m) surface scatter of midden and volcanic glass flakes (related to Site 50-60-05-531) during his survey in the same 5 acre lot, now subdivided and called Kaluaʻaha Estates (Athens 1985). Athens then performed three test excavations revealing a 30cm thick cultural layer, likely associated with the cultural layer observed by Barrera (1983). A single hearth was encountered in a test unit at 85cmbs. Cultural remains consisted of volcanic glass flakes, polished adze flakes, and fragments. No C-14 dates

were provided, but Athens stated that the site was prehistoric based on the types of artifacts found.

4.7 ONGOING ARCHAEOLOGICAL PROGRAMS

A protected 78 acre Special District has been designated for the area around the upper *mauka* boundary, which incorporates Kalauonākukui Heiau as well as stands of endangered or threatened flora species. A buffer zone has been put in place that extends out from the physical structure of Kalauonākukui Heiau to a minimum distance of 100 feet within the DHHL property. This buffer zone may be used in the future for the development of a cultural resource management (CRM) area including a cultural garden (Group 70 2005: 3-7).

According to the MIP, "[t]he Special District designation for Kalauonākukui Heiau will preserve this important cultural resource and the integrity of its cultural space as well as create opportunities for groups to engage with this *wahi pana* (traditional sacred site) for educational purposes and create linkages with the coastal cultural resources such as 'Ualapu'e Fishpond" (Group 70 2005:3-4). Further, the MIP states, "[t]he CRM area could include a staging area whereby community members that take on the responsibility for the long-term care of the *heiau* could conduct informal talk-story sessions and formal educational forums for visitors to the area" (Group 70 2005:3-7).

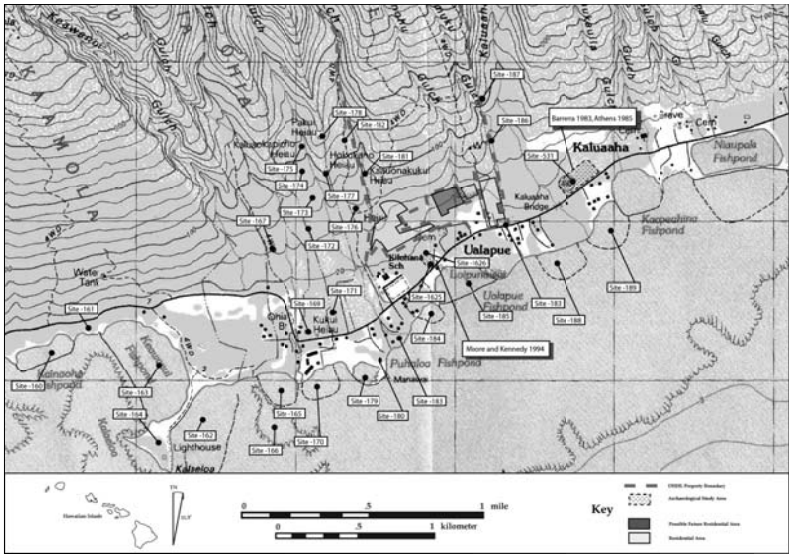

Figure 10. Previous archaeology and recorded archaeological sites in 'Ualapu'e.

5.0 KAPA‘AKEA, KAMILOLOA, AND MAKAKUPA‘IA

The *ahupua‘a* of Kapa‘akea, Kamiloloa, and Makakupa‘ia are located on the leeward slopes of the Eastern volcanic series, in the arid region of central Moloka‘i. In all three *ahupua‘a*, areas under review are located at an elevation ranging from the coast up to 250 feet above mean sea level (amsl).

The proposed future residential areas in the *ahupua‘a* of Kapa‘akea, Kamiloloa and Makakupa‘ia are comprised of 204 acres situated within the central region of the DHHL parcel, *mauka* of Kamehameha V Highway (Figure 11). The new residential areas would provide 286 half-acre lots. Potable water service to the area can only be provided to the 150 ft. elevation level since booster pump stations and storage tanks would be required for any development further *mauka*, and is cost prohibitive at this time. The three *ahupua‘a* are adjacent to one another and the three parcels to be further developed are separated by no more than 1.5 miles (Group 70 2005: 4-1). The majority of the DHHL lands in these *ahupua‘a* are designated for agricultural use. The upper slopes are within the Conservation district and its lower western section is within an Urban-designated area (Figures 11-14). The fishponds along the coastal region are also part of the Conservation District.

A total of 83 Tax Map Key (TMK) parcels are located in the proposed Kapa‘akea, Kamiloloa, and Makakupa‘ia development (Table 4). Appendix A provides aerial aspects of each of the following TMKs.

5.1 CLIMATE

The area is quite arid, receiving only 40 to 60 centimeters (16 to 24 inches) of mean annual rainfall (Giambelluca et al. 1986). There are no permanent streams in the area although there are numerous gulches that collect water in times of heavy rain. There are several known freshwater springs along the shoreline.

5.2 SOILS AND TOPOGRAPHY

The coastal portion of this parcel is made up of primarily of silt loams and silty clays with patches of Jaucas sands. One small marsh area is located along the coast on the western side of the parcel (Foot et al. 1972: 48, 67, 92, 95, and Map 77). The inland portion of this parcel is composed primarily of eroded, very stony land with large areas of very stony lands and rocky lands (Foot et al. 1972: 119, 124, and Map 77). The general landscape is very rocky, with about 50 – 75 percent of the surface covered with stones and boulders (Foot et al. 1972:124). This land type is generally used for pasture (ibid.) A detailed Custom Soil Resource Report for the Residential areas of Kapa‘akea, Kamiloloa, and Makakupa‘ia Ahupua‘a was generated using the U.S. Department of Agriculture (USDA) and Natural Resources Conservation Service (NRCS) Web Soil Survey and is provided in Appendix B.

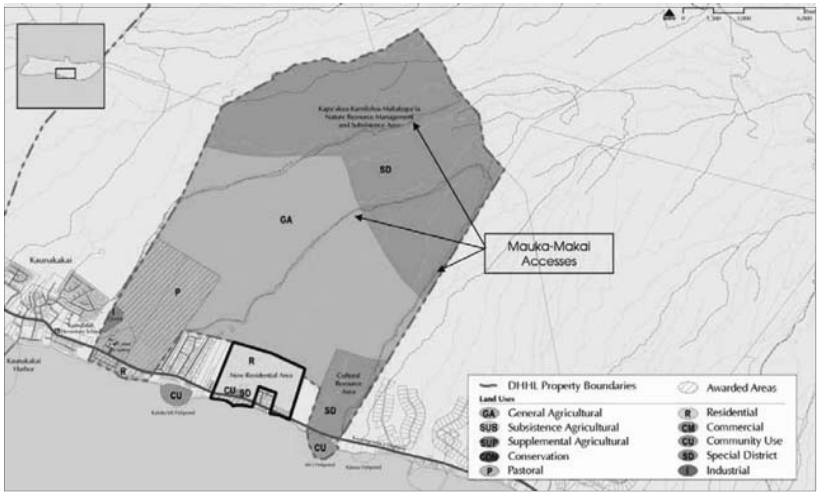

Figure 11. Kapa‘akea, Kamiloloa, and Makakupa‘ia Parcel with proposed land use distinctions (from Group 70 2005: Figure ES.4).

Figure 12. Current state of Kapa‘akea Ahupua‘a *makai* (west), residential lands highlighted (courtesy of Google Earth).

Figure 13. Current state of Kamiloloa Ahupua‘a *makai* (central), residential lands highlighted (courtesy of Google Earth).

Figure 14. Current state of Makakupa‘ia Ahupua‘a *makai* (east), residential lands highlighted (courtesy of Google Earth).

Table 4. Kapa‘akea, Kamiloloa, and Makakupa‘ia TMKs to be Impacted by Potential Development

Residential	Road
(2) 5-4-003:037	(2) 5-4-008:999, Road
(2) 5-4-003:003, portion	
(2) 5-4-003:009, portion	
(2) 5-4-003:031, portion	
(2) 5-4-003:033, portion	
(2) 5-4-006:001	
(2) 5-4-006:013 – 018	
(2) 5-4-006:020	
(2) 5-4-006:029 – 030	
(2) 5-4-006:055	
(2) 5-4-006:067 – 071	
(2) 5-4-007:002	
(2) 5-4-008:002 – 022	
(2) 5-4-003:037	

In the Kapa‘akea, Kamiloloa, and Makakupa‘ia Parcel, the coastal area is characterized as a flat coastal plain with major drainage channels that travel from the uplands and help form the wetlands near the shoreline. Surface runoff is a major issue particularly within Kapa‘akea, where severe flooding occurs on an annual basis in the coastal area (Group 70 2005: 4-2). Much of the land is unsuitable for most types of activities due to the rugged nature of the land and potential for further erosion. There are no permanent streams in any of the areas. The land is also moderately dissected and flood-prone (Figures 15-20).

5.3 VEGETATION

The vegetation in Kapa‘akea, Kamiloloa, and Makakupa‘ia Parcels is dominated by *kiawe* (*Prosopis pallida*.), *‘ilima* (*Sida fallax*.), finger grass and the native *pili* grass (*Heteropogon contortus*), which was an important thatching material for pre-Contact Hawaiian architecture (Figures 14-19). There are also areas of *koa haole* (*Leucaena glauca*), *ma‘o* (native cotton, *Gossypium tomentosum*), and a few *wiliwili* (*Erythrina sandwicensis*). The tree cover in the area is generally sparse (Hommon and Ahlo 1983; Tuggle 1993a).

5.4 TRADITIONAL ACCOUNTS

Little information exists on the oral traditions of these specific *ahupua‘a*. Pukui et al. (1976) list Kapa‘akea, and Kamiloloa, Makakupa‘ia Ahupua‘a in, *Place Names of Hawai‘i,* with literal translations of the first two place names from Hawaiian to English. Pukui et al. (1976:86) state that Kapa‘akea is also referred to as Pa‘akea, which translates as “the coral or limestone surface.” Kamiloloa translates as “the tall milo tree” (Pukui et al. 1976). Makakupa‘ia has no direct translation, but is stated to be the name of two land divisions. Summers (1971) agrees with Pukui et al. (1976) that Makakupa‘ia has two land sections, an east and a west, which to together make up the *ahupua‘a.*

The majority of the permanent settlement population in the pre-Contact era most likely lived close to the coast near the fish ponds, which would follow the same pattern as nearby Kawela (Weisler and Kirch 1985). Their subsistence would have been based largely on marine resources, supplemented by non-irrigated agriculture from pre-Contact times into the early twentieth century. Crops would have included mostly sweet potato (*Ipomea batatas*), gourd (*Lagenaria siceraria*), and perhaps yam (*Dioscorea alata*) and sugarcane (*Saccharum officinarum*). Coconut (*Cocos nucifera*), banana (*Musa* sp.), and dry-land taro (*Colocasia esculenta*). Breadfruit (*Artocarpus incisa*) could have been grown in alluvial plain areas, where the majority of population likely lived (Tuggle 1993a:9). Some *ali‘i* are also said to have in the area. For instance, Nāmāhana, the mother-in-law of Kamehameha stayed in Kamiloloa (Desha 2000:405).

Figure 15. Area under future consideration for wetland and fishpond restoration in existing Residential lands under lease in Kapa‘akea (from Group 70 2005:4-7).

Figure 16. *Mauka* view of existing drainage Pastoral lands of Kapa‘akea to NRM-SB (Special District) (from Group 70 2005:4-6).

Figure 17. Small ranch in Kamiloloa, *mauka* of Kamehameha V Hwy (view to north).

Figure 18. Undeveloped lands in Kamiloloa, *mauka* of Kamehameha V Hwy (view to north).

Figure 19. *Makai* view of One Ali'i Fishpond in Makakupa'ia (from Group 70 2005:4-6).

Figure 20. Native ecosystem within Kamakou Preserve adjacent to Special District in Makakupa'ia (from Group 70 2005:2-10).

Summers (1971:88-91) describes archaeological sites of each land division briefly, supplemented with a few Traditional accounts. The area where homesteads are now located in Kapaʻakea was at one time called *Ka laʻi o kioea*, or "The tranquil spot of the *kioea*," *kioea* being the Hawaiian name for curlew (*Numenius tahitiensis*). It was in this area that the curlews were said to urge the canoes on when it was time to fish. Summers (1971) also describes a fishpond in Kapaʻakea known as Kapaʻakea Pond (Site 132), which covered an area of 5.45 acres but has long since been filled. Further, the waters off the shore of Kamiloloa were known for their *heʻe* (octopus, *Polypus* sp.). The type of wind that blows in the *ahupuaʻa* of Kamiloloa is known as the *Pai* (to raise, lift up, increase). The Kalokoʻeli Pond (Site -133) was also known as "The dug up pond" (Summers 1971: 88). This 28 acre pond was a *loko kuapā* (a designed rock enclosure with a *mākāhā* or sluice gate that allows for ocean water to circulate within the pond).

Tuggle (1993a:11) mentions that the coastal zone of Kamiloloa was frequently used as a staging area for armies from the pre-Contact to early-Historic periods. He also states that according to lore, one major battle between Oʻahu and Molokaʻi armies was fought in the coastal area of Kamiloloa in the early 18th century, before European contact. In this battle, Kapiʻiohokalani, ruling chief of Oʻahu, invaded Molokaʻi and forced its chiefs up into the mountains. A distinguished chief of Hawaiʻi Island, Alapaʻinui, then comes to reinforce Molokaʻi's chiefs and a great battle ensued that stretched from Kawela to Kamiloloa. A vast number of warriors were slain during this battle and Kapiʻiohokalani was defeated (Fornander 1969:136-9 as cited by Tuggle 1993a:11). During Kamehameha's military campaign to conquer the islands about 60 years later, he and his troops camped on Molokaʻi before attacking Oʻahu's army in the battle of Nuʻuanu (Kamakau 1961: 71, 172 and Fornander 1969:344 as cited by Tuggle 1993a:11). The prewar scene on Molokaʻi for this particular battle, with Kamehameha's canoes and encampments spread from Kawela to Kalamaʻula, was telling of the impending doom of Oʻahu's armies. In these wars, Kaʻiana was said to camp at Kamiloloa (Kamakau 1961:71) and Kalanimoku is said to have camped at Kapaʻakea (Desha 2000:405).

5.5 HISTORIC BACKGROUND

Although few Historic documents were found referring to Kapaʻakea, Kamiloloa, and Makakupaʻia Ahupuaʻa, archaeological reports by Hommon and Ahlo (1984), Tomonari-Tuggle (1990), and Tuggle (1993a) provide a good compilation of Historic information on these *ahupuaʻa*.

The sandalwood harvest and trade appears to have been an important economic focus in the Ahupuaʻa of Kamiloloa in Historic times. Cooke (1949:61), describes a site named *Ka lua nā moku'iliahi,* which translates as "the pit (of) the sandalwood ships" that is located in the Kamiloloa between Puʻu Kaʻeo and the coast (Site 50-60-03-134). This trench was dug as a measuring system, which simulated the dimensions of a ship's cargo hold. Upon filling the trench with sandalwood logs, the Chiefs could then bargain with the captains of trading vessels for a fair price on the logs (Cooke 1949:61).

Maly and Maly (2003) in their ethnographic synthesis of state-wide history of traditional fishing practices have composed a database in English of fisheries and associated resources as

described in Native Testimonies. Of the 123 claims filed on Molokaʻi, one of these claims was granted to an individual in Makakupaʻia (Appendix C). However, several testimonies apply to the *ahupuaʻa* of Kamiloloa and Makakupaʻia that describe the aquatic resources of these localities. In the translated versions of Native Testimonies of the Island of Molokaʻi (Volume 1:184-185) recorded in the middle to late 19th Century, a Native Hawaiian claimant named Kekuhe states:

> …Kaluaaha is where I live now. My parents and grandparents were from Makakupaia and Kamiloloa. I know the boundaries of Kamiloloa. Kamiloloa has a Fishery, from the octopus grounds to where the waves break at Kunahiwa. There at the back of the waves… …Then from Puu Ulaula to Kaulahuki, it is a hill adjoining Makakupaia. From Kaulahuki to Waiulaula, a long house is there in which the old people prepared *olona* ; then from there to the edge of the cliff… …Go from Makaliiliii towards the sea, to Puu Pulou; from Puu Pulou go to Puu o Kamalii. From Puu o Kamalii go to the estuary; from the estuary go to Kalokoloa. It is on a reef flat, then go on until the edge of the blue ocean. That is the place that I know… [Maly, translator] (Maly and Maly 2003:365)

This statement outlines the type of marine resources available in Kamiloloa waters as well as the occurrence of *olonā* preparation. Kamiloloa and Makakupaʻia are also mentioned in another translated statement by Honunui, a Native Hawaiian claimant who further defined the Historic era marine resources of the area:

> …I am a native of Kamiloloa. I was born at Makakupaia. I live at Kaluaaha. My parents were from there (Kamiloloa). This land has a fishery, it is an area set apart for *hee*, out to Kuuna o Kuuwahine, the boundary from the sea. It is a reef flat… …From there to Waiulaula, the famous thing there is Puu Maniania, the long house where *olona* was prepared; from there go to the edge of the cliff of Puu o Kamakaliilii… …From Puu Pulou go to Puu o Kamalii and down to the estuary; from there go to Kalokoloa, it is a net fishery, (*kuuna*) and a reef flat; from there to the *hee* fishery. That is where we lived with our parents, and from our parents we gained our knowledge… [Maly, translator] (Maly and Maly 2003:366)

Honunui upholds Kekuhe's testimony that there was an estuary in the waters of Kamiloloa that allows for several fisheries of a diverse array of marine resources. Further, the two claimants agree on the presence of a long house where *olonā* was prepared.

5.6 PREVIOUS ARCHAEOLOGY

Several major archaeological investigations have been conducted in the *ahupuaʻa* of Kapaʻakea, Kamiloloa, and Makakupaʻia (Figure 21), yielding a total of 19 archaeological sites located within DHHL Residential TMKs in this parcel (Figure 22). A significant portion of these areas have been archaeologically surveyed. Table 5 provides a short synopsis of all previous archaeology carried out in the vicinity in chronological order. Appendix D provides a list of archaeological sites found in the selected *ahupuaʻa*. Following is a more lengthy discussion of the archaeology that has taken place in the specific areas to see further development.

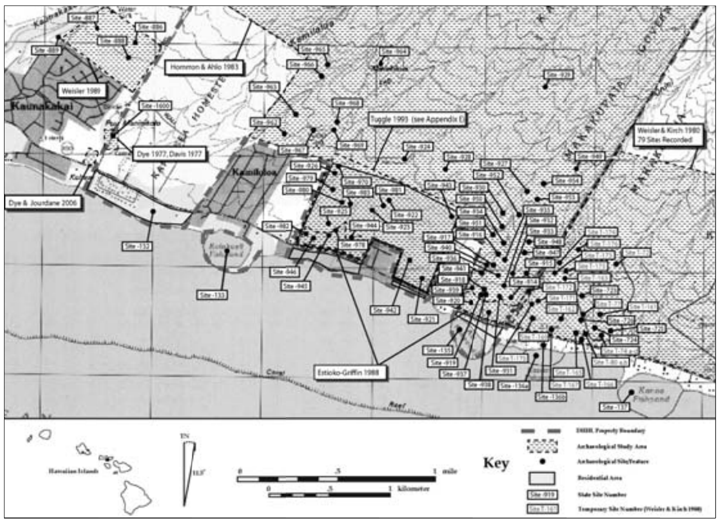

Figure 21. Previous archaeology and recorded archaeological sites in Kapa'akea, Kamiloloa, and Makakupa'ia.

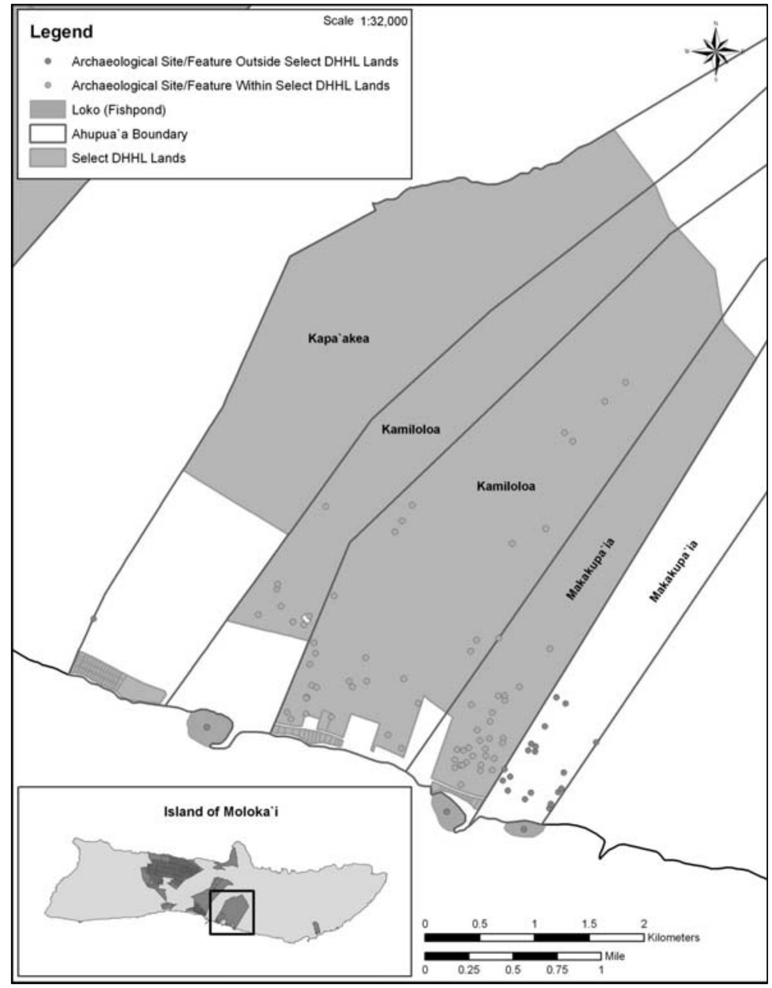

Figure 22. Archaeological sites in Kapa'akea, Kamiloloa, and Makakupa'ia Ahupua'a.

Table 5. Previous Archaeological Investigations in the Kapaʻakea, Kamiloloa, and Makakupaʻia Ahupuaʻa and Vicinity

Reference	Ahupuaʻa	Description and results
Summers 1971	Island-wide	A compilation of ethnographic, historic, archaeological and legendary material relating to Molokaʻi.
Davis 1977	Kapaʻakea	Work was conducted in conjunction with a flood control study undertaken by the U.S. Army Corps of Engineers for Kapaʻakea Homestead. Numerous enclosures, platforms, house sites, terraces, possible burials, trails and stone alignments were located on a small parcel of land immediately seaward of Puʻu Maninikolo cinder cone.
Dye 1977	Kapaʻakea	Continued the work of Davis in the same area, later in the year.
Weisler and Kirch 1980, 1985	Kawela and Makakupaʻia	A high intensity survey and excavations in conjunction with a planned development. They located a wide range of archaeological features representing habitation and agricultural use of the area. Their survey concentrated on areas below 500 feet elevation, where the vast majority of sites were found. Further analyses in 1985 were performed on the findings to determine patterns or trends in site functions for the area.
Shun 1982	Kaunakakai	Parallel mounds with unknown function and subsurface prehistoric cultural deposits found, some up to almost 1 m deep.
Hommon and Ahlo 1983	Kalamaʻula, Kapaʻakea, Kamiloloa, and Makakupaʻia	An intensive survey was conducted on 735 acres of Hawaiian Home Lands in the areas of future development from the 500 ft contour to the coast.
Estioko-Griffin 1988	Kalamaʻula, Kamiloloa, and Makakupaʻia	The one-day field inspection was conducted shortly after a brushfire uncovered numerous sites in the area. From this inspection, an inventory survey was recommended.
Weisler 1989a	Kaunakakai	Approximately 115 acres was surveyed above the town of Kaunakakai between 130 - 250 ft asl. An extensive dryland agricultural system was discovered. Four samples were taken for radiocarbon analysis which suggests the area was occupied from the AD 1200s to the 1400s.
Hammatt and Borthwick 1993	Kaunakakai	An enclosure with a paved surface and a stacked boulder wall were recorded.
Dye and Jourdane 2006	Kaunakakai	Only archival research was performed. The assessment of the property was that it contained no Historic sites on the surface and prior pineapple cultivation and construction in the area lessened the chance for shallow cultural deposits.

Summers (1971) found a total of six archaeological sites, mostly consisting of fishponds, for these three *ahupuaʻa*. Aliʻi Pond, also known as One Aliʻi Fishpond (Site -135), and Kaoaini, also known as Kaonini Pond (Site -136A) were major features of the *ahupuaʻa*. Summers (1971:90) examined these fishponds to find that the walls of Kaonini Pond were destroyed decades earlier, and were covered with mangrove. Aliʻi Pond, along with Kalokoʻeli Fishpond, were *loko kuapā* (fishponds extending from the coastal edge and made by building a wall on a reef). At the time of Summer's (1971:90) investigation, Aliʻi Pond's walls measured over 2,700 feet long, 4 feet wide, and 4.5 feet high at its prime. This pond was traditionally reserved for the *aliʻi* (Group 70 2005: 4-9). Summers also mentions that numerous burials (Site 136B) were uncovered in Makakupaʻia (East) when the construction for the Del Monte Park (One Aliʻi Beach Park) took place.

Systematic archaeological research in the general area began in 1983 with an intensive archaeological survey on DHHL land (Hommon and Ahlo 1983). The survey encompassed some 735 acres, a large portion of south-central Molokaʻi. With the exception of approximately ten acres of privately owned land, this survey covered the entire landward portion of Kalamaʻula and also portions of Kamiloloa (East and West) and Makakupaʻia (West). The survey was performed by Science Management Inc. in 1983 under a contract to Pacific Division, Naval Facilities Engineering Command in conjunction with an evaluation of potential environmental impacts that might be occasioned by military use of the area. This intensive survey resulted in the identification of 71 archaeological sites.

A large brush fire in 1988 prompted a one-day field inspection by Estioko-Griffin (1988) of a large portion of the DHHL subdivision previously surveyed by Hommon and Ahlo (1983). Site -920, in Makakupaʻia was relocated from the Hommon and Ahlo 1983 survey, two sites (-945 and -946) were relocated within Kamiloloa. Estioko-Griffin (1988) recommended data recovery for Sites -920, -938, and -945.

In 1993, Archaeological inventory and data recovery were also carried out in a section of the *ahupuaʻa* of Kamiloloa (TMK 5-4-004:031 and portion of :003) by IARII (Tuggle 1993a), which covered nearly one square kilometer. The area is part of the larger region inventoried by Hommon and Ahlo (1983). The site inventory was expanded from nine to 15 significant sites. Two of the sites (-945A and -983) were classified as preservation.

One correspondence document from 1997 was discovered in the SHPD database which corresponds to TMK 5-4-003:009 in Kapaʻakea. The document is a Historic Preservation Review of the Preliminary Plan for the Mowat Subdivision. This document states that a historic site, the Kapaʻakea Fishpond (Site 50-60-04-132), was once on the subject parcel but was filled in decades ago. The proposed subdivision of existing Lot 2-B of Kapaʻakea Hawaiian Homesteads into two separate lots was deemed to have "no effect" on significant historic sites based aerial photographs taken about 1972. Though no field inspection was made of the subject parcel, the lots appeared to have been modified extensively for residential purposes. There is also mention of an Archaeological Monitoring Plan prepared by Scientific Consultant Services Inc. from March 2009, for the Department of Hawaiian Home Lands for on-site drainage improvements in Kapaʻakea, TMK 2-5-4-007 and 008. This plan may have resulted in an archaeological inventory; however, neither report was available for review at this time. Another

correspondence was made to SHPD regarding two small projects that were conducted in the adjacent to Ali‘i Pond (Kirkendall 2010). Xamanek Researches prepared an archaeological assessment in 2004 on a parcel just east of Makakupa‘ia, which included a subsurface testing component consisting of two soil borings. No evidence of historic properties was noted (Fredericksen 2003 as cited in SHPD Correspondence LOG NO. 2004.0009; DOC. NO. 0401SC03). More recently, an archaeological assessment was conducted by Archaeological Services Hawai‘i on a parcel to the east of the project area within Kawela Ahupua‘a (Pantaleo 2006 as cited in SHPD Correspondence LOG NO. 2006.3590; DOC NO. 0611MK04). A total of five backhoe test-trenches were performed during this survey with no cultural deposits encountered.

Several other archaeological investigations were performed in areas less than a mile from the proposed Kapa‘akea, Kamiloloa, and Makakupa‘ia project areas (Figure 21).

In January of 1977, B. Davis published a cultural reconnaissance report on area inside Kapa‘akea Ahupua‘a, partially on DHHL lands, with findings suggesting that seven architectural features reflected two different periods of occupation, the earlier of which was thought to be pre-Contact. The features within this complex, Site No. 50-60-03-1600, included walled enclosures, platforms, house sites, terraces, trails, and miscellaneous low rock mounds and stone alignments (Davis 1977).

Later in the same year, Thomas Dye (1977) revisited the site and performed a more in depth archaeological investigation. Dye (1977) mapped and tested the site in several areas. He found a historic-era burial beneath the platform, which functioned as a burial marker and strongly suggests that the other platforms of the site were likely also burial markers. A long-enclosure wall that dominates this site complex is probably contemporaneous and is posited as an historic-era cemetery, which may include both historic and prehistoric components. In addition, Dye (1977) recorded a trail that runs between the cemetery wall and terrace complex and intersects a large enclosure. Test excavations were performed on the lower alluvial plain, in an upland enclosure, and within the platform complex. While there were artifacts collected from the surface of the lower alluvial plain, its test unit revealed no agricultural or cultural features. The test excavation performed in the upland enclosure revealed cultural remains, in the form of shell marine midden, *kukui*, and traces of charcoal. The final test unit, excavated in the platform complex, revealed a historic burial placed in a milled lumber casket, which was covered by fill that contained some traditional artifacts, including polished adze flakes, worked mammal bone, and midden.

Weisler and Kirch (1980) surveyed 542 acres located in coastal Makakupa‘ia, Makakupa‘ia Iki, and Kawela Ahupua‘a. A total of 79 new sites were identified, comprised of 331 features. Features consisted of six *heiau*, three petroglyphs, three platforms, 14 possible burial platforms, four L-shapes, 12 U-shapes, 17 C-shapes, ten rectangular enclosures, 41 terraces, eight midden/lithic scatters, 151 modified outcrops, ten cairns, three circular enclosures, one platform/ramp, seven walls, one alignment, and 39 windbreak shelters. There are seven sites in this study that are located within 1500 feet (457.2 m) of DHHL lands slated for residential use (TMKs 2-5-4-006:24 and 2-5-4-003:3). Several years later, Weisler and Kirch (1985), studied 499 structural features and sites in Makakupa‘ia Iki and Kawela Ahupua‘a, located a short distance

to the east and northeast of several DHHL lots zoned for residential use (TMKs 2-5-4-006:24 and 2-5-4-003:3). These features and sites were grouped into several function classes including, permanent residential, agriculture/production, temporary residential, and special/religious (Figure 23). Seventy-two structural features were tested (a total of 442.5 sq m excavated), which yielded 13 C-14 dates that range from 1650-1820. Cultural materials collected from test excavations represented a wide variety of activities and were used to interpret the function of the features.

Weisler (1989a) performed archaeological investigations on lands that would become known as the Kaunakakai Field System, located in the *ahupua‘a* of Kaunakakai on lands adjacent to Kapa‘akea Ahupua‘a and approximately 750 m north of DHHL lands slated for Residential use. The survey was conducted on 115.5 acres between the 40 and 75 meter contours, east of Kaunakakai Gulch and above the Ranch Camp. This survey produced four sites (Sites 50-60-03-886 to 889). These sites are attributed to the largest agricultural system ever recorded on Moloka‘i. Site -886 is a massive agricultural complex, measuring 120 m N/S by 95 m E/W, that is comprised of two field shelters, a low boundary or erosion control wall, seven terraces, ca. 100 stone mounds and modified outcrops. Site -887 is a very large dry-land agricultural complex, measuring 700+ m N/S by 150 m E/W (north end destroyed by ranch construction). This site consists of thousands of stone mounds, modified outcrops, and stone alignments, as well as a large enclosure, three shelters, and six cupboards. Site -888 is another large agricultural complex that measures 100 m N/S by 250 m E/W and is comprised of numerous terraces, stone mounds, modified outcrops, stone alignments, and one field shelter. Site -889 is a large boundary wall that creates the entire west edge of the project area. This stacked stone wall is constructed of stacked basalt boulders that progress from large boulders to smaller stacked stones from base to the top of the wall.

More recently, Dye and Jourdane (2006), performed archival research on lands located less than 90 m northwest of DHHL lands slated for residential zoning in Kapa‘akea Ahupua‘a [TMKs (2) 5-4-007:025, 024, 011, 010, and 090]. The site was not visited on this assessment, however, pictures were taken of the area by the contractor and were subsequently inspected by Dye and Jourdane (2006). The assessment of the property was that it contained no historic sites on the surface. Further, earlier ground disturbing activities attributed to pineapple cultivation or the building of the existing Moloka‘i Education Center revealed no cultural deposits.

5.7 Ongoing Archaeological Programs

Several plans have been made by DHHL to manage cultural resources in the Kapa‘akea, Kamiloloa, and Makakupa‘ia Ahupua‘a. An abundance of historical and cultural resources are located along the eastern portion of Makakupa‘ia, *mauka* of Kamehameha Highway in an area designated as the Makakupa‘ia Habitation and Agricultural Complex (Figures 21 and 23). The area is comprised of 207 acres and has been designated as a Special District. The cultural resources located here consist of numerous terraces, retaining walls, stone mounds, modified outcrops, enclosures, and habitation sites that are still intact (Group 70 2005: 4-7). The MIP plans call for Makakupa‘ia to be developed into “a cultural center that extends mauka to makai” (Group 70 2005:4-4). The Special District designation within Kamiloloa Ahupua‘a is designed to

protect existing historical sites, traditionally used native habitat, and agricultural complex. This CRM area will be programmatically linked with the restoration and care of One Ali‘i fishpond that is situated makai of the CRM area. Kaloko‘eli Pond is also slated for restoration and preservation as a working fishpond. According to the MIP (Group 70 2005:4-9), its walls were restored in the 1920s, and future restoration is envisioned so that this pond along with nearby Ali‘i Pond in Makakupa‘ia may be used and managed by local residents for primarily subsistence use and cultural educational tools.

The Moloka‘i Rural Development Program (RDP), which is a provision of the MIP, provides in-class and field archaeology training for students of Moloka‘i (Group 70 2005). This training is part of a partnership with the Society of Moloka‘i Archaeology, the RDP, Kamehameha Schools, the University of Hawai‘i Department of Anthropology, and Maui Community College Moloka‘i Education Center, and the Enterprise Community. The DHHL is working towards establishing a partnership with this existing working group to help plan, implement, and maintain this designated area as a culture resource area (*ibid).*

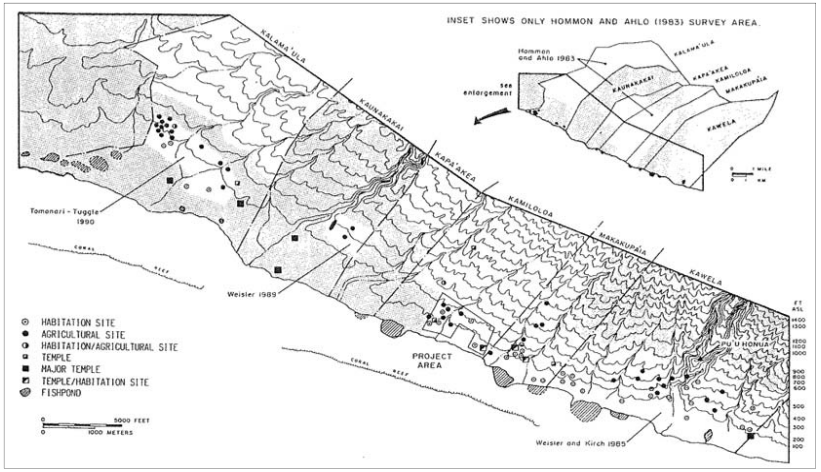

Figure 23. Settlement distribution in south-central Moloka‘i (from Tuggle 1993a).

Table 6. Archaeological Sites Located on Select DHHL Lands Within the Kapa'akea, Kamiloloa, and Makakupa'ia Ahupua'a

	SIHP No.	TMK	Description	No. of Features	Reported Current Status	Easting	Northing	Report Author	Notes
Kapa'akea Ahupua'a	132	5-3-007:039	Fishpond, Kapa'akea	No data	Filled in	706297	2332684	Stokes (n.d. *b*) Summers 1971	Summers (1971) states: Stokes reported as a *pu'uone* as large as 5.45 acres, recorded one *mākāhā*; Dunn mentioned the dense growth of mangrove, kiawe, and *akulikuli* covering the pond. Evens mapped site and illustrates two *mauka* springs feeding the pond.
Kamiloloa Ahupua'a	921	5-4-003:003	Habitation, Agriculture	12	Data recovery complete	709429	2331950	Hommon & Ahlo 1983 Tuggle 1993a	This site consists of one C-shape structure, one linear stone mound, one rectangular platform, one enclosure and several mounds.
	922	5-4-003:003	Habitation	12	Data recovery complete	709166	2332580	Hommon & Ahlo 1983 Tuggle 1993a	Site consists of one C-shape structure and other unspecified habitation features.
	923	5-4-003:003	Agriculture	1	Data recovery complete	708984	2332514	Hommon & Ahlo 1983 Tuggle 1993a	Site consists of one stone mound.
	925	5-4-003:003	Habitation	7	Data recovery complete	708561	2332406	Hommon & Ahlo 1983 Tuggle 1993a	This site consists of one oval cairn, two terraces, one rectangular enclosure, one rectangular platform and three C-shape shelters.
	926	5-4-003:003	Wall	1	Not significant	708647	2332853	Hommon & Ahlo 1983 Tuggle 1993a	This site consists of a ranching wall.
	942	5-4-003:003	Basalt Piles	6	Data recovery complete	709308	2332070	Hommon & Ahlo 1983 Tuggle 1993a	This site consists of six stone mounds.
	943	5-4-003:003	Basalt testing area	11	Data recovery complete	709714	2332426	Hommon & Ahlo 1983 Tuggle 1993a	This site consists of 11 stone mounds. Many of the boulders and cobbles have worked faces.
	944	5-4-003:003	Agriculture	20	Data recovery complete	708790	2332238	Hommon & Ahlo 1983 Tuggle 1993a	This site consists of a relatively dense cluster of agricultural features believed to be the result of ground clearing for planting areas.
	945	5-4-003:003	Habitation	35	Data recovery complete	708557	2332265	Hommon & Ahlo 1983 Tuggle 1993a	This site consists of numerous walls, terraces, enclosures, mounds, which make up a relatively dense cluster of habitation structures both complex and simple. These habitation features are interspersed with evidence of agriculture.
	945-A	5-4-003:003	Habitation	1	Preservation	708557	2332265	Hommon & Ahlo 1983 Tuggle 1993a	This feature is believed to be a shrine or *heiau*.
	946	5-4-003:003	Enclosure	1	Not significant	708422	2332219	Hommon & Ahlo 1983 Tuggle 1993a	This site is a cattle enclosure.

	SIHP No.	TMK	Description	No. of Features	Reported Current Status	Easting	Northing	Report Author	Notes
Kamiloloa Ahupua'a	970	5-4-003:003	Habitation	1	Data recovery complete	708632	2332913	Hommon & Ahlo 1983 Tuggle 1993a	This site consists of an unspecified habitation feature.
	978	5-4-003:003	Agriculture	13	Inventory			Tuggle 1993a	This site consists of numerous unspecified agricultural features.
	979	5-4-003:003	Agriculture	5	Inventory			Tuggle 1993a	This site consists of numerous unspecified agricultural features.
	980	5-4-003:003	Habitation	3	Inventory			Tuggle 1993a	This site consists of three unspecified habitation features.
	981	5-4-003:003	Agriculture	8	Inventory			Tuggle 1993a	This site consists of numerous unspecified agricultural features.
	982	5-4-003:003	Miscellaneous	4	Inventory			Tuggle 1993a	This site consists of unspecified features.
	983	5-4-003:003	Burial, habitation	3	Preservation			Tuggle 1993a	This site consists of one burial feature and one habitation feature.
Makakupa'ia Ahupua'a	914	5-4-003:003	Complex	11+	Inventory	710257	2331750	Hommon & Ahlo 1983	This site consists of numerous stone technology features.
	915	5-4-003:003	Complex	6+	Inventory	710278	2331858	Hommon & Ahlo 1983	This site consists of numerous stone technology features.
	916	5-4-003:003	Rock Shelter	1	Inventory	710147	2332020	Hommon & Ahlo 1983	This site consists of an unspecified habitation feature.
	917	5-4-003:003	Complex	3+	Inventory	710044	2331956	Hommon & Ahlo 1983	This site consists of agricultural and temporary habitation features.
	918	5-4-003:003	Complex	3	Inventory	710022	2331821	Hommon & Ahlo 1983	This site consists of habitation features.
	919	5-4-003:003	Complex	6	Inventory	709965	2331794	Hommon & Ahlo 1983	This site consists of habitation features.
	920	5-4-003:003	Complex	5	Inventory	709918	2331772	Hommon & Ahlo 1983	This site consists of habitation features.
	927	5-4-003:003	Complex	3+	Inventory	710317	2332427	Hommon & Ahlo 1983	This site consists of habitation features.
	930	5-4-003:003	Cupboard	1+	Inventory	710068	2332348	Hommon & Ahlo 1983	This site consists of agricultural features.
	932	5-4-003:003	Complex	7	Inventory	710155	2331797	Hommon & Ahlo 1983	This site consists of agricultural and habitation features.
	933	5-4-003:003	Crevice Burial	1	Inventory	710202	2331878	Hommon & Ahlo 1983	
	934	5-4-003:003	Wall	2	Inventory	710233	2332037	Hommon & Ahlo 1983	This site appears to consist of agricultural features.
	935	5-4-003:003	Complex	4+	Inventory	710197	2331944	Hommon & Ahlo 1983	This site consists of agricultural features.
	936	5-4-003:003	Complex	4	Inventory	710082	2331878	Hommon & Ahlo 1983	This site consists of habitation features.
	937	5-4-003:003	Complex	2	Inventory	709989	2331794	Hommon & Ahlo 1983	This site consists of habitation features.
	938	5-4-003:003	Complex	2	Inventory	709972	2331616	Hommon & Ahlo 1983	This site consists of habitation features.

	SIHP No.	TMK	Description	No. of Features	Reported Current Status	Easting	Northing	Report Author	Notes
Makakupa'ia Ahupua'a	939	5-4-003:003	Complex	2+	Inventory	709916	2331846	Hommon & Ahlo 1983	This site consists of habitation features.
	940	5-4-003:003	Complex	3+	Inventory	709995	2331930	Hommon & Ahlo 1983	This site consists of agricultural features.
	941	5-4-003:003	Complex	3+	Inventory	709939	2331939	Hommon & Ahlo 1983	This site appears to consist of agricultural features.
	947	5-4-003:003	Stone Mound	1	Inventory	710354	2331999	Hommon & Ahlo 1983	This site consists of one stone mound.
	948	5-4-003:003	Stone Mound	2	Inventory	710361	2332040	Hommon & Ahlo 1983	This site consists of two stone mounds.
	949	5-4-003:003	Complex	2+	Inventory	710508	2332514	Hommon & Ahlo 1983	This site consists of agricultural features.
	950	5-4-003:003	Stone Mound	1	Inventory	710239	2332196	Hommon & Ahlo 1983	This site consists of one stone mound.
	951?	5-4-003:003	Complex	4+	Inventory	710124	2332118	Hommon & Ahlo 1983	This site consists of habitation features.
	951?	5-4-003:003	Complex	8+	Inventory	710150	2331745	Hommon & Ahlo 1983	This site consists of habitation features.
	952	5-4-003:003	Complex	6+	Inventory	710261	2332278	Hommon & Ahlo 1983	This site consists of agricultural features.
	953	5-4-003:003	Terrace	1+	Inventory	710374	2332389	Hommon & Ahlo 1983	This site appears to consist of habitation features.
	954	5-4-003:003	Complex	5+	Inventory	710371	2332430	Hommon & Ahlo 1983	This site consists of agricultural features.
	976	5-4-003:003	U-Shaped Wall	1	Inventory	710786	2332859	Hommon & Ahlo 1983	This site appears to consist of one agricultural feature.

6.0 KALAMA'ULA

Kalama'ula Ahupua'a is located on the leeward slopes of the Eastern volcanic series, in the arid region of central Moloka'i. Though the entire *ahupua'a* is owned by the DHHL, it contains 160 existing or awarded and undeveloped residential lots on 210 acres (Figures 24 and 25). Areas under review are located at an elevation ranging from the coast up to 250 feet amsl. The 2005 MIP proposes a limited growth of new residential development in Kalama'ula that would entail 49 one-acre lots on 70 acres in the eastern portion and eight one-acre lots on 11 acres adjacent and *makai* of Maunaloa Highway. Also, 72 lots on about 212 acres have been designated as Subsistence Agriculture (Group 70 2005: ES-7–10). Two hundred and forty-nine TMKs in Kalama'ula Ahupua'a are included in the proposed development (Table 7, Appendix A).

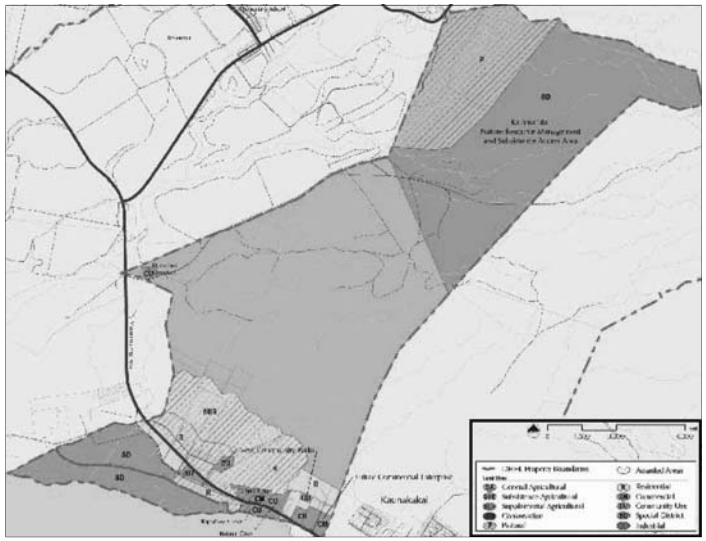

Figure 24. Kalama'ula Parcel, with proposed land uses (from Group 70 2005: Figure 5.2).

Figure 25. Current state of Kalamaʻula Ahupuaʻa *makai*, proposed residential (yellow) and subsistence agricultural (green) lands highlighted (courtesy of Google Earth).

6.1 CLIMATE

The area is quite arid, receiving only 40 to 60 centimeters (16 to 24 inches) of mean annual rainfall (Giambelluca et al. 1986). There are no permanent streams in the area although there are numerous gulches that collect water in times of heavy rain. There are several known freshwater springs along the shoreline.

6.2 SOILS AND TOPOGRAPHY

The landscape of Kalamaʻula, is dominated by the volcanic cinder cone, Puʻu Luahine at approximately 1,210 ft (Figure 26). There are multiple soil types ranging from salty marsh lands near the coast to rocky and stony outcrops in the uplands. A majority of the land *makai* of Maunaloa Highway is subject to flooding. A flood prone area is present in the center of the Kalaniana'ole Colony where several run-off streams come together (Group 70 2005: 5-1). A detailed Custom Soil Resource Report for the Residential and Subsistence Agriculture areas of Kalamaʻula was generated using the U.S. Department of Agriculture (USDA) and Natural Resources Conservation Service (NRCS) Web Soil Survey and is provided in Appendix B.

Table 7. Kalamaʻula TMKs to be Impacted by Potential Development

Residential	Sub/Supplemental Agriculture	Road
(2) 5-2-008:001 - 025	(2) 5-2-008:048	(2) 5-2-008:999
(2) 5-2-008:027 - 032	(2) 5-2-008:049, portion	(2) 5-2-009:999
(2) 5-2-008:033, portion	(2) 5-2-008:052	
(2) 5-2-008:034 - 037	(2) 5-2-008:079, portion	
(2) 5-2-008:040 – 047	(2) 5-2-008:084, portion	
(2) 5-2-008:055 - 057	(2) 5-2-008:085 – 089	
(2) 5-2-008: 060 - 065	(2) 5-2-008:091, portion	
(2) 5-2-008:067 – 076	(2) 5-2-008:099	
(2) 5-2-008:080 - 081	(2) 5-2-008:114	
(2) 5-2-008:090	(2) 5-2-010:001, portion	
(2) 5-2-008:094 - 098	(2) 5-2-011:015	
(2) 5-2-008:100 – 106		
(2) 5-2-008:107, portion		
(2) 5-2-008:108 – 113		
(2) 5-2-008:115 – 124		
(2) 5-2-008:125, portion		
(2) 5-2-008:127, portion		
(2) 5-2-008:129		
(2) 5-2-009:002 - 011		
(2) 5-2-009:016		
(2) 5-2-009:021		
(2) 5-2-032:001 - 029		
(2) 5-2-032:031 - 047		
(2) 5-2-032:049 - 050		
(2) 5-2-032:052 - 067		
(2) 5-2-032:069 – 070		
(2) 5-2-033:001 - 025		
(2) 5-2-033:026, portion		
(2) 5-2-033:027 – 045		
(2) 5-2-033:047 – 053		
(2) 5-2-033:054, portion		
(2) 5-2-033:055		
(2) 5-2-033:056 – 059, portion		
(2) 5-2-033:060 – 061		

6.3 VEGETATION

The vegetation is dominated by *kiawe* (*Prosopis pallida*.), *ʻilima* (*Sida fallax*.), finger grass and *pili* grass (*Heteropogon contortus*), which was an important thatching material for pre-Contact Hawaiian architecture. There are also areas of *koa haole* (*Leucaena glauca*), *maʻo* (native cotton, *Gossypium tomentosum*), and a few *wiliwili* (*Erythrina sandwicensis*). The tree cover in the area is generally sparse (Hommon and Ahlo 1983; Tuggle 1993a; Bush *et al*. 2001) (Figures 26-30).

Figure 26. Southern view of Pu‘u Luahine, an area discussed for possible future reforestation in Kalama‘ula (from Group 70 2005:5-3).

Figure 27. Rural lands in Kalama‘ula, taken from Kamehameha V Hwy (view to north).

Figure 28. Undeveloped Subsistence Agriculture lands in Kalama‘ula Ahupua‘a (from Group 70 2005:5-6).

Figure 29. Northern *mauka* view of Subsistence Agriculture lands, Kalama‘ula (from Group 70 2005:5-7).

Figure 30. Community Use lands at "Church Row" in Kalama'ula (from Group 70 2005:2-10).

6.4 TRADITIONAL ACCOUNTS

Few oral accounts have been recorded specifically about the *ahupua'a* of Kalama'ula. In the legend of According to Pukui et al. (1976:74), the name Kalama'ula literally translates to English as, "the red torch" or "red lama tree." However, Pukui and Elbert (1986) translate Kalama'ula to mean "a stone", or *humu'ula*, which is a red stone (jasper) that is used for adzes (as cited in Bush et al. 2001:9).

One story that takes place in pre-Contact Moloka'i and possibly the *ahupua'a* of Kalama'ula is the story of Manini-holo-kuaua, who was renowned as a swift thief (Beckwith 1976:10). In this story, the thief's *mo'o* grandmother is named Kalama-ula. The tale was written such:

> Manini-holo-kuaua (named by Rice as head fisherman of the Menehune at Haena on Kauai) is known as a noted thief of Molokai, so strong he can carry away a whole canoe on his back and so swift he can escape all pursuit. His mo'o grandmother, Kalama-ula, lives in a cave in the uplands which opens and shuts at command, and it is his custom to run with his booty to this cave and hide it away there. When Ke-lii-malolo, the fleet runner of Oahu, comes to Molokai on a visit and in contempt of warnings leaves his canoe unguarded while he goes in for a bath, Manini lays claim to it and carries it away with all it contains to his cave in the uplands, into which he disappears before its owner can overtake him. Ke-li'i-malolo engages the help of the two supernatural sons of Halulu, Kama-aka-mikioi and Kama-aka-ulu-ohia, and sails with them to Molokai. Manini, in con-tempt of his grandmother's warning, seizes their canoe also, but is overtaken by one of the men, who overhears his command and orders the cave to shut just as he is entering so that he is caught and crushed within its jaws. Within the cave are found innumerable possessions (Beckwith 1976:10).

Another tale from Kalama'ula, "The Five Red Rays of Kalama'ula," was recounted by Harriet Ne (Ne and Cronin as cited by Bush et al. 2001:9). In this tale, the name Kalama'ula was explained as the name of a large, red rock. Near this rock, the love-stricken daughter of a Kalama'ula area chief fell asleep awaiting for her lover, a commoner she was forbidden to see. After being awaken by the sun's rays, she realized her lover did not meet her, so she struck the rock in anger and the rock was permanently emblazoned with five red rays of the sun.

6.5 HISTORIC BACKGROUND

The History of Kalama'ula is more commonly mentioned than the *ahupua'*a of Kapa'akea, Kamiloloa, and Makakupa'ia combined. There is a reference to Kalama'ula and the general Kaunakakai area as a place of military encampments during the 18th century wars of conquest. Kamehameha I had a base camp at Kaunakakai, and it was from this camp that his troops prepared to launch for his conquest of O'ahu. One of his chiefs, Ke'eaumoku, was encamped at Kalama'ula at the same time (Kamakau 1961:43; 70-71; 159; 171-172). Another reference to the area made by Kamakau (1961:149; 388), is in regards to the reconciliation between Kamehameha I, and Kalola, the mother of Kīwala'ō, the defeated chief of Hawai'i. After Kamehameha had successfully conquered Maui, he traveled to Moloka'i to secure the allegiance of the island's chiefs. At this time, he also met with Kalola, who was staying at Kalama'ula, to persuade her to approve of his taking her granddaughter, the sacred Keōpūolani, as his wife. Shortly after Kalola agreed to the taking of Keōpūolani, she died and is said to have been buried in a cave at Kalama'ula.

Kalama'ula was also known for its sweet potato plantations. A Hawaiian writer described the cultivation of sweet potatoes in a 1922 Ka Nupepa Ku'oko'a:

> …In these land divisions (kalana) of Kalama'ula and Pala'au in early days there were sweet potatoes on all the rocky ('a'a) high lands and from these places came the sweet potato eaters who knew potato cultivation… there are two favorites of the sweet potato consumers of Kalama'ula and Pala'au, the kala and the kalaponi. (cited in Summers 1971:38)

Aside from dry land sweet potato cultivation, land use for the area likely centered on exploitation of marine resources and irrigated agriculture along stream bottoms and along the coastal plain. Rental receipts between the years of 1858 and 1861 show that rents collected by the *Konohiki* of Kalama'ula include payment for coconut trees, taro patches, a squid fishery and a fishpond (Hommon and Ahlo 1983:14-15). In a review of documented fisheries and fishing rights recorded in the Mahele 'Āina, Maly and Maly (2003) compiled a list of claims to ocean resources and fishing rights for the entire state. Of the 123 claims filed on Moloka'i, Kalama'ula contained two of these claims, one of which was granted to the Crown. A listing of Moloka'i ocean resource and fishing right claims is provided in Appendix C. Fishing remains an active form of subsistence in Kalama'ula to this day (Tomonari-Tuggle 1990:9).

The Kamehameha coconut grove called Kapuāiwa is located along the shore, just southeast of the Kalaniana'ole Colony, and is believed to have been planted by Lot Kapuāiwa (Kamehameha V), grandson of Kamehameha I in the 1860s. The king maintained a home, Hale Malama, on the beach in nearby Kaunakakai and had a strong affection for the island. The grove originally consisted of approximately 1,000 coconut trees, covering an area of approximately 10 acres. The trees were to represent each warrior that served under his rule and provided shelter for a freshwater spring that was used for bathing by the *ali'i* (Group 70 2005: 5-9). As late as the 1920s, there were numerous known freshwater springs located within the coconut grove, but due to erosion, the shoreline has eroded and all but one of the springs can be observed flowing in the ocean (Bush et al. 2001:9). Several hundred descendants of the original trees now make up Kapuāiwa Grove.

The Kalaniana'ole homestead was developed in 1922. It was named after Prince Jonah Kūhiō Kalaniana'ole, its main promoter and supporter of the Hawaiian Homes Commission Act, which was a homesteading program enacted by the U.S. Congress in 1921. This program was created to place native Hawaiians, defined as "any descendant of not less than one-half part of the blood of the races inhabiting the Hawaiian Islands previous to 1778," on designated lands. The Kalaniana'ole homestead was to be a trial run for the concept of Hawaiian homesteading. In 1928, the homestead was deemed a success and plans were carried out to develop homesteads on all islands. During the first phase of development, twenty-two farm lots and thirty-three residential lots were established and in 1924, a second, larger phase was underway in what is now the Ho'olehua-Pālā'au Homesteads. By 1930, difficulties for farmers became apparent in the form of insect and pest problems, not to mention the high salinity in the spring water being pumped in for irrigation. It was soon realized that the area was not suitable for agriculture and the agricultural leases were exchanged for land at Ho'olehua (Tomonari-Tuggle 1990:11). The lots in the Kalaniana'ole homestead were then reserved for residential lots.

6.6 Previous Archaeology

The *ahupua'a* of Kalama'ula is, perhaps, one of the most archaeologically studied areas in Moloka'i (Figure 31). A total of 53 sites were recorded in DHHL properties slated for Residential and Subsistence Agriculture. Appendix D provides a list of all archaeological sites found the selected *ahupua'a*. Table 8 provides a list of prior archaeological investigations performed in and around Kalama'ula and Table 9 lists the archaeological sites found within the DHHL Residential and Subsistence Agriculture areas. Following is a summary of the sites of Kalama'ula, according to Summers (1971:84-87). No less than five fishponds were recorded by Summers (Sites -117, -118, -119, -120 and -122). All of these ponds are now destroyed or buried under modern siltation and mangrove growth. In addition, a pool by the name of 'Olo'olo was recounted. This pool was fed by five springs and was used for bathing by the chiefs and by people who lived on the beach. It was well cared for until 1888 when a large rainstorm caused the pool to fill with mud. Years later, early homesteaders discovered one of the springs once again, and used it until the water became too brackish. Another spring is mentioned as being near the boundary of Kalama'ula and Kaunakakai, which was developed for irrigation purposes by the Hawaiian Homes Commission.

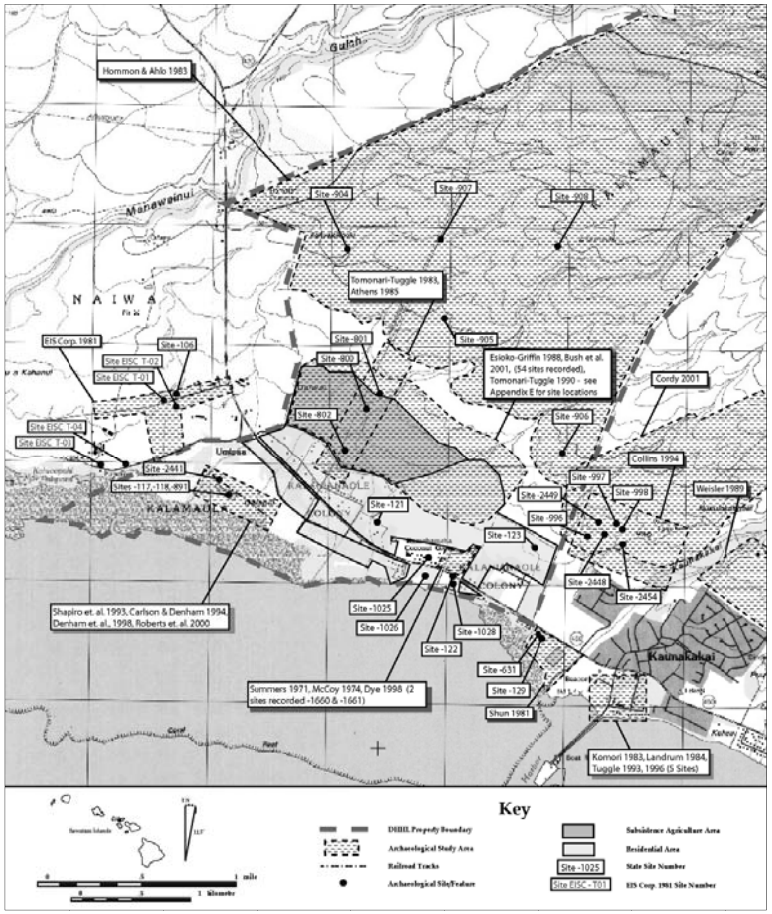

Figure 31. Previous archaeology and recorded archaeological sites in Kalamaula

Table 8. Previous Archaeological Investigations in the Kalama'ula Ahupua'a and Vicinity

Reference	Location (Ahupua'a)	Description and Results
Summers 1971	Island-wide	A compilation of ethnographic, historic, archaeological and legendary material.
Environment Impact Study Corp. 1980, 1981	Nā'iwa Industrial Park, (Nā'iwa)	Two sites found: a terrace with possible clearance mounds nearby; and a stacked stone wall. No maps or photographs provided.
Shun 1982	(Kaunakakai)	Parallel mounds with unknown function; of particular interest is the presence of subsurface prehistoric cultural deposits, some up to almost 1 m deep.
Hommon and Ahlo 1983	(Kalama'ula, Kapa'akea, Kamiloloa, and Makakupa'ia)	An intensive survey was conducted on 735 acres of Hawaiian Home Lands in the areas of future development from the 500 ft contour to the coast.
Komori 1983	(Kaunakakai)	Test auguring yielded subsurface cultural deposits (pre-Contact and historic artifacts, midden, charcoal) attributed to Site 630.
Tomonari-Tuggle 1983	(Kalama'ula)	Conducted along a waterline corridor of the access road to a water tank. Three sites consisting of a complex of walls, terraces, and cairns (Site 800), seven cairns (Site 801), and a cattle wall (Site 802).
Athens 1984, 1985	(Kalama'ula)	Data Recovery completed as a result of Tomonari-Tuggle 1983 Reconnaissance Survey. Excavations of features (Site 800) that were damaged or destroyed by waterline corridor; excavation results indicated that site occupation and use began ca. AD 1200.
Landrum 1984	(Kaunakakai)	Conducted on 3.6 acre parcel ca. 200m NW of Kaunakakai Wharf. Finds included: archaeological deposit consisting of pre-Contact cultural layer and Historic structural foundation; and pre-Contact surface artifacts.
Weisler 1989a	(Kaunakakai)	Approximately 115 acres was surveyed above the town of Kaunakakai between 130 - 250 ft asl. An extensive dryland agricultural system was discovered. Four samples were taken for radiocarbon analysis which suggests the area was occupied from AD 1200s to 1400s.
Sinoto and Pantaleo 1992	Moloka'i Refuse Disposal Landfill (Kalama'ula)	Conducted on 40 acre parcel bordering several DHHL TMKs of concern. No surface remains were observed on the property due to prior disturbances from quarrying. No testing performed.
Hammatt and Borthwick 1993	(Kaunakakai)	An enclosure with a paved surface and a stacked boulder wall were recorded.
Shapiro et al. 1993	Maunaloa Borrow and 'Ōhi'apilo Pond (Kalama'ula)	A possible religious complex with multiple features was identified. Core samples were taken, which did not contain any cultural deposits or datable material.
Tuggle 1993b	(Kaunakakai)	Tested three previously identified sites: a cultural deposit, old pier, and Malama platform - the base for K. V's summer house, Kalaiakamanu Church, and Mahinahina *heiau*. Found pre-Contact and historic cultural material.
Denham et al. 1998	'Ōhi'apilo Pond (Kalama'ula)	A subsurface section of a basalt and coral wall was discovered.
Dye 1998	Kulana 'Ōiwi Multi-Services Center (Kalama'ula)	This survey was conducted of a 12 acre lot for Kaunakakai School. A petroglyph gallery and a limestone quarry with associated cultural deposits were found including concrete features, masonry structures, landscaping, and historic-period artifacts displaying a continuous archaeological record from early Historic (late 1700s) to the present.
Cordy 2000	(Kalama'ula)a	Large area just *mauka* of DHHL Residential lands in Kalama'ula. Nine new sites identified and two known sites were further examined. Sites include: a notched enclosure; possible small *heiau;* a field shelter complex comprised of a rectangular enclosure, paved area, stone mound, and rectangular mound.
Roberts et al. 2000	'Ōhi'apilo Fishpond (Kalama'ula)	Further detail about 'Ōhi'apilo Pond was obtained and a historic railroad grade was discovered – portions of sites disturbed during project construction.
Bush et al. 2001	(Kalama'ula)	Recommended by IARI Tomonari-Tuggle 1990 inventory survey findings. 13 sites were excavated of which two were recommended for preservation.

Table 9. Archaeological Sites Located on Select DHHL Lands Within the Kalama'ula Ahupua'a

SIHP No.	Description	Possible Function	No. of Features	Reported Current Status	Easting	Northing	Report Author	Notes
802	Wall		1	Inventory	703393	2334934	Tomonari-Tuggle 1990	Believed to have been a possible boundary marker.
1700	Complex	Agriculture, Habitation	4	Inventory	702840	2335621	Tomonari-Tuggle 1990	Site includes one small enclosure (3 x 5 m), one stone pile, one stone alignment and one cupboard.
1701	Complex	Habitation	4	Inventory	702792	2335804	Tomonari-Tuggle 1990	Site includes one wall, two petroglyphs, and one shelter.
1702	Complex	Agriculture	6	Inventory	702889	2335712	Tomonari-Tuggle 1990	Site includes two terraces, one stone pile, one alignment, one modified outcrop, and one wall.
1703	Complex	Agriculture, Habitation	7	Inventory	702813	2335735	Tomonari-Tuggle 1990	Site includes one enclosure, two semi-enclosures, one terrace, one pile, one alignment, and one modified outcrop.
1704	Semi-Enclosure	Habitation	1	Inventory	702787	2335817	Tomonari-Tuggle 1990	Site consists of one semi-enclosure.
1705	Enclosure and Stone Mound	Agriculture, Habitation	2	Inventory	702849	2335839	Tomonari-Tuggle 1990	Site includes one enclosure and one pile.
1706	Complex	Agriculture, Habitation	4	Inventory	702896	2335786	Tomonari-Tuggle 1990	Site includes one enclosure, one pocket terrace, one pile and one alignment.
1707	Complex	Agriculture, Habitation, Ceremonial	6	Inventory	702986	2335727	Tomonari-Tuggle 1990	Site includes one enclosure, two semi-enclosures, one pile, and two alignments. One of the features is believed to be a shrine.
1708	Complex	Agriculture, Habitation	4	Inventory	703155	2335784	Tomonari-Tuggle 1990	Site includes 1 enclosure, 1 pocket terrace, one pile and one wall.
1709	Complex	Agriculture, Habitation	7	Inventory	703079	2335714	Tomonari-Tuggle 1990	Site includes one large enclosure (80 x 100 m), one pile, one alignment, one modified outcrop and three walls.
1710	Complex	Unknown	4	Inventory	702743	2335485	Tomonari-Tuggle 1990	Site consists of two pocket terraces, one pile and one wall.
1711	Complex	Agriculture, Habitation	6	Inventory	702996	2335547	Tomonari-Tuggle 1990	Site consists of an enclosure, a semi-enclosure, an *ahu*, two alignments, and a wall.
1712	Complex	Agriculture, Habitation	6	Inventory	703024	2335552	Tomonari-Tuggle 1990	Site consists of two enclosures and four alignments.
1713	Complex	Agriculture	5	Inventory	702860	2335497	Tomonari-Tuggle 1990	Site includes one enclosure, one pocket terrace, one pile, one alignment and one wall.
1714	Complex	Habitation, ceremonial	9	Inventory	703136	2335588	Tomonari-Tuggle 1990	Site includes two semi-terraces, two ahu, one pile, three alignments, and one feature with an uncertain function. One of the features is believed to be a shrine.
1715	Complex	Agriculture, Habitation	6	Inventory	703069	2335513	Tomonari-Tuggle 1990	Site includes two enclosures, two terraces, one pile, and one alignment.

SIHP No.	Description	Possible Function	No. of Features	Reported Current Status	Easting	Northing	Report Author	Notes
1716	Complex	Habitation	9	Inventory	702971	2335275	Tomonari-Tuggle 1990	Site consists of two enclosures, five terraces, one alignment, and one wall and appears to have the most potential for being a permanent residential site. It was suggested that this site may have been the residence of Kalola, the mother of Keōpūolani and Kiwala'ō, the defeated chief of Hawai'i.
1717	Complex	Habitation	6	Inventory	703104	2335316	Tomonari-Tuggle 1990	Site consists of one enclosure, two terraces, two piles, and one alignment.
1718	Complex	Habitation	3	Inventory	703010	2335297	Tomonari-Tuggle 1990	Site includes two terraces and one pile.
1719	Complex	Agriculture, Habitation	5	Inventory	703019	2335359	Tomonari-Tuggle 1990	Site includes two enclosures, one pile and two alignments.
1720	Complex	Agriculture, Habitation	12	Inventory	703136	2335487	Tomonari-Tuggle 1990	Site includes three semi-enclosures, three terraces, one pile, three alignments, and two walls.
1721	Wall/Auwai	Water	2	Inventory	703217	2335176	Tomonari-Tuggle 1990	Site consists of two walls. Sites 1721 and 1722 are believed to have served as erosion control structures but construction date is uncertain.
1722	Complex	Boundary, water	1	Inventory	703246	2335008	Tomonari-Tuggle 1990	Sites 1721 and 1722 are believed to have served as erosion control structures but construction date is uncertain.
1723	Modified Outcrop	Unknown	1	Inventory	703361	2335310	Tomonari-Tuggle 1990	Site consists of one modified outcrop.
1724	Complex	Agriculture	3	Inventory	703300	2335304	Tomonari-Tuggle 1990	Site consists of one pocket terrace, one pile and one alignment.
1725	Wall and Stone Mound	Unknown	2	Inventory	703296	2335261	Tomonari-Tuggle 1990	Site consists of one pile and one wall.
1726	Semi-Enclosure	Habitation	1	Inventory	703459	2335453	Tomonari-Tuggle 1990	Site consists of one semi-enclosure.
1727	Semi-Enclosure	Habitation	1	Inventory	703568	2335567	Tomonari-Tuggle 1990	Site consists of one semi-enclosure.
1728	Complex	Agriculture, Habitation	15	Inventory	703675	2335466	Tomonari-Tuggle 1990	Site consists of three enclosures, four semi-enclosures, four terraces, one pile, one alignment and two walls.
1729	Mounds	Agriculture?	3	Inventory	703606	2335203	Tomonari-Tuggle 1990	Site consists of three mounds.
1730	Mounds	Agriculture	1	Inventory	703652	2335175	Tomonari-Tuggle 1990	Site consists of one wall.
1731	Irrigation Flume		1	Preservation, data recovery	703664	2335271	Tomonari-Tuggle 1990 Bush *et al.*2001	Site constructed as an irrigation ditch used by homesteaders in the 1920s. Mitigation of the eastern-most portion of this site changed from preservation to data recovery in order to accommodate lot preparation for lessees (Lot 93). As a result, a backhoe trench was dug to record stratigraphy.
1732	Mound	Unknown	1	Inventory	703760	2335054	Tomonari-Tuggle 1990	Site consists of one mound.
1733	Historic Scatter	Habitation	1	Inventory	703618	2334969	Tomonari-Tuggle 1990	Site is an historic habitation site with historic scatter.
1734	Stone Mound and Alignment	Agriculture	2	Inventory	704138	2335132	Tomonari-Tuggle 1990	Site consists of one stone mound and one alignment.
1735	Wall	Unknown	1	Inventory	703725	2334994	Tomonari-Tuggle 1990	Site consists of a wall.

SIHP No.	Description	Possible Function	No. of Features	Reported Current Status	Easting	Northing	Report Author	Notes
1736	Modified Outcrop	Unknown	1	Inventory	703665	2334973	Tomonari-Tuggle 1990	Site consists of a modified outcrop.
1737	Boulder Concentration	Habitation	1	Inventory	703601	2335092	Tomonari-Tuggle 1990	Site consists of placed boulders.
1738	Mound Complex	Agriculture	6	Inventory	704039	2334770	Tomonari-Tuggle 1990	Site consists of six mounds.
1739	Mound	Unknown	1	Inventory	704098	2334720	Tomonari-Tuggle 1990	Site consists of one mound.
1740	Complex	Habitation	1	Data recovery complete	704157	2334822	Tomonari-Tuggle 1990 Bush *et al.*2001	Site includes one semi-enclosure and three mounds.
1741	Complex	Habitation	7	Data recovery complete	704429	2334664	Tomonari-Tuggle 1990 Bush *et al.*2001	Site includes one enclosure, three semi-enclosures and two platforms.
1742	Platform	habitation	2	Data recovery complete	704489	2334673	Tomonari-Tuggle 1990 Bush *et al.*2001	Site was previously believed to be a possible *heiau* in 1990, however after further investigation by CSH in 2001, it was recorded as an historic water tank platform made of stone. Other feature is still designated as temporary habitation.
1743	Mound Complex	Agriculture	5	Data recovery complete	704250	2334537	Tomonari-Tuggle 1990 Bush *et al.*2001	Site includes five mounds.
1745	Mound	Agriculture	1	Data recovery complete	703987	2334373	Tomonari-Tuggle 1990 Bush *et al.*2001	Site consists of one stone mound
1746	Enclosure Complex	Agriculture	1	Data recovery complete	704216	2335013	Tomonari-Tuggle 1990 Bush *et al.*2001	Site consists of one large enclosure with interior alignments.
1747	Enclosure Complex	Agriculture	1	Data recovery complete	704144	2334567	Tomonari-Tuggle 1990 Bush *et al.*2001	Site is a large enclosure, defined by stacked rock walls.
1748	Enclosure	Habitation	1	Data recovery complete	704331	2334554	Tomonari-Tuggle 1990 Bush *et al.*2001	Site consists of low, tumbled down enclosing walls built off of bedrock boulders.
1750	Complex	Agriculture	6	Data recovery complete	703731	2334571	Tomonari-Tuggle 1990 Bush *et al.*2001	Site consists of mounds and one modified outcrop.
1751	Terrace and Mound	Agriculture	1	Data recovery complete	703845	2334449	Tomonari-Tuggle 1990 Bush *et al.*2001	Site is made of one terrace retaining wall.
1752	Complex	Habitation	1	Data recovery complete	703916	2334491	Tomonari-Tuggle 1990 Bush *et al.*2001	Only site in the project area with complex construction. Also, charcoal samples, substantial amount of midden, and the presence of numerous lithic artifacts indicate a prehistoric to early historic occupation.
1753	Complex	Historic Habitation, Burials	4	Preservation	703452	2334483	Tomonari-Tuggle 1990 Bush *et al.*2001	Two coffin burials were encountered. An accepted burial treatment plan approved preservation in place with an appropriate buffer. Site appears to have been used in several different phases, from pre-Contact to modern. Carbon dating analyses indicates a presence as early as A.D. 790-1030 but also includes dates of A.D. 1800 to present. A coastal *heiau* mentioned by Summers may have been located in the vicinity but was destroyed to build the pier at Kaunakakai.

Four *heiau,* are said to have once existed in Kalamaʻula. ʻŌpaeʻula *heiau* (Site -121) was destroyed to build the pier at Kaunakakai in 1899. Puʻupapai *heiau* (Site -123), built for human sacrifice, was dedicated to Kāne and Kanaloa. This *heiau* was dismantled about 1855, and the stones were used to build a pier for the American Sugar Co. It was rumored that the failure of the company may have been due to the sacrilege of tearing down the sacred structure. A third unnamed *heiau* (Site -126) is briefly mentioned as having been located about 1.3 miles NE of Puʻu Luahine. Its condition is unknown. Kaʻanaopea *heiau,* was reported by natives to Fornander, but was not seen and its location is unknown.

It is believed that the only remaining *kahua maika* in the islands is in Kalamaʻula, just north of Puʻu Luahine (Site -127). Another *kahua maika* (Site -124) once existed between Kauluwai and Mauna Hui. Summers also mentions an area *mauka* of Puʻu Luahine where there are remains of house sites and stone walls on the ridges and in the small valleys (Site -128).

Adjacent *ahupuaʻa*, Nāʻiwa to the west and Kaunakakai to the east, have also had numerous archaeological studies performed that are located less than 1 mile (ca. 1610 m) from DHHL lands slated for Residential use and Subsistence Agriculture.

Systematic archaeological research in the general area began in 1983 with an intensive archaeological survey on DHHL land (Hommon and Ahlo 1983). The survey encompassed some 735 acres in south-central Molokaʻi. With the exception of approximately ten acres of privately owned land, this survey covered the entire landward portion of Kalamaʻula and also portions of Kamiloloa (east and west) and Makakupaʻia (west). The survey was performed by Science Management Inc. (Hommon and Ahlo 1983). The work was contracted for by the Pacific Division, Naval Facilities Engineering Command in conjunction with an evaluation of potential environmental impacts that might be occasioned by military use of the area. This intensive survey resulted in the identification of 71 archaeological sites.

In 1983, Tomonori-Tuggle performed a reconnaissance survey of a access road corridor for an upland Kalamaʻula water tank (Tomonori-Tuggle 1983). Three sites were located during this survey. The first site (Site -800) consists of a complex of walls, terraces, enclosures, and cairns located at the nose of a low ridge forming the west boundary of one of the larger, dry gulches of the *ahupuaʻa*. This site covers an area of approximately 3.16 acres, mostly situated on a steep slope of the ridge sides between 130 and 150 feet above sea level. Site -801, which is located on the eastern side of the low ridge which forms the west boundary of a large, dry gulch in Kalamaʻula, is comprised of seven cairns and a short, amorphous wall. This site covers approximately 0.11 acres (450 sq m) at about an elevation of 160 ft. The final site (Site -802), was described as a well constructed, boulder-faced, cobble-core historical cattle wall that had has been bisected by the dirt road leading from Kalanianaʻole Colony to the water tank, ca. 125 m (410 ft) *mauka* of the old gate separating the homesteads from the community pasture area. Several years later, Athens (1985) mapped the sites and performed six test excavations at Site -800, an enclosure and terrace complex – originally recorded by Tomonori-Tuggle (1983). Site -801 was also revisited. Athens found additional features at Site -800 and cultural deposits in the site that were very likely prehistoric.

A large brush fire in 1988 prompted a one-day field inspection by Estioko-Griffin (1988) of a large portion of the DHHL subdivision. Numerous sites were located and described. Estioko-Griffin (1988) recorded 21 sites within the DHHL Kalamaʻula subdivision. From this inspection, an inventory survey was recommended. Subsequently, an archaeological inventory survey of approximately 300 acres in the *ahupuaʻa* of Kalamaʻula was undertaken for the Department of Hawaiian Home Lands in the fall of 1989 (Tomonari-Tuggle 1990). A total of 54 sites were identified and mapped and two previously recorded sites (No. 50-60-03-800 and -802) were re-surveyed (Tomonari-Tuggle 1983; Athens 1984, 1985). Features in 16 sites were test excavated. Coastal sites were described as being low intensity agriculture, short-term, low intensity, and intermittent habitation in nature. Identified sites were located within 75 of the 184 residential lots surveyed. Over a decade later, Bush et al. (2001) conducted data recovery on the Kalamaʻula Residence Lots (Unit I), which is covered the eastern half of the area studied by Estioko-Griffin (1988) and Tomonori-Tuggle (1990). Detailed mapping and excavation of sites -1731, -1740, -1743, -1745, -1748, and -1751 through -1753. Sites were found to be largely temporary habitation or agricultural from the pre-Contact to Historic era. Artifacts consisted of a variety of lithics, tools, fishing gear, and manuports. Midden, in the form of various marine shell, bone, and *kukui* were also collected from most sites excavated. In addition, two coffin burials were discovered in Site -1753, which were preserved in place (Bush et al. 2001). A detailed map of this study area with archaeological sites shown is provided in Figure 32.

Located on DHHL lands, but not within Residential or Subsistence agriculture zoned areas are two lots (TMK 2-5-2-012 and 030) that were extensively studied by Dye (1998), which are bordered on three sides by residential zoned DHHL properties. The Historic Kaunakakai School House (Site 50-60-06-1661) is located on these lots, which was built in the early 1920s. Also within this property is a pre-Contact petroglyph gallery and limestone quarry (Site 50-60-06-1660) that has at least five anthropomorphic, zoomorphic, and geometric petroglyphs as well as three major quarry features. Both sites exhibit traditional and historic features. During the 1996 survey of the entire lot, 29 surface features were identified, 17 of which were traditional, 10 were historic, and two were undetermined. Traditional features included stone mounds, U-shaped enclosure, enclosure, modified outcrop, cobble paving, stone terrace, and earthen terrace. Mapping and testing of the features was performed in 1997, where nine features were mapped and three controlled test excavations, two test trenches, shovel test pit, and eight backhoe trenches were performed. The test excavation in Site -1660 revealed numerous cultural layers and features such as hearths. The excavations also yielded a variety of traditional cultural materials, such as a perforated pig tooth, bone pick, hammerstone, volcanic glass, and basalt debitage as well as bone and shell midden. Also retrieved from the test units were three historic artifacts. Excavations in Site -1661 to determine the nature of some mound features, particularly to indicate the presence or absence of human remains. No burials were encountered. Some Historic artifacts were found, but no traditional artifacts.

In 1980 and 1981, Environment Impact Study Corporation (EISC) conducted a survey in bordering Nāʻiwa Ahupuaʻa, approximately 1 kilometer west of DHHL lands zoned residential (EISC 1980, 1981). EISC surveyors were not able to relocate Summers (1971) Site -106, which consisted of at least seven anthropomorphic petroglyphs originally found in 1965 behind the chicken farm west of a small gulch. However, two new sites were discovered. The first site is described as a terrace located above west bank of stream on the *mauka* end of the study area that

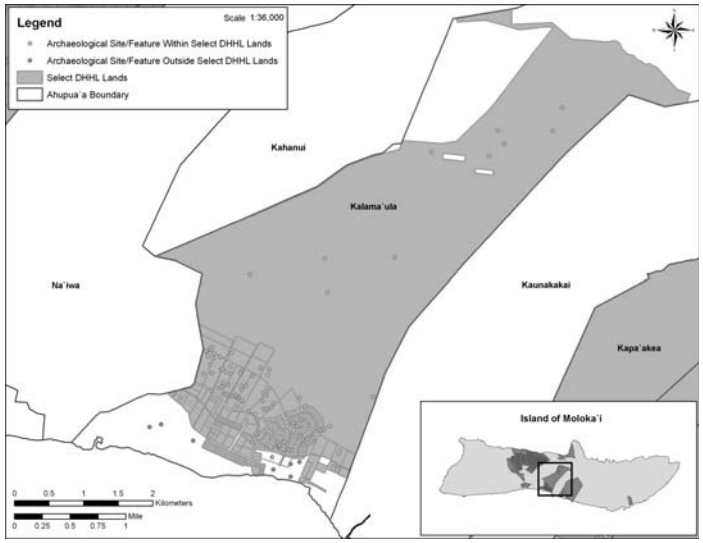

Figure 32. Archaeological sites in the Kalamaʻula Ahupuaʻa.

follows the slope for 10 m. It has a front retaining wall ca. 30 centimeters in height and 1-2 m wide. Possible clearance mounds accompany the terrace. The second site consists of a stacked stone wall situated on a high point of the ridge above the stream between two large natural outcrops. The wall is located ca. 90 m east of the first and measures 1 m long and 0.4 m tall. These sites were not mapped, photographed, nor given site numbers.

Shun (1982) performed a reconnaissance survey and test excavations on a property that is located directly across from DHHL lands in Kalamaʻula and less than 400 m south of DHHL lands slated for residential zoning (Figure 31). During the survey, two parallel mounds of undetermined function were discovered (no site numbers). During backhoe test excavations (n=46), a cultural layer was found in the northwestern corner of the property, which received a Bishop Museum Site No. 60-Mo-B1-5 (State Site No. 50-60-03-631). The cultural layer, observed at near the same depth in two trenches (number 6 and 43), contained basalt rocks, possible fire-cracked rocks, charcoal flecks, a basalt flake, charcoal lens, and midden.

While test auguring, Komori (1983) encountered subsurface cultural deposits near to the Kaunakakai Wharf, less than 1 kilometer southeast of DHHL Lands slated for residential use. This cultural deposit is likely attributed to Site 50-60-03-630, which was described as a cultural deposit containing midden, including marine shells and fish bone, and numerous charcoal fragments. In addition, two prehistoric-type and one historic artifacts were recovered from the surface of the site, which included a basalt grinding or polishing stone, a coral abrader, and a pearl-shell button, likely of local manufacture.

In 1984, J. Landrum surveyed a 3.6 acre parcel ca. 200 m northwest of the Kaunakakai Wharf, which is just over 1 kilometer southeast of several DHHL properties zoned for Residential use. An archaeological deposit, consisting of prehistoric cultural layer and Historic structural foundation, exposed by bulldozing was assigned Bishop Museum Site number 50-Mo-Bl-7 (State Site 50-60-30-632)**.** Also found on the ground surface during the survey were prehistoric artifacts, including a vesicular basalt discoidal hammerstone and a rectangular adze fragment, which were found within 7 m of one another (Landrum 1984).

Weisler (1989a) performed archaeological investigations on lands that would become known as the Kaunakakai Field System. A total of 115.5 acres were surveyed between the 40 and 75 meter contours, east of Kaunakakai Gulch and above the Ranch Camp. This survey recorded four sites (50-60-03-886 to -889). These sites are attributed to the largest dry-land agricultural system ever recorded on Molokaʻi. Site -886 is a massive agricultural complex, measuring 120 m N/S by 95 m E/W, that is comprised of two field shelters, a low boundary or erosion control wall, 7 terraces, ca. 100 stone mounds and modified outcrops. Site -887 is a very large dryland agricultural complex, measuring 700+ m N/S by 150 m E/W (north end destroyed by ranch construction). This site consists of thousands of stone mounds, modified outcrops, and stone alignments, as well as a large enclosure, three shelters, and six cupboards. Site -888 is another large agricultural complex that measures 100 m N/S by 250 m E/W and is comprised of numerous terraces, stone mounds, modified outcrops, stone alignments, and one field shelter. Site -889 is a large boundary wall that creates the entire west edge of the project area. This stacked stone wall is constructed of stacked basalt boulders that progress from large boulders to smaller stacked stones from base to the top of the wall.

Located less than 4000 f t. (ca. 1150 m) southeast of Residential DHHL lands in Kalamaʻula Ahupuaʻa and about the same distance from Residential Use lands in Kapaʻakea Ahupuaʻa, Tuggle (1993b) performed extensive testing for Malama Cultural Park. This property contained three previously identified sites, including a subsurface cultural deposit (Site 50-60-03-630), a Historic pier (Site -890), and the Malama platform (Site -1030), which is the base for a Historic complex comprised of Kamehameha V's summer house, Kalaʻiakamanu Church, and a temple named Māhinahina. Tuggle (1993b) supervised the mapping of the Malama platform, trenching of areas around the platform, and the excavation of a single trench through the platform. These investigations added insight to the complete history of the sites. Cultural materials represented in the collection were a variety of artifacts and midden. Artifacts include basalt flakes, basalt grinding stone, two flaked cobbles, and some pieces of "Molokaʻi chert" (a type of cherty limestone) as well as historic iron, corroded metal, glass, and ceramic fragments. Midden consisted of fish, bird, and mammal bone, marine shell, and *kukui*.

Cordy (2000) surveyed a large area (no measurements given – see Fig. 3) just *mauka* of DHHL Lands on east side of Residential lands in Kalamaʻula. Nine new sites were identified in the upland end of the survey area and two previously identified sites were further examined. Site -996, identified as a notched enclosure, possible small *heiau*, originally found by Collins (1994), lies less than 1300 ft east north-east of proposed DHHL Residential lands. Site -2448 is a complex that lies ca. 2500 feet to the east of the project area and is comprised of a rectangular enclosure with a separate paving area, stone mound, and a rectangular mound. This site is interpreted as a field shelter.

Several archaeological investigations have been performed in the ʻŌhiʻapilo Wetlands, which is located less than 100 m south of several DHHL lots zone as Residential (Shapiro et al. 1993; Denham et al. 1998; and Roberts et al. 2000). A total of 8 core samples were retrieved from several areas in ʻŌhiʻapilo Pond (Site 50-60-03-891) by Shapiro (1993), where the stratigraphic profile of the pond was observed through these samples. No evidence of the pond being manmade or altered for use as a fish pond was found during this study, however, a single volcanic glass flake was found. In 1998, Denham et al. (1998) performed paleoenvironmental investigations for the ʻŌhiʻapilo Wetland Enhancement project, which entailed excavating a stratigraphic test trench and auguring 13 sediment cores in the area of ʻŌhiʻapilo Pond. The pollen, diatom, and shell within the excavated and extracted sediments provided general paleoenvironmental data to uphold the previously determined configuration of pond features, such as walls and alignments. Although some charcoal flecking was observed, no artifacts, midden, or datable charcoal were observed. A few years later, Roberts et al. (2000) performed archaeological monitoring, in which additional data about ʻŌhiʻapilo Pond was obtained and a Historic railroad grate was discovered (Site -2441).

6.7 Ongoing Archaeological Programs

There are numerous archaeological sites in the ahupua`a, such as ʻŌhiʻapilo Fishpond, ʻŌpaeʻula Heiau, Puʻu Pāpaʻi Heiau, Kalamaʻula Heiau, and Puʻu omoʻo Heiau that the MIP (Group 70 2005:5-3) advises to be protected and preserved for cultural learning and perpetuation. However, no comprehensive plans have been outlined in the MIP.

7.0 HOʻOLEHUA – PĀLĀʻAU (APANA 1 & 2)

The Hoʻolehua and Pālāʻau Parcels are located in central Molokaʻi on the plateau dividing the west and east portions of the island, the two properties stretching from the north coast to the south (Figure 33). These DHHL lands are at an elevation of approximately 160 m, and make up a large portion of what is today known as the Hoʻolehua Plain. The homesteads of Hoʻolehua/ Pālāʻau Apana 2 have become collectively known as Hoʻolehua since its initial settlement in 1923, though the area encompasses both of the traditional land units of Hoʻolehua and Pālāʻau 2. Very few people today differentiate Pālāʻau 2 as an *ahupuaʻa*, though it appears on maps to be a larger entity than Hoʻolehua, and actually surrounds the north side of the *ahupuaʻa*, preventing any access to the sea (Major and Dixon 1995:43). The collective *ahupuaʻa* of Pālāʻau consists of three separate parcels, or *ʻapana*, that together transect the Hoʻolehua Plain. Pālāʻau 1 is located on the southern coast. Pālāʻau 2 is a large parcel just north of Pālāʻau 1 in the central region, and Pālāʻau 3 is a smaller strip of land that lies just southwest of Kalaupapa. All three *ʻapana* are managed by the DHHL. Though the land is not contiguous like most *ahupuaʻa*, it is hypothesized that these parcels would have, at one time, provided access to resources from the differing environments to its inhabitants, following the traditional *ahupuaʻa* pattern from sea to mountain. Several *ahupuaʻa* of central Molokaʻi follow this pattern including Hoʻolehua (Hoʻolehua 1 borders the ocean and Hoʻolehua 2 is the larger portion joined with Pālāʻau 2). The *ahupuaʻa* of ʻĪloli, Nāʻiwa and Kahanui also had small separate *ʻapana* portions along the south shore which would have provided the people access to the productive fishponds which covered the entire southern coast.

Of the areas that will see upcoming development in Hoʻolehua, are two existing designated residential areas that consist of approximately 55 acres. The first area is bounded by Farrington Avenue, Puʻu Kapeʻelua Avenue, and Puʻu Kapele Avenue. This area consists of half-acre lots that are serviced by paved roads, potable and irrigation water. In addition, approximately 5,862 acres have been designated for Supplemental Agriculture and 2,138 acres as Subsistence Agriculture.

Today, Hoʻolehua is a rural agricultural community. Hoʻolehua is the only DHHL area with a dedicated irrigation water system, and is considered to have some of the best agricultural lands in the State. Much of the area exhibits excellent soil quality, adequate drainage and a fairly even topography. There is a farm supply cooperative in the area, as well as a community college training farm, and a UH Extension Research and Demonstration Farm. The agricultural technical support services on the island reflect the encouragement of the community for agriculture to be the primary economic generator. (Group 70 2005: 2-9). The 2005 MIP states,

> The general approach for the land use plan of Hoʻolehua is to maintain the integrity of large parcels of agricultural land for existing and future agricultural use while assessing where future homestead growth can be directed to minimize impacts to agriculture activities. The plan evaluated necessary infrastructure development or improvements to provide the means for multiple generations of families to live and work together. A major limiting factor currently is providing potable and irrigation water from existing sources to meet anticipated demand." (Group 70 2005:ES13).

The land of Pālā‘au 1 slopes gently to the shore and was once known for having fresh and brackish water sources and a large complex of *lo‘i (*taro pond fields). Historically, it was not as extensively used for pineapple cultivation as Ho‘olehua throughout the 20th century. This parcel is where Pālā‘au village was located before it was abandoned in the 1850s and is home to Poho‘ele, the largest of the Moloka‘i fishponds, though it is now destroyed.

A total of 542 Tax Map Key parcels are located in the proposed Ho‘olehua Pālā‘au development (Table 10). See Appendix A for aerial images of Ho‘olehua-Pālā‘au (Apana 1 and 2) parcel TMKs.

Table 10. Ho‘olehua-Pālā‘au (Apana 1 and 2) TMKs to be Impacted by Development

Residential	Sub/Supplemental Agriculture	Road
(2) 5-2-015:047 – 048	(2) 5-2-002:001 – 025	(2) 5-2-002:999
(2) 5-2-017:001 – 002	(2) 5-2-002:027 – 028	(2) 5-2-004:999
(2) 5-2-017:021 – 043	(2) 5-2-002:030 – 046	(2) 5-2-005:999
	(2) 5-2-002:048 – 052	(2) 5-2-006:999
	(2) 5-2-002:056 – 075	(2) 5-2-007:999
	(2) 5-2-003:001	(2) 5-2-015:999
	(2) 5-2-004:001 – 002	(2) 5-2-021:999
	(2) 5-2-004:004	(2) 5-2-023: 999
	(2) 5-2-004:007	(2) 5-2-024:999
	(2) 5-2-004:009 – 010	(2) 5-2-025:999
	(2) 5-2-004:012 – 015	(2) 5-2-026:999
	(2) 5-2-004:018 – 029	(2) 5-2-027:999
	(2) 5-2-004:036	
	(2) 5-2-004:042 – 044	
	(2) 5-2-004:046	
	(2) 5-2-004:049	
	(2) 5-2-004:052	
	(2) 5-2-004:054 – 057	
	(2) 5-2-004:059	
	(2) 5-2-004:061 – 062	
	(2) 5-2-004:078	
	(2) 5-2-004:012 – 015	
	(2) 5-2-004:080	
	(2) 5-2-004:085 - 091	
	(2) 5-2-004:093 – 102	
	(2) 5-2-004:104 – 105	
	(2) 5-2-004:111 – 113	
	(2) 5-2-004:124	
	(2) 5-2-005:013 – 015	
	(2) 5-2-005:024 – 026	
	(2) 5-2-005:028 – 035	
	(2) 5-2-005:038 – 042	
	(2) 5-2-006:057 - 062	
	(2) 5-2-006:081	

Residential	Sub/Supplemental Agriculture	Road
	(2) 5-2-006:122	
	(2) 5-2-006:124	
	(2) 5-2-006:150 - 153	
	(2) 5-2-006:057 - 062	
	(2) 5-2-006:081	
	(2) 5-2-006:122	
	(2) 5-2-006:124	
	(2) 5-2-006:150 - 153	
	(2) 5-2-006:163 - 165	
	(2) 5-2-007:001 - 012	
	(2) 5-2-007:021 - 022	
	(2) 5-2-007:028 - 033	
	(2) 5-2-007:035 - 036	
	(2) 5-2-007:038 - 041	
	(2) 5-2-007:051	
	(2) 5-2-007:055	
	(2) 5-2-007:059 - 085	
	(2) 5-2-007:091	
	(2) 5-2-007:093 - 108	
	(2) 5-2-015:003 - 044	
	(2) 5-2-015:049 - 050	
	(2) 5-2-015:052	
	(2) 5-2-015:057 - 060	
	(2) 5-2-017:004 – 006	
	(2) 5-2-021:001 – 003	
	(2) 5-2-021:005 – 017	
	(2) 5-2-022:002 – 024	
	(2) 5-2-023:005 – 016	
	(2) 5-2-023:005 – 017	
	(2) 5-2-023:018 – 021	
	(2) 5-2-023:023	
	(2) 5-2-023:025 – 030	
	(2) 5-2-024:001 – 003	
	(2) 5-2-024:005 – 015	
	(2) 5-2-024:016	
	(2) 5-2-025:001 - 020	
	(2) 5-2-026:001 - 017	
	(2) 5-2-027:001 - 034	
	(2) 5-2-027:039 - 040	
	(2) 5-2-030:001 - 017	
	(2) 5-2-027:019 - 068	

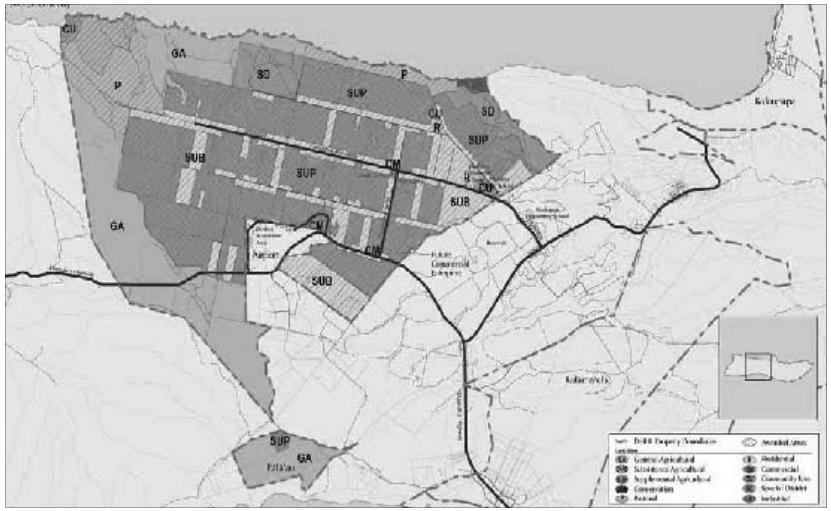

Figure 33. Hoʻolehua Pālāʻau Parcels with proposed land use distinctions (from Group 70 2005: Figure ES.7).

7.1 CLIMATE

The central region of Molokaʻi is dry, with only 15 to 20 inches of rain annually. The majority of the rainfall occurs during the winter months. Significant amounts of rainfall end up as runoff rather than penetrating the soil, due to the fact that much of the surface area has been stripped of topsoil and vegetation. Periodic droughts have affected the region, and the area has reportedly experienced rainless periods for up to one year (Major and Dixon 1995:18). The region is known for experiencing strong trade winds that sweep over the land and erode soil.

7.2 SOILS AND TOPOGRAPHY

Hoʻolehua consists of large tracts of relatively level ground that has been the focus of large-scale agriculture during the twentieth century. The topography is varied, ranging from level plains to rolling hills and sea cliffs at the northern coastal boundary (Figures 34-36). Two gulches, Kalaupeʻelua and Maneʻopapa, bisect the northeastern section of H, and Anahaki Gulch is in the northwest. Six hundred foot seacliffs border the northeastern portion and the land transforms moving west, from cliffs to gentle sloping fields to protected beach access at Moʻomomi. (Group 70:2005 7-1). Pālāʻau has is situated in a low elevation on a gentle south facing slope. The land is abundant in fresh and brackish water sources. The substrate is mostly very stony land, eroded soils that are typically Mala silty clay, 0 to 3 percent slopes and Kealia silt loam. Detailed Custom Soil Resource Reports for the Residential, Subsistence Agriculture, and Supplemental Agriculture areas of Hoʻolehua and Pālāʻau (Apana 1 and 2) were generated using the U.S. Department of Agriculture (USDA) and Natural Resources Conservation Service (NRCS) Web Soil Survey and are provided in Appendix B.

7.3 VEGETATION

The region's varied native ecosystems have been greatly altered over the last hundred years due to introduced species of grasses, shrubs, trees, and cultivated crops. The species of flora have varied greatly over the years, and no known, up to date listing exists. However, the vegetation has been generally characterized as grass and scrub land, with few plants exceeding 1 m in height (Major and Dixon 1995:18). Such introduced species as clovers, *koa haole* (*Leucaena leucocephala*), lantana (*Lantana camara*) and Christmas berry *(Schinus terebinthifolius*) are present. The native species, *ʻilima* (*Sida fallax*) and *pili* grass (*Heteropogon contortus*), are also said to be present (ibid.). Hoʻolehua is dominated by grass and shrubs in areas not actively gardened or farmed (Figures 34-36). Pālāʻau is dominated by wetland plants, such as pickleweed (*Batis maritime*) with stands of *koa haole* (*Leucaena leucocephala*) and *kiawe* (Prosopis pallida) (Figure 37).

7.4 TRADITIONAL ACCOUNTS

The pre-Contact subsistence economy of the general area likely revolved around the cultivation of *ʻuala* (sweet potato, *Ipomoea batatas*). As previously mentioned, the people of Pālāʻau and Kalamaʻula were known for their skills in sweet potato cultivation (Summers 1971:38). The volcanic soil was considered good for *ʻuala* cultivation and rainfall during winter months would generally have provided ideal growing conditions. Numerous place names in the area reflect

Figure 34. Supplemental and Subsistence Agricultural parcel in Hoʻolehua (from Group 70 2005:7-7).

Figure 35. Supplemental and Subsistence Agricultural parcel in Hoʻolehua (from Group 70 2005:7-9).

Figure 36. Aerial photo of Hoʻolehua agricultural lands, March 2005 (from Group 70 2005:7-8).

Figure 37. Pālāʻau (Apana 1 and 2) wetland area (from Group 70 2005:7-4).

the importance of *ʻuala*, such as Kualapuʻu (Sweet Potato Hill) and Puʻu Kapeʻelua (*peʻelua*, a caterpillar or army worm pest that feeds on the leaves of the *ʻuala*). According to Summers (1971: 36), "In the old days, Hoʻolehua 2 was noted for growing sweet potatoes (Handy, 1940:157) and, on the plain where Molokaʻi Airport is now located, Kamehameha I is said to have trained his warriors" (Cooke, 1949:112).

Cultural historian Harriet Ne told a story which was recounted by Major and Dixon (1995:28) about the *peʻelua* in which a young woman named Pele is visited nightly by a lover who disappears each morning. In order to find him, the villagers tie a piece of *kapa* (bark cloth) to his back. After searching, they find that he has changed into a giant *peʻelua,* with the *kapa* on his back to show that it is the same person. They burn him, which caused the giant caterpillar to burst, and myriad small *peʻelua* come crawling forth, eating the tender leaves of the *ʻuala* crops. To this day, caterpillars can be seen around the hill and it is considered the source of plagues of caterpillars that strip the crops of leaves every few years (Major and Dixon 1995:28). This is the story behind the "Caterpillar Stones" (Site -11A), which are on top of the hill called Puʻu Kapeʻelua (Summers 1971:37).

7.5 HISTORIC BACKGROUND

The pre-Contact history for the entire central region of Molokaʻi is very obscure though there is a fair amount history in regards to the early ranching days of the mid-1800s with the advent of commercial ranching and agriculture.

The waters along the north coast of Pālāʻau 2 are considered to be rich with marine life, though they are very rough during most of the year. Fish could have been collected with nets and *ʻopihi* (*Cellana* genus) are reportedly found in abundance along with sea urchin, *heʻe* (octopus), and *ula* (spiny lobster, *Panulirus* spp.). Passageway to the shore is not easily accessible. There are only a handful of paths and all are extremely dangerous (Major and Dixon 1995:26).

In view of the fine fishing grounds in deep water and on the reefs and shoals within reasonable distance from the islands, it is surprising that there are no vessels engaged in fishing. Several attempts have been made to establish vessel fisheries, but for various reasons they have met with failure.

Maly and Maly (2003:489) write about the short-lived endeavor of commercial vessel fishing off the coast of Pālāʻau 1. This interesting story provides a rare account of this coast and its resources during the end of the 19th Century. The story is outlined as follows:

> The last attempt was in 1898, when a number of persons in Honolulu formed a company and, at a cost of $6,600, had the gasoline schooner *Malolo* built to engage in this business. She was fitted out with six seines and one bag net, at a cost of $1,000, and carried a crew of four men. The fishermen were Japanese, who were hired at Honolulu. They had their own boats and lines, and the schooner towed them to the fishing grounds. A station was established at Palaau district, on Molokai, and an old fish pond there was purchased with the purpose of cleaning it out and using it for catching fish which came in through the entrance. It was the intention of the company to hire fishermen on the islands to work the nets, while the Japanese would engage in line-fishing, and the schooner would make regular trips to Honolulu with the catch. The fishing was to be done on the reefs about the west and south sides of the island of Molokai.
>
> Difficulty was at once encountered in the unreliability of the Japanese crew, who would go to Lahaina and other places and sell their catch. Another crew was collected, composed largely of white men, mostly beach combers, and they were taken to the fishing grounds, to work the nets principally. This plan also failed, owing to ignorance of the business on the part of the crew, and a third effort was made, this time with a crew of native Hawaiians and South Sea islanders secured at Lahaina. Twelve of these men were put on the island of Lanai and supplied with boats, nets, lines, and provisions. After a few hauls the vessel left for Honolulu with the catch, the understanding with the fishermen being that they were to continue fishing to secure a second cargo during her absence. When the vessel returned, however, half of the fishermen had deserted and the few remaining were carried to Lahaina. The whole business was abandoned in August, 1899, after the failure of an effort to get another gang on Maui.
>
> The captain of the vessel says there was no lack of fish at any time, and if the fishermen could have been properly trained to the work the experiment would have been a brilliant success. Most of the fishing was done with trolling and hand lines, as the nets would not work well on the coral reefs, frequently tearing, and the numerous sharks about the reefs also did much damage to them (Maly and Maly 2003:489-490).

Although this commercial venture was not successful, the account provides insights on how prolific the marine resources were in this area in the Historic era. Further, the story mentions modifications to the fishpond and the addition of a fishing station to the location.

The introduction of large mammals such as cattle, sheep and deer, in the nineteenth century would have caused a profound change in eating habits. In 1851, 200 cattle and 200 horses were roaming the island, and in 1852, the first sheep were introduced as Kamehameha IV and V intensified ranching throughout the latter half of the century (Major and Dixon 1995:40). Deer were introduced to the island by Kamehameha V in 1868, after which a thirty year *kapu* (taboo, in this case a royal prohibition on hunting) followed. Deer had become a common ingredient of the diet by the early twentieth century and have become thoroughly integrated into cultural lore and tradition (ibid: 25).

The Molokaʻi Ranch ran herds of sheep and cattle over most of central and west Molokaʻi and the Ranch's holdings in Kaluakoʻi, Pālāʻau, and elsewhere in the island remained the largest bloc of land in private ownership on Molokaʻi until May of 2008, when the Ranch ceased all its operations on the island. During the early Homestead days, 6,000+ acres covering much of the central and west parts of the island were divided into pasture land as part of the Pālāʻau community pasture.

Although livestock were kept, agriculture was the focus of Homesteading. The livestock never contributed as much to the economy as crops, especially the primary cash crop, pineapple. For years, favorable contracts with Libby, McNeill, and Libby and the California Packing Corporation allowed Hawaiian Homesteaders to reap profits, causing an influx of Kalamaʻula residential Homestead lot holders to apply for and receive agriculture lots in Hoʻolehua.

In the late 19th Century, Rudolph Wilhelm Meyer, who managed Molokaʻi Ranch for the Bishop family, began obtaining his own lands for pasturage. Meyer experimented with growing a diverse variety of cultivars within the next decade. Sugar cane became a major export for Hawaiʻi during this period and Meyer followed suit, cultivating sugar cane in 30 acres of his lands and building a small sugar mill of unique design in 1876 to process his cane into sugar and molasses. The Meyer Sugar Mill, although modest in size, is one of the last surviving 19th Century sugar mills. Meyer continued sugarcane production, from field to mill, until 1890. By 1890, Meyer acquired 2,936 acres in Kalaʻe, which is less than a mile east (ca. 1.5 kilometer) of the Hoʻolehua-Pālāʼau Homestead (Bluestone 1978).

Hoʻolehua was the first area to receive Hawaiian homesteads following the passage of the Hawaiian Homes Commission Act of 1920. Thirteen homesteaders settled in Hoʻolehua in February of 1923. Tomatoes, corn, watermelons, sweet potato and cucumbers were some of the first crops to be cultivated in the area. With the aid of irrigation water piped in from the windward side of the island, Molokaʻi has been promoted as the "breadbasket of Hawaiʻi" (Major and Dixon 1995:28).

The land of Pālāʻau was once known for its *kalo*. Summers (1971) quotes a native writer who said that taro was planted at Pālāʻau by Hoʻolepanui, a favorite of Kamehameha I, and his men who came from Hawaiʻi, after Kamehameha I had conquered Oʻahu.

> It was said that when one ascended to the top of Kaʻana and looked down on Pālāʻau on a clear moonlight night, the taro patches seen below are as close together as the stars above. Each patch made by the men of Hawaiʻi was named and the biggest one in the center of the many little ones was called Pehu. There is a tale attached to this name. These patches were planted only with the best liked varieties of taro: the *piko, haokea, kai, nohu* and *ʻowene*. These were hard and long-rooted taros that did well in these brackish water patches. In mashing the taro the stone was worked back and forth (*ʻanai*) instead of bringing the stone down on the mass (*ka Nupepa Kuʻokoʻa, 1922c*, as cited in Summers 1971:77).

Sugarcane cultivation was experimented in Pālāʻau 1 and possibly in parts of Pālāʻau 2 as well near the end of the 1880s. The American Sugar Company (ASCO) was a failure after a short run, and the company's holdings later became part of what is known as Molokaʻi Ranch.

There was once a village known a Pālāʻau located in Pālāʻau 2 along the coast, which may have been quite extensive in the early 19th century. The village was abandoned suddenly in 1853 after all of the men in the village were implicated in rustling, and were sentenced to five year terms in jail on Oʻahu. Pālāʻau was never reoccupied. The families of the jailed men followed them to Oʻahu. This *ʻapana* appears to have been the population center for the *ahupuaʻa* in the 19th century, according to historical and contemporary ethnographic sources. Springs were known in the area to flow year round and an area just beyond the reef was considered a good natural harbor.

7.6 Previous Archaeology

The archaeological record for central region of Molokaʻi is not well documented. There are no records in the SHPD library of any archaeological work or archaeological sites within the specific planned residential areas aside from Summers (1971) recordation of four sites (No. 50-60-03-11A, -11B, -13, and -14), all located in the northeast corner of Hoʻolehua. However, there have been several archaeological surveys to the north, south, and east of the subject properties (Table 11, Figures 38 and 39). The operation of pineapple plantations in Hoʻolehua and Pālāʻau transformed much of the land, and probably impacted or destroyed a great deal of the archaeological features that may have survived ranching (Major and Dixon 1995:43). Ethnographic sources have suggested that surface artifacts such as adzes, slingstones, *ʻulu maika,* and other recognizable artifacts have likely been removed over the years by ranch personnel, thus depleting the surface archaeological record. (ibid:51). Table 12 contains a list of archaeological sites found in the subject properties (see also Appendix D).

The majority of archaeological, historical and environmental information for these areas is provided by Summers (1971), and also from an inventory survey report from the USAF Receiver Station in Pālāʻau, which was created by the Anthropology Department of the Bishop Museum (Major and Dixon 1995) for the National Park Service. This report examines not only the specific project area, but provides a good synthesis of historical and archaeological data, often pointing out the lack of data, for the entire central region of Molokaʻi (i.e., the *ahupuaʻa* of Pālāʻau , ʻIloli, Hoʻolehua, Nāʻiwa, and Kahanui). Major and Dixon (1995:53) mention the recordation of over 15 sites in 1988 by Pantaleo (n.d.) in Pālāʻau 1 that appear to be associated with Pālāʻau Village, now abandoned. Unfortunately, no details were given about the sites, save for their rough locations, several of which are located just north of the Pālāʻau 1 Subsistence Agriculture parcel (Pantaleo n.d. as cited in Major and Dixon 1995: 53, Figure 18).

Summers (1971) describe six sites throughout Pālāʻau 2 and four sites for Hoʻolehua 2. Two *heiau* are mentioned as being in Pālāʻau 2. The first *heiau* (Site -14) is located east of the Hoʻolehua Cemetery at an elevation of 800 feet. The structure was first reported by Cartwright in 1922, but was in ruins by 1957 when only traces of paving and the remains of a wall with an upright stone were could be seen. The second *heiau* (Site -16) was also first recorded by Cartwright in 1922 and is located on the west side of the mouth of Anahaki Gulch at an elevation of about 50 feet. The structure was a partially paved enclosure with a house site or shelter on the crest of the hill to the south. A *kahua maika* (Site -13) is mentioned as an "old *kahua maika,"* located on a rise at a place called Akani. Two *koʻa* are noted. One is at Naʻaukahihi (Site -18) at the northern extremity of Naʻaukahihi Point. The shrine is a small oval enclosure where numerous fish bones were observed upon it first being discovered. The other is on top of the hill at Puʻu Kapele (Site -15). This *koʻa* has probably been destroyed according to Major and Dixon (1995:48). During their 1994 survey, three mounds were located atop Puʻu Kapele, but they appear to be clearing mounds associated with antenna tower construction. Also, several house sites (Site -17) were seen at the coastal area of Kahinaokalani. Two *heiau* are listed for Hoʻolehua 2; one located on the east side of the crest of ʻEleuweuwe (Site -10) and one named Lepekaheo Heiau (Site -12), located on the boundary of Hoʻolehua 2 and Pālāʻau 2, west of Kaluapeʻelua Gulch. Neither *heiau* are described in any detail nor is their current condition known. The "Catepillar Stones" (Site -11A) are on top of the hill Puʻu Kapeʻelua, as is the

"Stone at Puʻu Kapeʻelua," which is just south of the Caterpillar Stones. The face of the stone has a hollowed out basin with several grooves cut into it, likely used for sharpening adzes or for collecting water.

Table 11. Previous Archaeological Investigations in the Hoʻolehua - Pālāʻau Ahupuaʻa and Vicinity

Reference	Location	Description and results
Southwick Phelps 1937	Island-wide	Included in the sites documented is a *koʻa* atop the hill Puʻukapele (recorded as Site 20 in Phelps 1940, and Site 15 in Summers 1971), and five features he referred to as agricultural shrines just north of the *koʻa*.
Summers 1971	Island-wide	A compilation of ethnographic, historic, archaeological and legendary material relating to Molokaʻi.
AECOS, Inc. 1980	Airport Area, Hoʻolehua	Found a complex of World War II bunkers, horseshoe-shaped revetments, earth covered Quonset huts, wood-lined causeways, roadways, and an alternate runway. Found a Historic hunting site with seven structural features with one possible prehistoric wall.
Earl Neller 1982	Northern coast of central Molokaʻi, including a portion of Pālāʻau 1	A brief aerial reconnaissance spanning several *ahupuaʻa* was conducted. Several "house sites" between Naʻaukahihi and Kahinaokalani were observed. *Koʻa* were noted at Naʻaukahihi and a photo was taken of the *heiau* at Anahaki (Summers Site 16).
Weisler 1987a	Kipu	550 acres located immediately east of the easternmost portion of Subsistence & Supplemental Agriculture DHHL lands; three sites were relocated and rerecorded, Sites 109A, 109B, and 111.
Weisler 1987b	Kīpū	Inadvertently discovered cache of adze pre-forms from an area located 2 km northeast of Kualapuʻu were analyzed.
Weisler 1989b	Kīpū	Found new Site 885, a buried Traditional habitation layer, was revealed in several backhoe test trenches from 1.4 to 1.65 mbs. Cultural deposit included an oven feature, midden, charcoal, and one bifacially flaked core.
Griffin 1993	North central coast, near Anahaki	Site 995 was documented during a field visit. Features included a C-shape and a modified outcrop. One boulder with a pecked rectangular basin and several boulders with natural basins were interpreted as water catchments.
Major and Dixon 1995	Hoʻolehua	Found two sites - one pre-Contact and one Historic; Features include three enclosures, one dump, and one isolate artifact; performed archival research on Pālāʻau and found an unpublished study by J. Pantaleo (n.d.) on Pālāʻau – site locations mapped with no additional info.
Hartzell 2000	North central coast Hoʻolehua	Same area as Major and Dixon (1995); recorded in detail known sites and found and recorded one new site on the property; one site is adjacent DHHL project area, Sites 843, -1623, and -1624; sites mostly pre-Contact with some Historic.

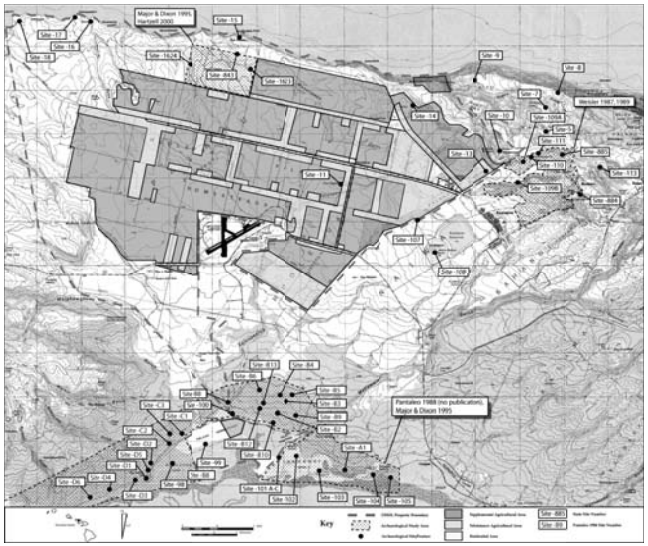

Figure 38. Previous archaeology and recorded sites in Hoʻolehua-Pālāʻau (Apana 1 and 2).

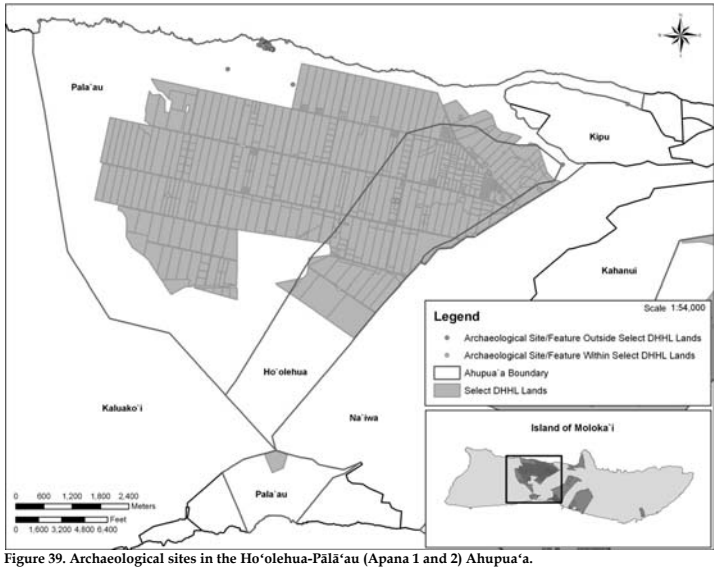

Figure 39. Archaeological sites in the Hoʻolehua-Pālāʻau (Apana 1 and 2) Ahupuaʻa.

Table 12. Archaeological Sites Located on Select DHHL Lands Within the Hoʻolehua-Pālāʻau Ahupuaʻa

	TMK	SIHP No.	Description	No. of Features	Reported Current Status	Easting	Northing	Report Author	Notes
Hoʻolehua Ahupuaʻa	5-2-023:007	11A	Cultural Place of Interest, Caterpillar Stones	No Data	No Data	700262	2341496	Summers 1971	Setting for Traditional Hawaiian myth.
		11B	Cultural Place of Interest, Stone at Puʻu Kapeʻelua	No Data	Preserved			Summers 1971	Modified Boulder, possibly to sharpen adzes or to collect water.
	5-2-023:007	1004	Molokaʻi Baptist Church			700358	2341482		
	5-2-007:035	1004	DHHL Office at Hoʻolehua			702239	2342260		
	5-2-007:046	1006	Former Sacred Heart Church			702307	2342084		
	5-2-015:001	1008	Molokaʻi High School Complex			702599	2341528		
Pālāʻau Ahupuaʻa	5-2-007:076 and 028	13	Kahua Maika	No Data	No Data	703377	2341730	Summers 1971	Location is called Akani.
	5-2-007:041	14	Heiau	1	Destroyed	701707	2343271	Summers 1971	Near Hoʻolehua Cemetery, in what were pineapple fields in 1922.

Archaeological survey has shown that settlement of the north coast of central Molokaʻi was more concentrated between Kapalauoʻa and Kahinaakalani, than further east along the Pālāʻau shoreline. However, none of the previous investigations derived their data from systematic, intensive survey and are therefore unconvincing (Hommon and Ahlo 1995:51-55):

Summers (1971:77-78) mentions only two sites for Pālāʻau 1, the first being the Pohoʻele or Pālāʻau Pond (Site -99). This was the largest of the Molokaʻi fishponds with a size of somewhere between 200 and 500 acres. The pond is now filled with mud but its walls were still visible in 1922 along with traces of an old-fashioned sluice gate. It is believed to have been built for Kamehameha I by Hoʻolepanui after he retired to Molokaʻi from Hawaiʻi. About 800 m to the west of Pohoʻele Pond (Site -99), is Hoʻolehua Fishpond (Site -98), which was a *loko ʻumeiki* (shore fishing pond) that extended to the western wall of Pohoʻele Pond. This site had six lanes leading to the sea (Summers 1971:77) during its pre-Contact era use. However, in Historic times, the pond was used by people of Pālāʻau Village for growing taro and for raising cattle (Summers 1971:77). In 1988, Pantaleo surveyed this same area and found at least 21 sites that were included in Pālāʻau 1 a map provided by Major and Dixon (1995:53, Figure 18), but no additional data was given (Figure 37). Several of these sites are within 500 m of Pālāʻau 1 Subsistence Agriculture parcels included in this study.

Near DHHL Subsistence Agriculture lands and the Kualapuʻu Reservoir in Nāʻiwa Ahupuaʻa are two sites (No. -107 and -108) located by Summers (1971) (Figure 37). The *holua* slide (Site -107) appears to be near or on the eastern boundary of the project area. This site is described as a slide on the south-southwest side of Kualapuʻu hill and was slightly visible in 1966 (Summers 1971:80). About 800 m to the southeast of Site -107 is the Kalakupale Heiau, also known as Palakupale Heiau (Site -108). This site was described as a small *heiau*.

Site -100 is a boundary stone which marks the point where the *ahupuaʻa* of Pālāʻau 1, Kaluakoʻi, Hoʻolehua 2, and Nāʻiwa meet. The stone was relocated in 1923 (Summers 1971). Four *heiau* are listed by Stokes (n.d.) that were "reported by natives but not seen," which were described as:

> Kahimakau, southern portion of Pālāʻau Manai, near Kalamaʻula
> Puʻunana
> Panuhu; for rain purposes; a female deity (as cited in Summers 1971: 78)

The *loʻi* built by Hoʻolepanui, the Big Island chief, in the late 1700s were never been mapped, and have likely suffered erosion and siltation among other destructive development (Major and Dixon 1995:53).

Weisler (1987a) surveyed 550 acres located immediately east of the easternmost portion of DHHL lands slated for Subsistence and Supplemental Agriculture in the Hoʻolehua-Pālāʻau Project area. Within this survey area, three sites were relocated and rerecorded, Sites 50-60-03-109A, -109B, and 111. Summers (1971) wrote that sites -109A and B were reported by Cartwright fifty years prior (n.d. *d*) as *heiau* but did not relocated them and believed that they were both destroyed. Site -109A was a large terrace found somewhat intact, but may have contained additional structures or features destroyed by bulldozing activities. What remained of it, a 4 m N/S by 13 m E/W terrace with a stacked and faced retaining wall, was mapped.

This site is located ca. 530 m east of DHHL lands slated for supplemental agriculture. Site -109B had more severe damage from pineapple cultivation activities. No structures remained, but artifacts and midden were collected in and around the supposed area that it once stood. This site is located ca. 545 m southeast of DHHL Subsistence Agriculture properties. Site -111, Na Imu Kalua Ua Heiau, was first recorded by W.T. Brigham in the late 19th century (Stokes 1909:27) and further described by stokes in the early 20th century (Stokes 1909). The site was revisited by Fowke in the early 1920s, where he measured its internal and external features (Fowke 1922) and measured again by Phelps in the late 1930s (Phelps 1941).

In 1987, Weisler examined an adze cache that came from an area located 2 km northeast of Kualapuʻu (Site 50-60-03-884). The site is situated on a small hill adjacent to an unnamed gulch, at the 400 m contour overlooking the saddle area and south coast of Molokaʻi. The cache of 11 adze preforms was purported to be buried approximately 1 m below surface and inadvertently discovered by the property owner while excavating a utility trench (Weisler 1987b). Several years later, Weisler (1989b) returns to the area that the adze cache was inadvertently discovered for testing. He records another site, 50-60-03-885, which consisted of a buried traditional habitation layer, which was found in several backhoe test trenches from 1.4 to 1.65 mbs. Found in this cultural deposit was an oven feature, midden, charcoal, and one bifacially flaked core (Weisler 1989b).

The most recent study performed in Hoʻolehua was Hartzell (2000), where she records in detail a total of three sites were identified in the property that continued into adjacent properties (to the north of the TMK). Two of the sites, -1623 and -1624, were first recorded in 1994 by Major and Dixon (1995). Site -1623, a complex that measures ca. 750 m N/S by 400 m E/W, is comprised of two enclosures and a Historic artifact scatter. This site is situated on the western boundary of TMK slated for Supplemental Agriculture. Site -1624 consists of two features, including an enclosure and an isolated basalt flake. This site measures ca. 100 m N/W by 80 m E/W. Site -843, the Puʻuka Pele complex, is composed of 37 individual features, including: 26 stacked and faced walls, five alignments, four enclosures, a depression, and a "prominent, massive natural boulder. This site, comprised of agricultural, habitation, erosion control, water diversion, and religious type features, measures nearly 250 m N/S by 400 m E/W. Its northern two-third is situated in other TMKs owned by DHHL slated for general agriculture and the southern third lies within a DHHL TMK designated as a Special District.

7.7 Ongoing Archaeological Programs

Hoʻolehua contains two Special Districts, according to the MIP (Group 70 2005:7-11), which include the Puʻukapele Rock Wall Complex and lands surrounding Puʻu ʻEleuweuwe (Site -10, *heiau*). The 372 acres on which the Puʻukapele Rock Wall Complex is located is currently leased to the U.S. Air Force. Upon termination of the lease in 2013, the MIP recommends future preservation and a CRM plan. The 288 acres on which the second Special District is located have no future plans for development due to its status as a nature reserve.

8.0 EXPECTATIONS AND RECOMMENDATIONS

As indicated in previous sections, the current distribution of archaeological sites on DHHL lands in Molokaʻi represented in the archaeological record largely reflects archaeological work conducted in the past two decades. The distribution of sites identified during Summers (1971) island-wide inventory that focused primarily on monumental structures (i.e., *heiau*) and fishponds, yet the distribution of these suggests a relatively even distribution of archaeological sites was once distributed across the landscape. From the massive field systems of Kaunakakai across to the Hōkūkano-ʻUalapuʻe Complex and contiguous fishponds distributed along the southeast shore to the north coast ceremonial and habitation complexes, the subject properties represent a great diversity of site types. Barring those areas with a history of pineapple and sugar cultivation, areas of slated for DHHL development have a significant potential to contain unrecorded sites – surface and subsurface. Areas on Molokaʻi, such as Kaunakakai coastal environs, have been subjected to such continuous development that the contiguous distribution is obscured. Yet, most areas covered by this report have been relatively undisturbed by large-scale development and agriculture. Efforts to document any previously disturbed sites and to inventory areas not previously developed is vital in an effort to preserve and understand what vestiges of the cultural landscape remain.

8.1 SETTLEMENT PATTERN EXPECTATIONS

Obviously, the areas of concern represent a wide variety of environments and natural resources, which affects expectations on settlement patterns. In general, surface sites expected in areas not yet surveyed and in those areas possibly missed by earlier surveys due to vegetation cover consist of small-scale or ephemeral structural features and surface scatters of cultural materials. These sites would typically be related to temporary habitation, agriculture, ranching, erosion control, boundary markers, resource management, tool manufacture, arts and crafts, as well as human interments and ceremonial sites. Surface sites will probably date to both pre-Contact and historic eras. Sub-surface features predicted to be present consist mainly of traditional deposits, including hearths, midden, structural foundations, post-holes, and lithics, which represent habitation areas and activity areas. These features also can provide samples of ethnobotanical remains to determine foods and plant materials used for domestic functions, and medicines, as well as charcoal for dating and macrobotanical, pollen, and phytolith remains that help reconstruct the environment in which these early inhabitants lived. Additionally, burials are also a concern in areas of sand deposits, lava tubes, and sinkholes.

Coastal areas, including those of concern in Pālāʻau 1, Kalamaʻula, Kapaʻakea, Kamiloloa, Makakupaʻia, and ʻUalapuʻe, have the highest potential for encountering archaeological sites, based on the high population density as indicted by the historic record and traditional accounts as well as the substantial amount of archeological sites found within and adjacent to these areas. The propensity for encountering sites is also upheld by the abundance of natural resources and occurrence of traditional sites related to food production such as fishponds, lowland taro patches, and upland dry land agriculture field systems. Furthermore, these areas have a higher

potential for subsurface cultural deposits, based on the higher rate of soil deposition from higher rain-fall averages and steeper slopes *mauka*, which leads to an accelerated encapsulation of archaeological sites. Sub-surface features and deposits are typically significant for their potential to yield datable cultural materials and materials related to the inhabitants' diets, manufacture materials, and technologies. These cultural materials are invaluable to determining the lifeways, history, inter-island trade, and settlement chronology of Molokaʻi's pre-Contact population. In addition, these areas are also renowned for their concentration large *heiau,* which appear to correlate with the abundance of natural resources as well as the level and intensity of agriculture and aquaculture.

Conversely, archaeological sites appear more sparse on the Hoʻolehua Plain, as the area lacks adequate rainfall to support the same population density as the southeast coastal region of Molokaʻi. However, this vast plain contains several zones, particularly in the north and northeast, which boast a high concentration of religious sites and places associated with Traditional mythology.

8.2 RECOMMENDATIONS

Coastal ʻUalapuʻe may not have been the subject of many archaeological investigations, yet, based on the closeness in proximity that Hōkūkano - ʻUalapuʻe Complex and Site 50-60-05-531 are to the proposed DHHL residential areas as well as the historical accounts of a relatively high population in this area, there appears to be a high potential to encounter archaeological sites and cultural materials on the surface and subsurface of the subject properties. Therefore, archaeological survey and testing is recommended prior to initiating ground disturbing events.

Generally, the *ahupuaʻa* of Kapaʻakea, Kamiloloa, and Makakupaʻia appear have a high potential to encounter archaeological sites and cultural materials on the surface of areas not previously surveyed and subsurface anywhere in the project area not yet developed, based on the closeness in proximity to the proposed DHHL residential areas and density of sites previously recorded. The only area that has not been surveyed is a narrow strip of land between 150 – 250 ft amsl, and the 300m – 700m wide coastal flat between the Kalaniana'ole homestead and the ocean. This area has already seen development (i.e., TMKs (2) 5-2-008:034-051), therefore, archaeological survey would have to involve extensive subsurface testing, according to Tomonari-Tuggle (1990:33). This unsurveyed area may prove to be the settlement center for the *ahupuaʻa* since the coastal flat is where the majority of substantial habitation complexes have been found in the nearby *ahupuaʻa* of Kawela, (Weisler and Kirch 1985) and also in Kamiloloa (Hommon and Ahlo 1983; Tomonari-Tuggle 1990). Tomonari-Tuggle further states that the low degree of agricultural intensification in the areas *mauka* suggests that the numerous fishponds and the land along the shore held greater importance. The coastal region is relatively flat land, ideal for habitation. There are six fishponds, and at least two known fresh water springs, along with three known *heiau* in the area. This indicates that there was likely a relatively large population in the area that is not reflected in the current known archaeological sites (Tomonari-Tuggle 1990:34). Therefore, archaeological survey and, more importantly, sub-surface testing are recommended prior to initiating ground disturbing events.

Coastal Kalamaʻula also has a high potential for sub-surface archaeological deposits, as large portions of the area has been developed for residential and commercial use. There are many significant historic sites in this area that have been preserved in place and are currently being used for community gatherings, religious ceremonies, and as administrative buildings. Sites are more likely to be found sub-surface than surface, especially in areas already surveyed. Thus, survey is recommended for areas not yet investigated, followed by testing and areas already surveyed areas should be tested prior to development.

The Hoʻolehua-Pālāʻau Project Area represents the greatest diversity of environments. As previously described, the Hoʻolehua Plain lacked the natural resources, predominantly fresh water, to support a large population. However, there are several significant cultural and religious sites located within the project area. Most areas within the Hoʻolehua Plain appear to be relatively flat with slight slopes and gullies. Further, much of the project area is covered in modest ground cover and only small stands of forest, limited to the northeast extreme. Therefore, the potential for undiscovered surface sites is low. Furthermore, the rate of soil deposition is relatively low in this arid area, which lessens the possibility that sites were encapsulated below the plow zone (maximum depth that the plow reaches) and left undisturbed. The potential for subsurface sites remains a concern in areas of known sites. Testing is recommended prior to development in these areas. In contrast, the southernmost parcel, Pālāʻau 1, has a relatively high prospective for archaeological sites, surface and sub-surface, based on the lack of development, closeness in proximity of known sites and Pālāʻau village, and amount of vegetation cover, which would have obscured sites during previous investigations. It is recommended that survey, followed by testing be performed prior to initiating any ground disturbing activities.

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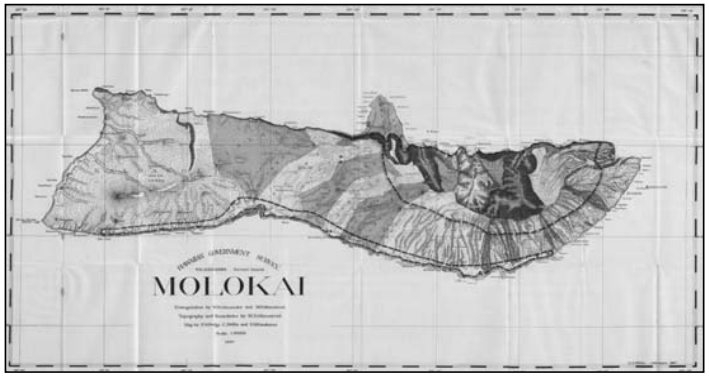
Pacific Legacy

Historic Preservation

LITERATURE REVIEW
OF PREVIOUS ARCHAEOLOGICAL WORK
WITHIN 8,955 ACRES OWNED BY
THE DEPARTMENT OF HAWAIIAN HOME LANDS
ON THE ISLAND OF MOLOKA'I

APPENDICES



Pacific Legacy: Exploring the past, informing the present, enriching the future.

CULTURAL RESOURCES CONSULTANTS

Hawai'i Offices:
Kailua, O'ahu
Hilo, Hawai'i

California Offices:
Arnold
Berkeley
El Dorado Hills
Lancaster

APPENDIX A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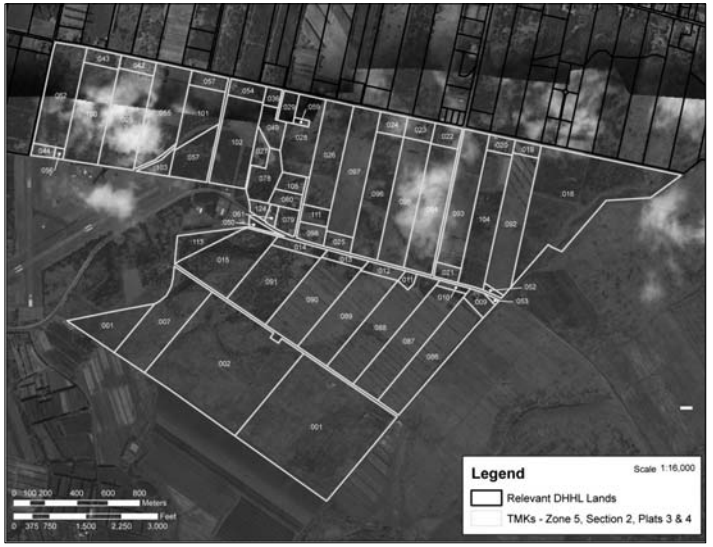
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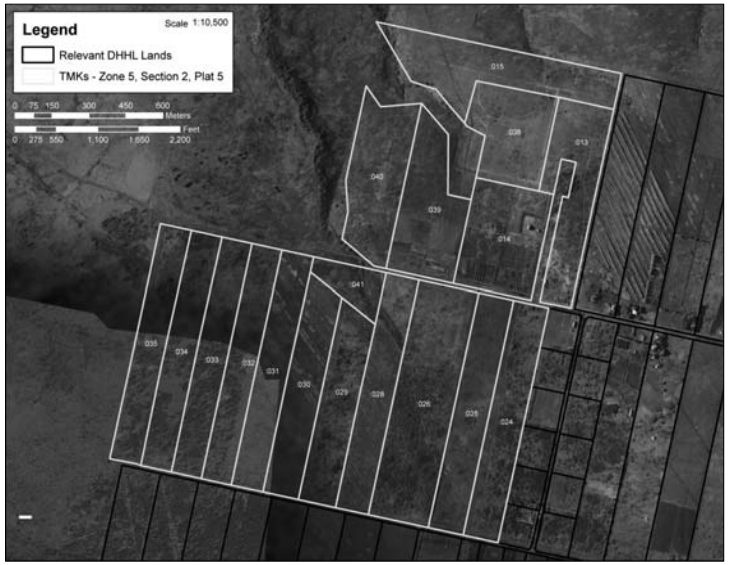
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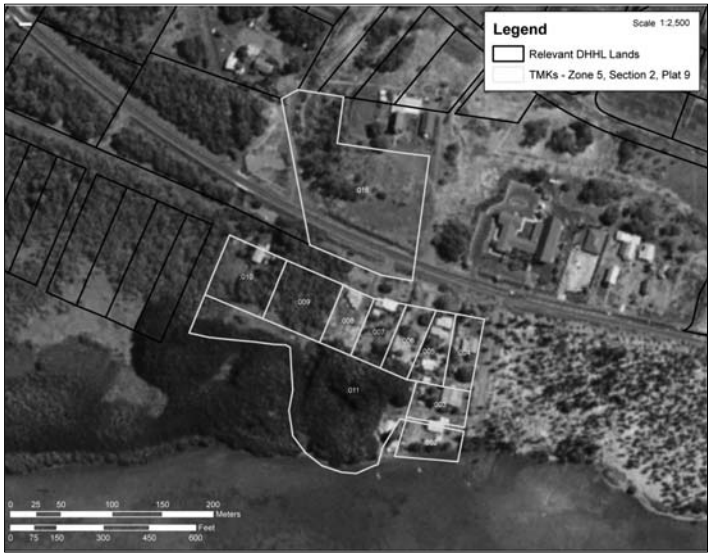
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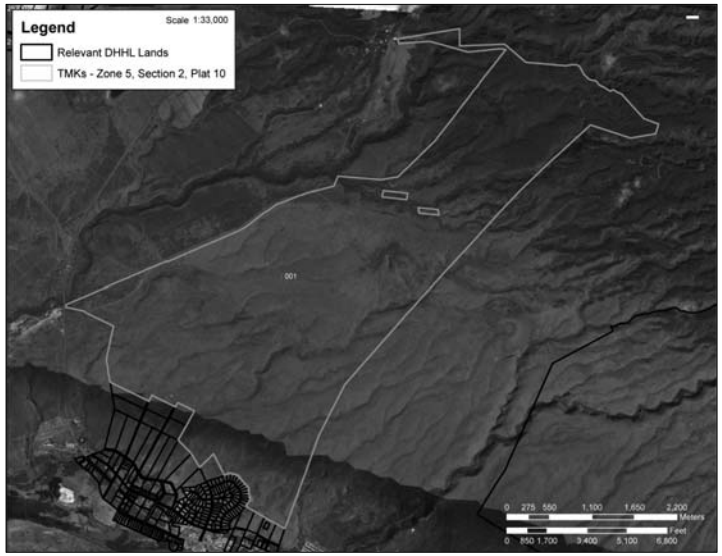
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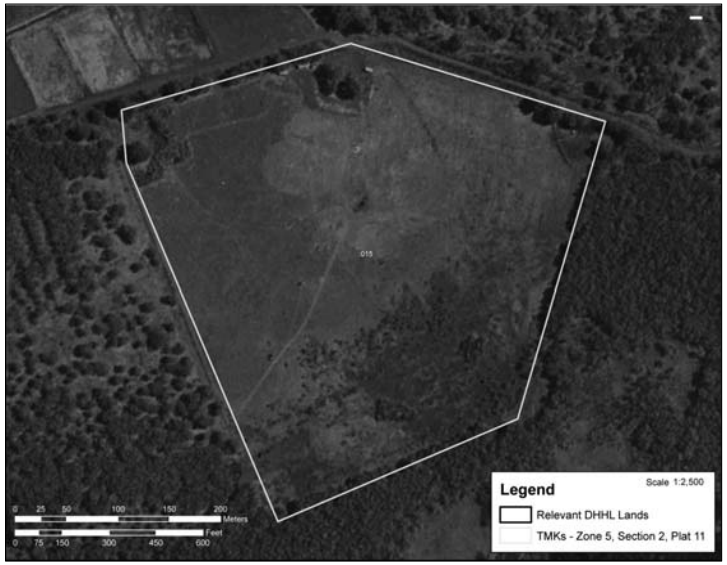
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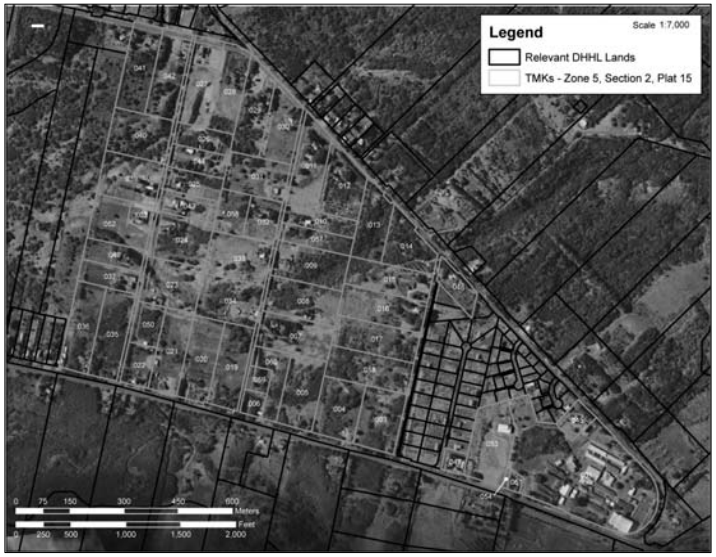
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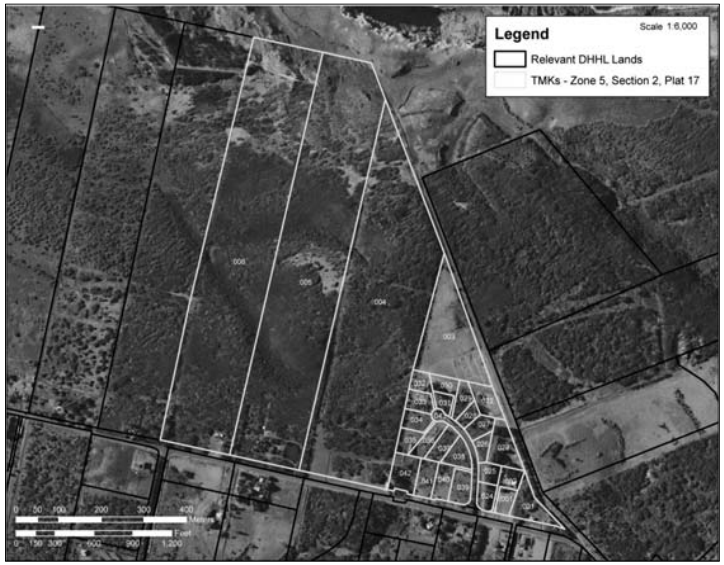
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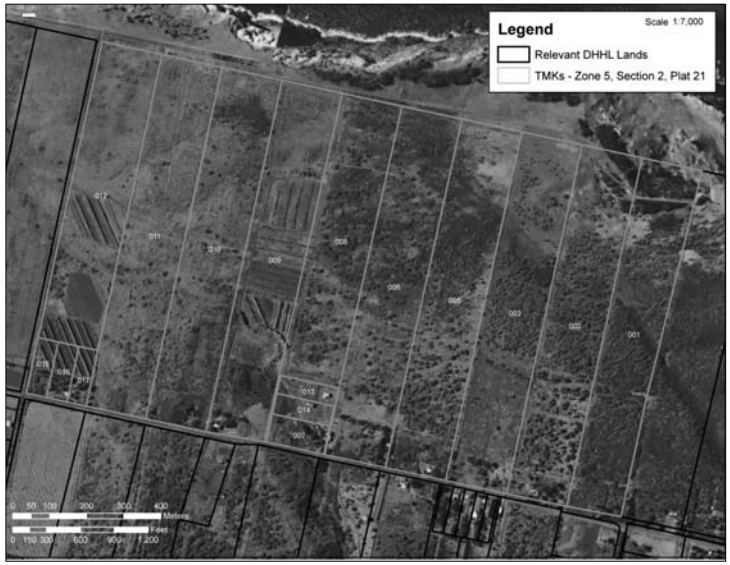
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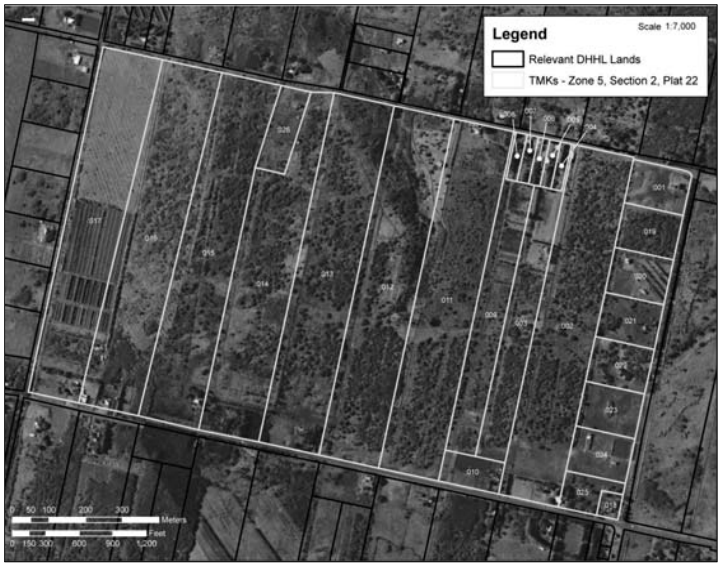
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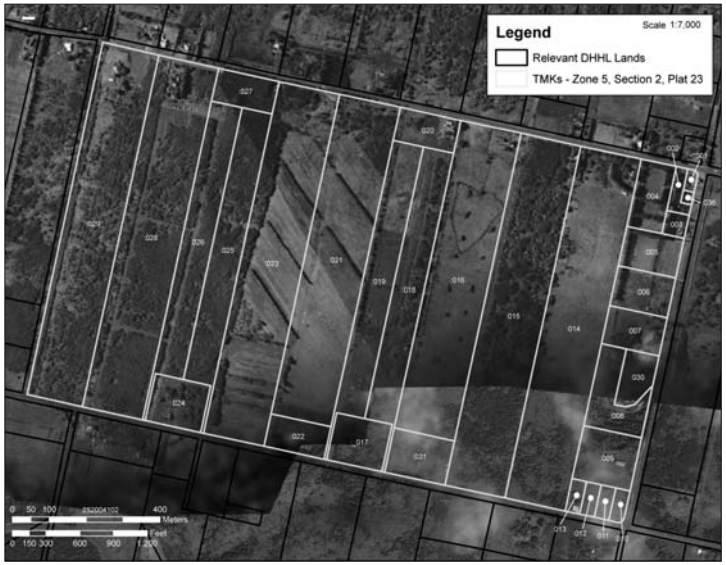
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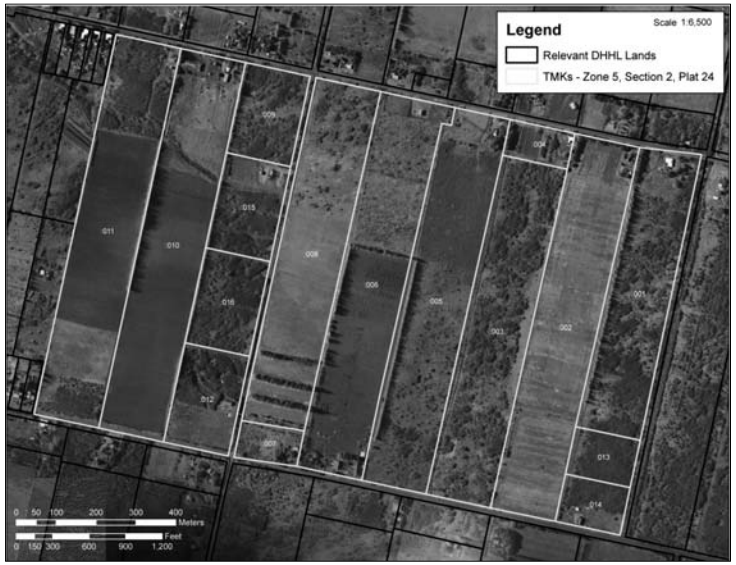
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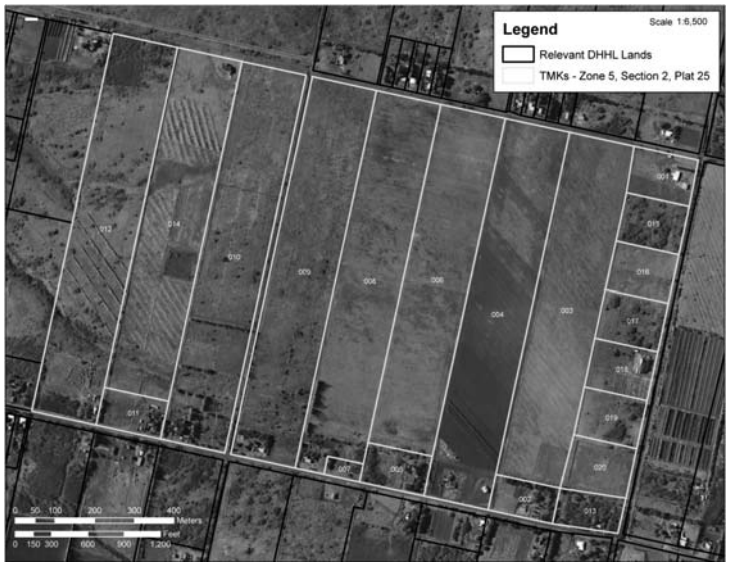
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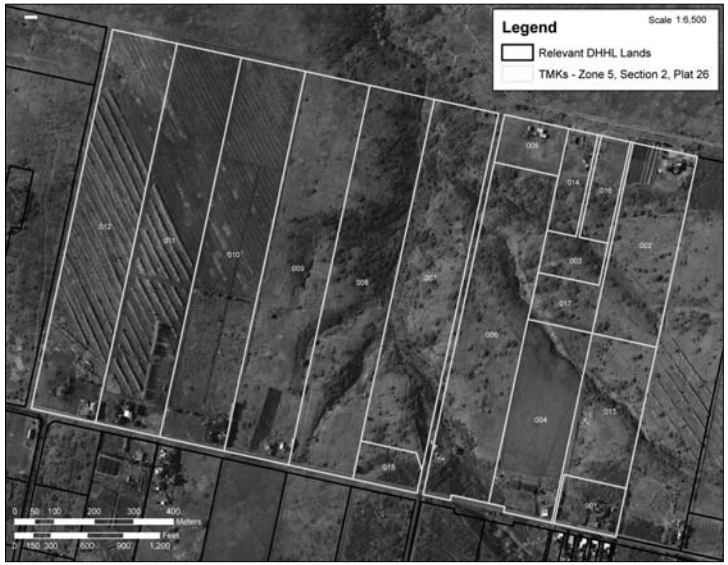
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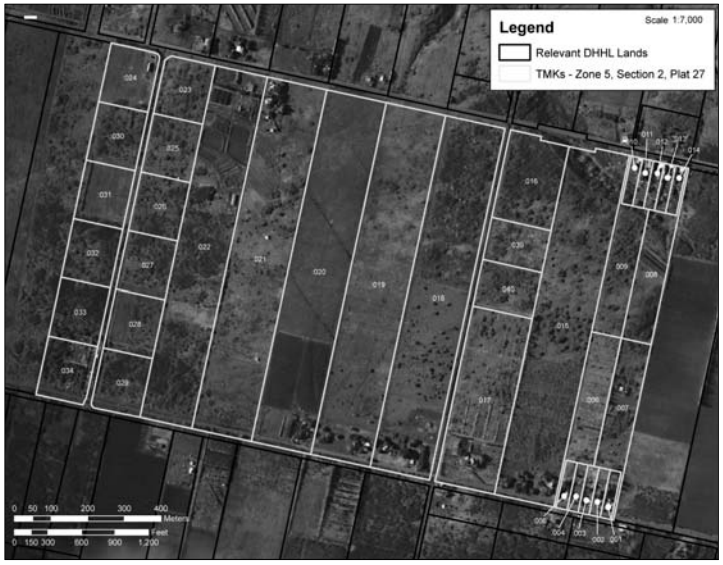
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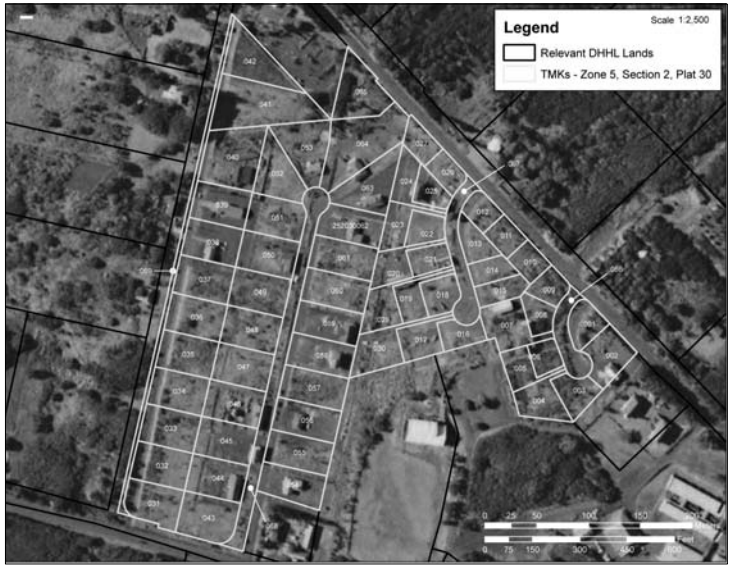
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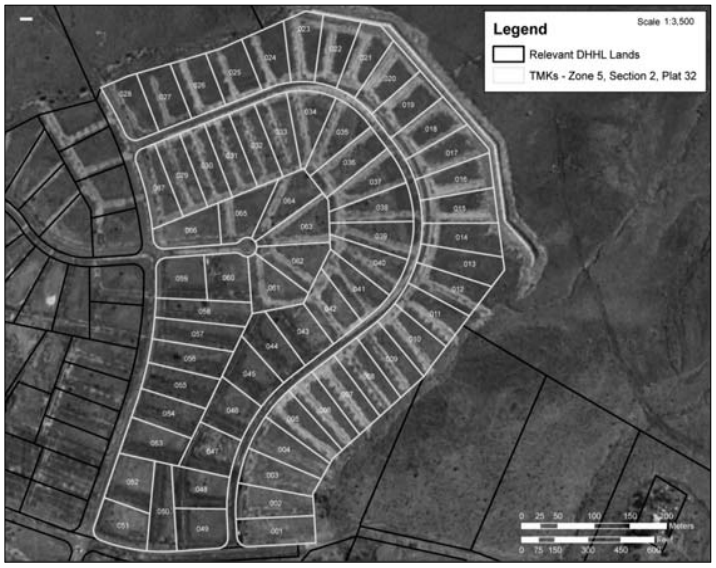
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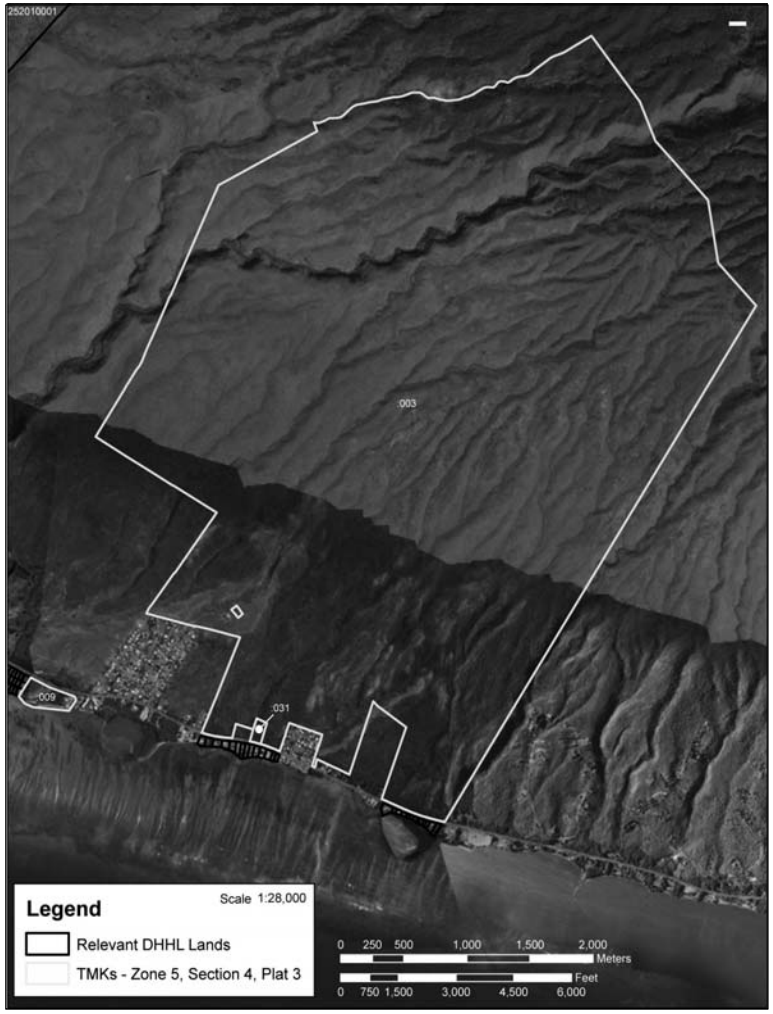
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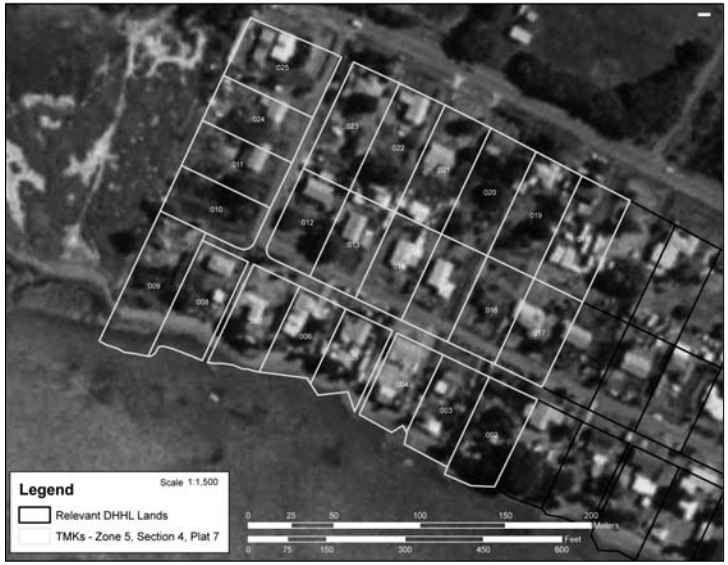
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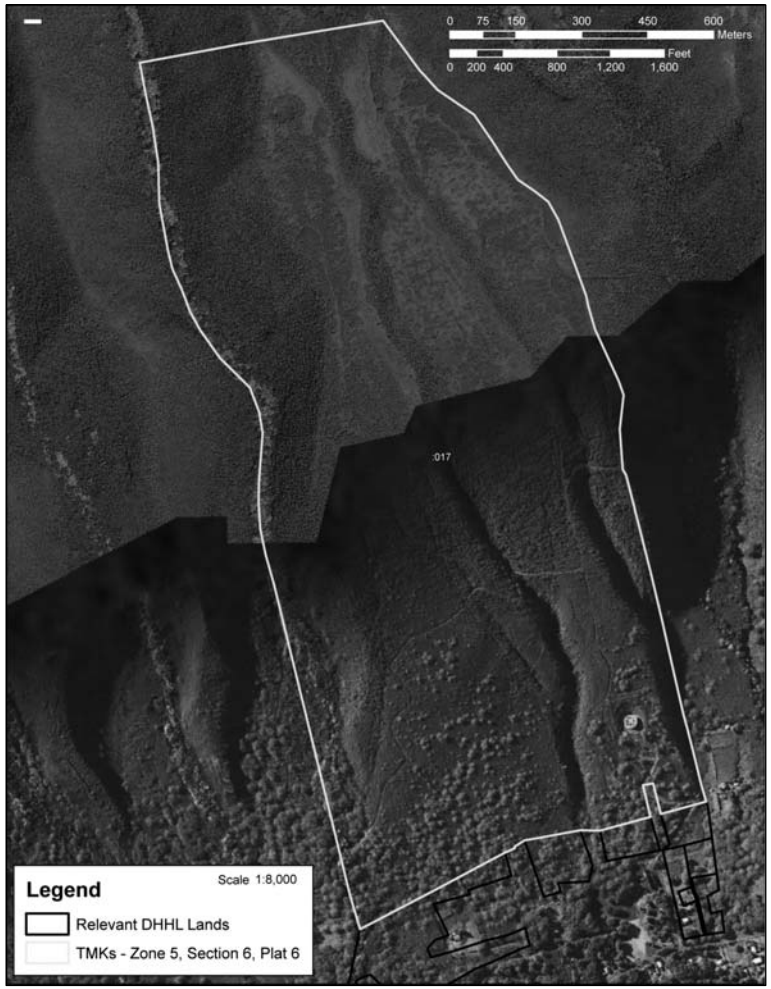
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APPENDIX B

United States Department of Agriculture

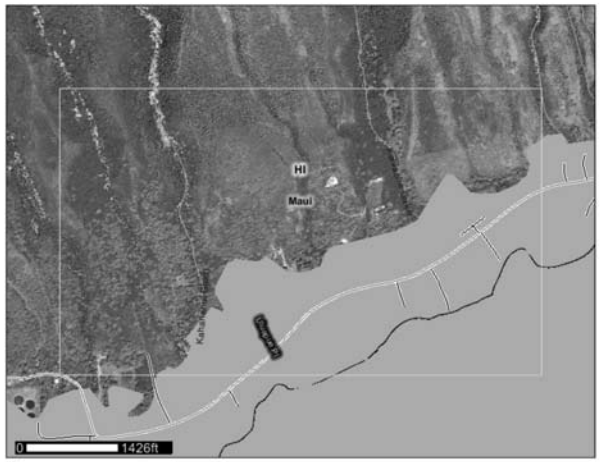
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Island of Molokai, Hawaii

Ualapu`e



April 17, 2011

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

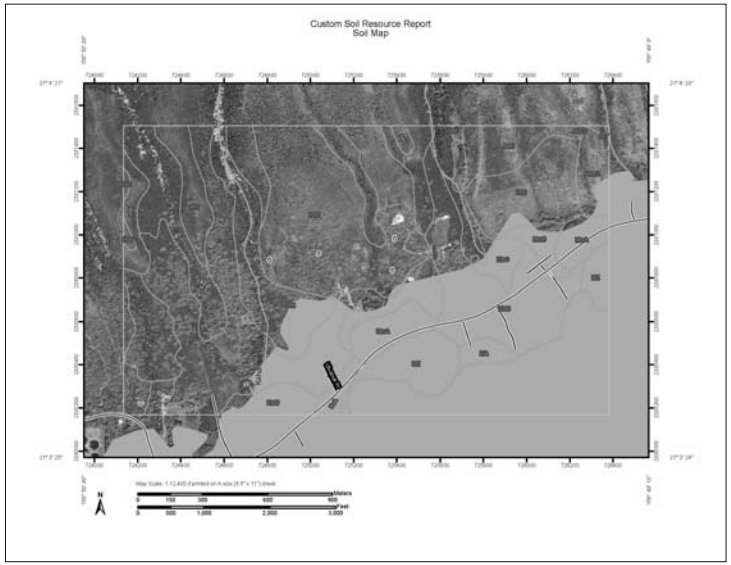
While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:12,400 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 4N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Island of Molokai, Hawaii
Survey Area Data: Version 6, Dec 31, 2006

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Island of Molokai, Hawaii (HI950)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AeE	Alaeloa silty clay, 15 to 35 percent slopes	17.4	2.3%
ALE3	Alaeloa silty clay, 15 to 35 percent slopes, severely eroded	0.4	0.1%
AME3	Alaeloa stony silty clay, 15 to 35 percent slopes, severely eroded	13.4	1.8%
HzE	Hoolehua silty clay, 15 to 35 percent slopes	159.6	21.5%
KlA	Kawaihapai clay loam, 0 to 2 percent slopes	6.3	0.8%
KlaB	Kawaihapai stony clay loam, 2 to 6 percent slopes	77.9	10.5%
KlbC	Kawaihapai very stony clay loam, 0 to 15 percent slopes	119.4	16.1%
MmA	Mala silty clay, 0 to 3 percent slopes	25.5	3.4%
MmB	Mala silty clay, 3 to 7 percent slopes	25.8	3.5%
MZ	Marsh	30.7	4.1%
PoaB	Pulehu stony sandy loam, 0 to 7 percent slopes	5.5	0.7%
PsA	Pulehu clay loam, 0 to 3 percent slopes	5.8	0.8%
rRK	Rock land	26.6	3.6%
rRT	Rough mountainous land	39.8	5.4%
rSM	Stony alluvial land	111.0	15.0%
Subtotals for Soil Survey Area		**665.1**	**89.6%**
Totals for Area of Interest		**742.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be

made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Island of Molokai, Hawaii

AeE—Alaeloa silty clay, 15 to 35 percent slopes

Map Unit Setting
Elevation: 100 to 1,500 feet
Mean annual precipitation: 35 to 60 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Alaeloa and similar soils: 100 percent

Description of Alaeloa

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Basic igneous rock

Properties and qualities
Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups
Land capability (nonirrigated): 6e

Typical profile
0 to 10 inches: Silty clay
10 to 18 inches: Silty clay
18 to 29 inches: Silty clay
29 to 48 inches: Silty clay
48 to 58 inches: Silty clay
58 to 70 inches: Stony silty clay

ALE3—Alaeloa silty clay, 15 to 35 percent slopes, severely eroded

Map Unit Setting
Elevation: 100 to 1,500 feet
Mean annual precipitation: 35 to 60 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Alaeloa and similar soils: 100 percent

Description of Alaeloa

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Basic igneous rock

Properties and qualities
Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.5 inches)

Interpretive groups
Land capability (nonirrigated): 7e

Typical profile
0 to 3 inches: Silty clay
3 to 7 inches: Silty clay
7 to 18 inches: Silty clay
18 to 37 inches: Silty clay
37 to 47 inches: Silty clay
47 to 60 inches: Stony silty clay

AME3—Alaeloa stony silty clay, 15 to 35 percent slopes, severely eroded

Map Unit Setting
Elevation: 100 to 1,500 feet
Mean annual precipitation: 35 to 60 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Alaeloa, stony, and similar soils: 100 percent

Description of Alaeloa, Stony

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Basic igneous rock

Properties and qualities
Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.5 inches)

Interpretive groups
Land capability (nonirrigated): 7e

Typical profile
0 to 3 inches: Stony silty clay
3 to 7 inches: Silty clay
7 to 18 inches: Silty clay
18 to 37 inches: Silty clay
37 to 47 inches: Silty clay
47 to 60 inches: Stony silty clay

HzE—Hoolehua silty clay, 15 to 35 percent slopes

Map Unit Setting
Elevation: 400 to 1,300 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Hoolehua and similar soils: 100 percent

Description of Hoolehua

Setting
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Side slope, tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium material

Properties and qualities
Slope: 15 to 35 percent
Depth to restrictive feature: 36 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Sodium adsorption ratio, maximum: 5.0
Available water capacity: Very low (about 2.1 inches)

Interpretive groups
Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e

Typical profile
0 to 9 inches: Silty clay
9 to 15 inches: Silty clay loam
15 to 21 inches: Silty clay
21 to 27 inches: Silty clay
27 to 36 inches: Silty clay
36 to 63 inches: Bedrock

KlA—Kawaihapai clay loam, 0 to 2 percent slopes

Map Unit Setting
Elevation: 0 to 300 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Kawaihapai and similar soils: 85 percent
Minor components: 15 percent

Description of Kawaihapai

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Basic igneous rock

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water capacity: Moderate (about 7.2 inches)

Interpretive groups
Land capability classification (irrigated): 1
Land capability (nonirrigated): 2c

Typical profile
0 to 22 inches: Clay loam
22 to 32 inches: Sandy loam
32 to 54 inches: Sand

Minor Components

Inclusion
Percent of map unit: 15 percent
Landform: Alluvial flats

KlaB—Kawaihapai stony clay loam, 2 to 6 percent slopes

Map Unit Setting
Elevation: 0 to 300 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Kawaihapai, stony, and similar soils: 100 percent

Description of Kawaihapai, Stony

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Basic igneous rock

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water capacity: Moderate (about 6.8 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 2e

Typical profile
0 to 22 inches: Stony clay loam
22 to 32 inches: Sandy loam
32 to 54 inches: Sand

KlbC—Kawaihapai very stony clay loam, 0 to 15 percent slopes

Map Unit Setting
Elevation: 0 to 300 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Kawaihapai, very stony, and similar soils: 100 percent

Description of Kawaihapai, Very Stony

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Basic igneous rock

Properties and qualities
Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water capacity: Moderate (about 6.4 inches)

Interpretive groups
Land capability classification (irrigated): 6s
Land capability (nonirrigated): 6s

Typical profile
0 to 22 inches: Very stony clay loam
22 to 32 inches: Sandy loam
32 to 54 inches: Sand

MmA—Mala silty clay, 0 to 3 percent slopes

Map Unit Setting
Elevation: 0 to 100 feet
Mean annual precipitation: 10 to 25 inches

Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Mala and similar soils: 100 percent

Description of Mala

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 99 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): 1
Land capability (nonirrigated): 6c

Typical profile
0 to 7 inches: Silty clay
7 to 40 inches: Stratified silty clay
40 to 60 inches: Sand

MmB—Mala silty clay, 3 to 7 percent slopes

Map Unit Setting
Elevation: 0 to 100 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Mala and similar soils: 100 percent

Description of Mala

Setting
Landform: Alluvial fans

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 99 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 6c

Typical profile
0 to 7 inches: Silty clay
7 to 40 inches: Stratified silty clay
40 to 60 inches: Sand

MZ—Marsh

Map Unit Setting
Elevation: 0 to 800 feet
Mean annual precipitation: 12 to 150 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Marsh and similar soils: 100 percent

Description of Marsh

Setting
Landform: Marshes
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Maximum salinity: Nonsaline to moderately saline (0.0 to 16.0 mmhos/cm)
Available water capacity: Very high (about 16.2 inches)

Interpretive groups
Land capability (nonirrigated): 8w

Typical profile
0 to 10 inches: Mucky peat
10 to 60 inches: Mucky peat

PoaB—Pulehu stony sandy loam, 0 to 7 percent slopes

Map Unit Setting
Elevation: 0 to 300 feet
Mean annual precipitation: 10 to 35 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Pulehu, stony, and similar soils: 100 percent

Description of Pulehu, Stony

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water capacity: Moderate (about 7.1 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 6s

Typical profile
0 to 21 inches: Stony sandy loam

21 to 60 inches: Silty clay loam

PsA—Pulehu clay loam, 0 to 3 percent slopes

Map Unit Setting
Elevation: 0 to 300 feet
Mean annual precipitation: 10 to 35 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Pulehu and similar soils: 100 percent

Description of Pulehu

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water capacity: Moderate (about 8.4 inches)

Interpretive groups
Land capability classification (irrigated): 1
Land capability (nonirrigated): 4c

Typical profile
0 to 21 inches: Clay loam
21 to 60 inches: Silty clay loam

rRK—Rock land

Map Unit Setting
Elevation: 0 to 6,000 feet
Mean annual precipitation: 15 to 60 inches
Mean annual air temperature: 57 to 75 degrees F

Frost-free period: 365 days

Map Unit Composition
Rock land and similar soils: 55 percent
Minor components: 45 percent

Description of Rock Land

Setting
Landform: Pahoehoe lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, riser, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Basalt

Properties and qualities
Slope: 40 to 70 percent
Depth to restrictive feature: 8 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.1 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 4 inches: Silty clay
4 to 8 inches: Silty clay
8 to 20 inches: Bedrock

Minor Components

Rock outcrop
Percent of map unit: 45 percent
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, tread, rise
Down-slope shape: Linear
Across-slope shape: Concave

rRT—Rough mountainous land

Map Unit Setting
Elevation: 0 to 6,000 feet
Mean annual air temperature: 57 to 72 degrees F
Frost-free period: 365 days

Map Unit Composition
Rough mountainous land and similar soils: 100 percent

Description of Rough Mountainous Land

Setting
Landform: Gulches
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium and colluvium

Properties and qualities
Slope: 50 to 99 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.2 inches)

Interpretive groups
Land capability (nonirrigated): 8e

Typical profile
0 to 5 inches: Silty clay loam
5 to 25 inches: Very cobbly clay loam
25 to 29 inches: Bedrock

rSM—Stony alluvial land

Map Unit Setting
Elevation: 0 to 1,000 feet
Mean annual precipitation: 10 to 50 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Stony alluvial land and similar soils: 100 percent

Description of Stony Alluvial Land

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Rise
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 10 inches: Extremely stony silty clay
10 to 60 inches: Silty clay loam

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United States Department of Agriculture

NRCS

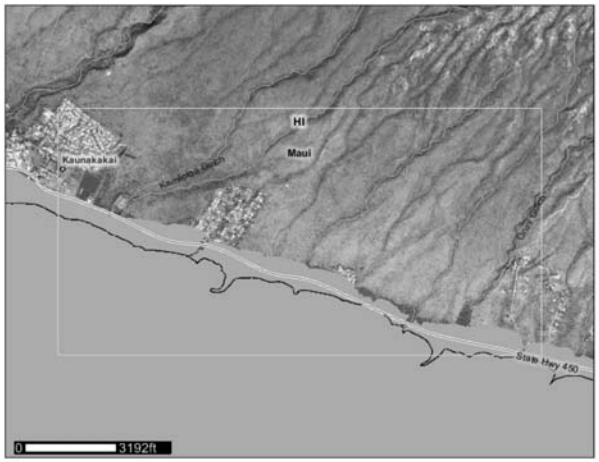
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Island of Molokai, Hawaii

Kapa'akea, Kaimiloloa, and Makakupa'ia



April 17, 2011

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

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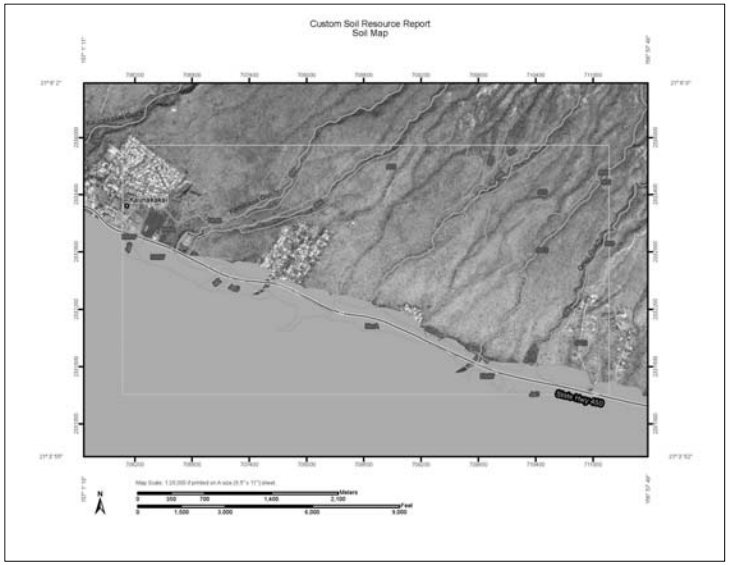

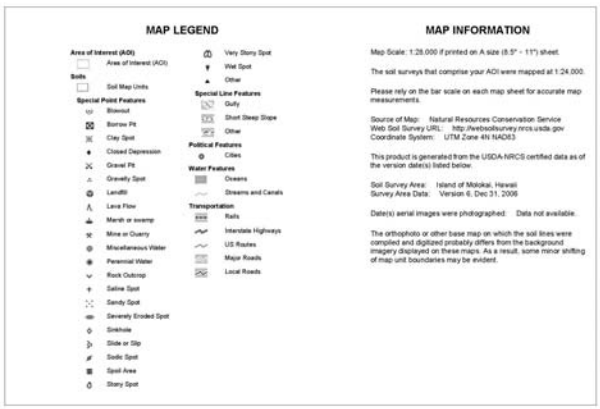

Map Unit Legend

Island of Molokai, Hawaii (HI950)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
JaC	Jaucas sand, 0 to 15 percent slopes	23.9	0.7%
KMW	Kealia silt loam	90.5	2.8%
MmA	Mala silty clay, 0 to 3 percent slopes	198.8	6.0%
MmB	Mala silty clay, 3 to 7 percent slopes	6.2	0.2%
MZ	Marsh	8.8	0.3%
rRK	Rock land	184.2	5.6%
rVS	Very stony land	264.7	8.0%
rVT2	Very stony land, eroded	1,695.5	51.5%
Subtotals for Soil Survey Area		**2,472.6**	**75.1%**
Totals for Area of Interest		**3,290.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been

observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Island of Molokai, Hawaii

JaC—Jaucas sand, 0 to 15 percent slopes

Map Unit Setting
Elevation: 0 to 100 feet
Mean annual precipitation: 10 to 50 inches
Mean annual air temperature: 73 to 77 degrees F
Frost-free period: 365 days

Map Unit Composition
Jaucas and similar soils: 100 percent

Description of Jaucas

Setting
Landform: Beaches
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Sand

Properties and qualities
Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 99 percent
Available water capacity: Low (about 3.5 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 13 inches: Sand
13 to 60 inches: Sand

KMW—Kealia silt loam

Map Unit Setting
Elevation: 0 to 10 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Kealia and similar soils: 45 percent
Kealia, deep water table and similar soils: 35 percent
Minor components: 20 percent

Description of Kealia

Setting
Landform: Salt marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 5.95 in/hr)
Depth to water table: About 12 to 42 inches
Frequency of flooding: Frequent
Frequency of ponding: Occasional
Maximum salinity: Moderately saline to strongly saline (16.0 to 32.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability (nonirrigated): 7w

Typical profile
0 to 3 inches: Silt loam
3 to 19 inches: Loam
19 to 63 inches: Fine sandy loam

Description of Kealia, Deep Water Table

Setting
Landform: Salt marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 5.95 in/hr)
Depth to water table: About 60 inches
Frequency of flooding: Occasional
Frequency of ponding: Occasional
Maximum salinity: Moderately saline to strongly saline (16.0 to 32.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Typical profile
0 to 3 inches: Silt loam
3 to 19 inches: Loam
19 to 63 inches: Fine sandy loam

Minor Components

Salt marsh
Percent of map unit: 20 percent
Landform: Salt marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave

MmA—Mala silty clay, 0 to 3 percent slopes

Map Unit Setting
Elevation: 0 to 100 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Mala and similar soils: 100 percent

Description of Mala

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 99 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): 1
Land capability (nonirrigated): 6c

Typical profile
0 to 7 inches: Silty clay
7 to 40 inches: Stratified silty clay
40 to 60 inches: Sand

MmB—Mala silty clay, 3 to 7 percent slopes

Map Unit Setting
Elevation: 0 to 100 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Mala and similar soils: 100 percent

Description of Mala

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 99 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 6c

Typical profile
0 to 7 inches: Silty clay
7 to 40 inches: Stratified silty clay
40 to 60 inches: Sand

MZ—Marsh

Map Unit Setting
Elevation: 0 to 800 feet
Mean annual precipitation: 12 to 150 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Marsh and similar soils: 100 percent

Description of Marsh

Setting
Landform: Marshes
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Maximum salinity: Nonsaline to moderately saline (0.0 to 16.0 mmhos/cm)
Available water capacity: Very high (about 16.2 inches)

Interpretive groups
Land capability (nonirrigated): 8w

Typical profile
0 to 10 inches: Mucky peat
10 to 60 inches: Mucky peat

rRK—Rock land

Map Unit Setting
Elevation: 0 to 6,000 feet
Mean annual precipitation: 15 to 60 inches
Mean annual air temperature: 57 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Rock land and similar soils: 55 percent
Minor components: 45 percent

Description of Rock Land

Setting
Landform: Pahoehoe lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, riser, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Basalt

Properties and qualities
Slope: 40 to 70 percent
Depth to restrictive feature: 8 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.1 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 4 inches: Silty clay
4 to 8 inches: Silty clay
8 to 20 inches: Bedrock

Minor Components

Rock outcrop
Percent of map unit: 45 percent
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, tread, rise
Down-slope shape: Linear
Across-slope shape: Concave

rVS—Very stony land

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Very stony land and similar soils: 100 percent

Description of Very Stony Land

Setting
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Aa lava and volcanic ash

Properties and qualities
Slope: 7 to 30 percent
Depth to restrictive feature: 0 to 10 inches to paralithic bedrock; 0 to 35 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0.5 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 5 inches: Extremely stony silty clay
5 to 9 inches: Bedrock

rVT2—Very stony land, eroded

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Very stony land, eroded, eroded, and similar soils: 100 percent

Description of Very Stony Land, Eroded, Eroded

Setting
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Aa lava and volcanic ash

Properties and qualities

Slope: 7 to 30 percent
Depth to restrictive feature: 5 to 35 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Land capability (nonirrigated): 7s

Typical profile

0 to 10 inches: Extremely stony silty clay loam
10 to 30 inches: Extremely stony silty clay loam
30 to 40 inches: Bedrock

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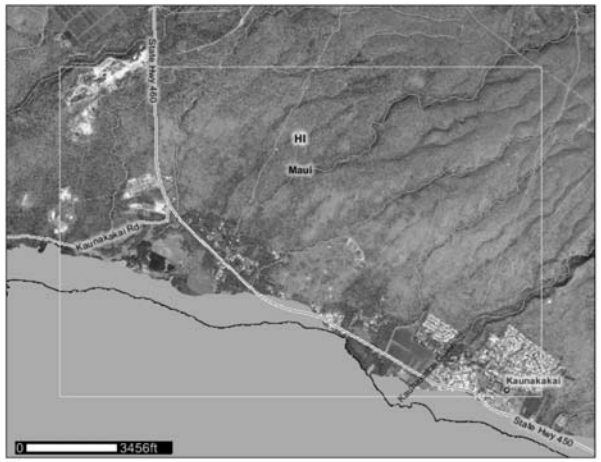
USDA United States Department of Agriculture

NRCS Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Island of Molokai, Hawaii

Kalama`ula



April 17, 2011

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

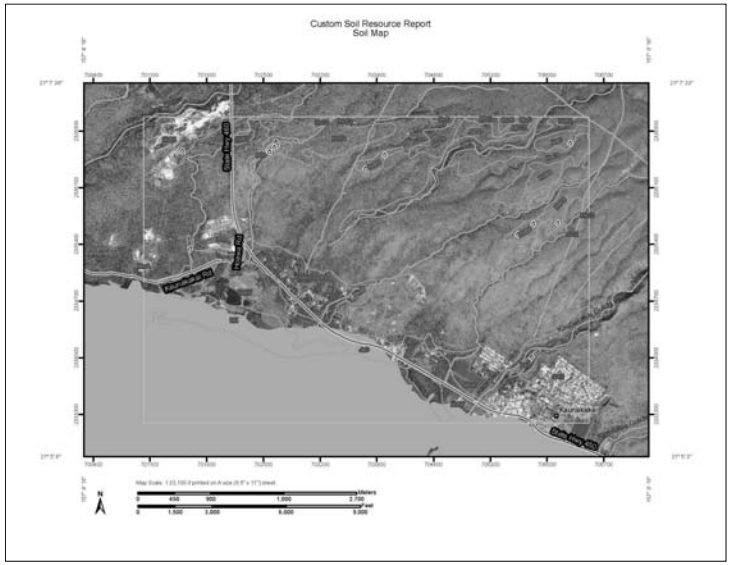
While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


Custom Soil Resource Report
Soil Map


Custom Soil Resource Report
MAP LEGEND
MAP INFORMATION
Area of Interest (AOI)
Area of Interest (AOI)
Soils
Soil Map Units
Special Point Features
Blowout
Borrow Pit
Clay Spot
Closed Depression
Gravel Pit
Gravelly Spot
Landfill
Lava Flow
Marsh or swamp
Mine or Quarry
Miscellaneous Water
Perennial Water
Rock Outcrop
Saline Spot
Sandy Spot
Severely Eroded Spot
Sinkhole
Slide or Slip
Sodic Spot
Spoil Area
Stony Spot
Very Stony Spot
Wet Spot
Other
Special Line Features
Gully
Short Steep Slope
Other
Political Features
Cities
Water Features
Oceans
Streams and Canals
Transportation
Rails
Interstate Highways
US Routes
Major Roads
Local Roads
Map Scale: 1:33,100 if printed on A size (8.5" × 11") sheet.
The soil surveys that comprise your AOI were mapped at 1:24,000.
Please rely on the bar scale on each map sheet for accurate map measurements.
Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 4N NAD83
This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.
Soil Survey Area: Island of Molokai, Hawaii
Survey Area Data: Version 6, Dec 31, 2006
Date(s) aerial images were photographed: Data not available.
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Island of Molokai, Hawaii (HI950)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
HvB3	Holomua silt loam, 3 to 7 percent slopes, severely eroded	325.2	6.3%
HvC	Holomua silt loam, 7 to 15 percent slopes	31.5	0.6%
HvC3	Holomua silt loam, 7 to 15 percent slopes, severely eroded	205.2	4.0%
JaC	Jaucas sand, 0 to 15 percent slopes	30.2	0.6%
KMW	Kealia silt loam	351.0	6.8%
MmA	Mala silty clay, 0 to 3 percent slopes	361.8	7.0%
MmB	Mala silty clay, 3 to 7 percent slopes	18.5	0.4%
MuB	Molokai silty clay loam, 3 to 7 percent slopes	8.3	0.2%
MuC	Molokai silty clay loam, 7 to 15 percent slopes	2.0	0.0%
MuC3	Molokai silty clay loam, 7 to 15 percent slopes, severely eroded	19.1	0.4%
MZ	Marsh	230.3	4.5%
PsA	Pulehu clay loam, 0 to 3 percent slopes	7.3	0.1%
rRK	Rock land	110.3	2.1%
rRO	Rock outcrop	56.1	1.1%
rVT2	Very stony land, eroded	2,563.4	49.9%
W	Water > 40 acres	0.6	0.0%
Subtotals for Soil Survey Area		**4,320.6**	**84.1%**
Totals for Area of Interest		**5,134.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic

classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar

interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Island of Molokai, Hawaii

HvB3—Holomua silt loam, 3 to 7 percent slopes, severely eroded

Map Unit Setting
Elevation: 100 to 1,000 feet
Mean annual precipitation: 15 to 20 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Holomua and similar soils: 100 percent

Description of Holomua

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 6e

Typical profile
0 to 3 inches: Silt loam
3 to 14 inches: Silt loam
14 to 20 inches: Silty clay loam
20 to 31 inches: Silty clay loam
31 to 37 inches: Silty clay loam
37 to 47 inches: Silty clay loam
47 to 59 inches: Silty clay loam

HvC—Holomua silt loam, 7 to 15 percent slopes

Map Unit Setting
Elevation: 100 to 1,000 feet

Mean annual precipitation: 15 to 20 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Holomua and similar soils: 100 percent

Description of Holomua

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Moderate (about 7.8 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 6e

Typical profile
0 to 2 inches: Silt loam
2 to 9 inches: Silt loam
9 to 20 inches: Silt loam
20 to 26 inches: Silty clay loam
26 to 37 inches: Silty clay loam
37 to 43 inches: Silty clay loam
43 to 53 inches: Silty clay loam
53 to 65 inches: Silty clay loam

HvC3—Holomua silt loam, 7 to 15 percent slopes, severely eroded

Map Unit Setting
Elevation: 100 to 1,000 feet
Mean annual precipitation: 15 to 20 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Holomua and similar soils: 100 percent

Description of Holomua

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 6e

Typical profile
0 to 3 inches: Silt loam
3 to 14 inches: Silt loam
14 to 20 inches: Silty clay loam
20 to 31 inches: Silty clay loam
31 to 37 inches: Silty clay loam
37 to 47 inches: Silty clay loam
47 to 59 inches: Silty clay loam

JaC—Jaucas sand, 0 to 15 percent slopes

Map Unit Setting
Elevation: 0 to 100 feet
Mean annual precipitation: 10 to 50 inches
Mean annual air temperature: 73 to 77 degrees F
Frost-free period: 365 days

Map Unit Composition
Jaucas and similar soils: 100 percent

Description of Jaucas

Setting
Landform: Beaches
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear

Across-slope shape: Convex
Parent material: Sand

Properties and qualities
Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 99 percent
Available water capacity: Low (about 3.5 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 13 inches: Sand
13 to 60 inches: Sand

KMW—Kealia silt loam

Map Unit Setting
Elevation: 0 to 10 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Kealia and similar soils: 45 percent
Kealia, deep water table and similar soils: 35 percent
Minor components: 20 percent

Description of Kealia

Setting
Landform: Salt marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 5.95 in/hr)
Depth to water table: About 12 to 42 inches
Frequency of flooding: Frequent

Frequency of ponding: Occasional
Maximum salinity: Moderately saline to strongly saline (16.0 to 32.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability (nonirrigated): 7w

Typical profile
0 to 3 inches: Silt loam
3 to 19 inches: Loam
19 to 63 inches: Fine sandy loam

Description of Kealia, Deep Water Table

Setting
Landform: Salt marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 5.95 in/hr)
Depth to water table: About 60 inches
Frequency of flooding: Occasional
Frequency of ponding: Occasional
Maximum salinity: Moderately saline to strongly saline (16.0 to 32.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Typical profile
0 to 3 inches: Silt loam
3 to 19 inches: Loam
19 to 63 inches: Fine sandy loam

Minor Components

Salt marsh
Percent of map unit: 20 percent
Landform: Salt marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave

MmA—Mala silty clay, 0 to 3 percent slopes

Map Unit Setting
Elevation: 0 to 100 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Mala and similar soils: 100 percent

Description of Mala

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 99 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): 1
Land capability (nonirrigated): 6c

Typical profile
0 to 7 inches: Silty clay
7 to 40 inches: Stratified silty clay
40 to 60 inches: Sand

MmB—Mala silty clay, 3 to 7 percent slopes

Map Unit Setting
Elevation: 0 to 100 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Mala and similar soils: 100 percent

Description of Mala

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 99 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 6c

Typical profile
0 to 7 inches: Silty clay
7 to 40 inches: Stratified silty clay
40 to 60 inches: Sand

MuB—Molokai silty clay loam, 3 to 7 percent slopes

Map Unit Setting
Elevation: 0 to 1,500 feet

Mean annual precipitation: 20 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Molokai and similar soils: 100 percent

Description of Molokai

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 7.0
Available water capacity: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 4c

Typical profile
0 to 15 inches: Silty clay loam
15 to 72 inches: Silty clay loam

MuC—Molokai silty clay loam, 7 to 15 percent slopes

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 20 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Molokai and similar soils: 100 percent

Description of Molokai

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise

Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 7.0
Available water capacity: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 4e

Typical profile
0 to 15 inches: Silty clay loam
15 to 72 inches: Silty clay loam

MuC3—Molokai silty clay loam, 7 to 15 percent slopes, severely eroded

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 20 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Molokai and similar soils: 100 percent

Description of Molokai

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 7.0
Available water capacity: Moderate (about 7.1 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 6e

Typical profile
0 to 6 inches: Silty clay loam
6 to 60 inches: Silty clay loam

MZ—Marsh

Map Unit Setting
Elevation: 0 to 800 feet
Mean annual precipitation: 12 to 150 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Marsh and similar soils: 100 percent

Description of Marsh

Setting
Landform: Marshes
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Maximum salinity: Nonsaline to moderately saline (0.0 to 16.0 mmhos/cm)
Available water capacity: Very high (about 16.2 inches)

Interpretive groups
Land capability (nonirrigated): 8w

Typical profile
0 to 10 inches: Mucky peat
10 to 60 inches: Mucky peat

PsA—Pulehu clay loam, 0 to 3 percent slopes

Map Unit Setting
Elevation: 0 to 300 feet
Mean annual precipitation: 10 to 35 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Pulehu and similar soils: 100 percent

Description of Pulehu

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water capacity: Moderate (about 8.4 inches)

Interpretive groups
Land capability classification (irrigated): 1
Land capability (nonirrigated): 4c

Typical profile
0 to 21 inches: Clay loam
21 to 60 inches: Silty clay loam

rRK—Rock land

Map Unit Setting
Elevation: 0 to 6,000 feet
Mean annual precipitation: 15 to 60 inches
Mean annual air temperature: 57 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Rock land and similar soils: 55 percent
Minor components: 45 percent

Description of Rock Land

Setting
Landform: Pahoehoe lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, riser, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Basalt

Properties and qualities
Slope: 40 to 70 percent
Depth to restrictive feature: 8 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.1 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 4 inches: Silty clay
4 to 8 inches: Silty clay
8 to 20 inches: Bedrock

Minor Components

Rock outcrop
Percent of map unit: 45 percent
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, tread, rise
Down-slope shape: Linear
Across-slope shape: Concave

rRO—Rock outcrop

Map Unit Setting
Elevation: 0 to 10,000 feet
Mean annual precipitation: 10 to 175 inches
Mean annual air temperature: 45 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Rock outcrop: 100 percent

Description of Rock Outcrop

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Basalt

Properties and qualities
Slope: 5 to 99 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups
Land capability (nonirrigated): 8s

Typical profile
0 to 60 inches: Bedrock

rVT2—Very stony land, eroded

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Very stony land, eroded, eroded, and similar soils: 100 percent

Description of Very Stony Land, Eroded, Eroded

Setting
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Aa lava and volcanic ash

Properties and qualities
Slope: 7 to 30 percent
Depth to restrictive feature: 5 to 35 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 10 inches: Extremely stony silty clay loam
10 to 30 inches: Extremely stony silty clay loam
30 to 40 inches: Bedrock

W—Water > 40 acres

Map Unit Setting
Frost-free period: 365 days

Map Unit Composition
Water > 40 acres: 100 percent

Description of Water > 40 Acres

Properties and qualities
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

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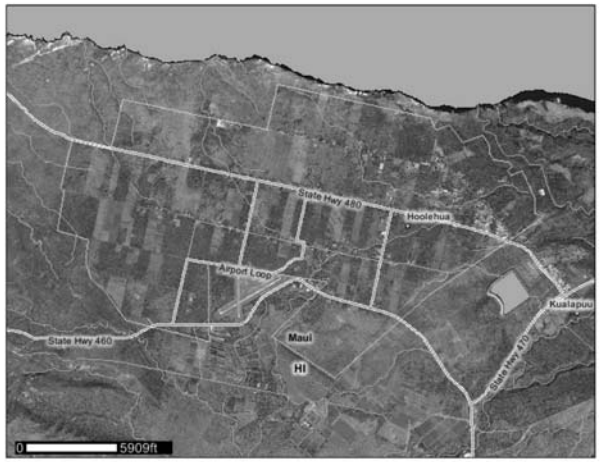
USDA United States Department of Agriculture
NRCS Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Island of Molokai, Hawaii

Ho`olehua



April 17, 2011

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

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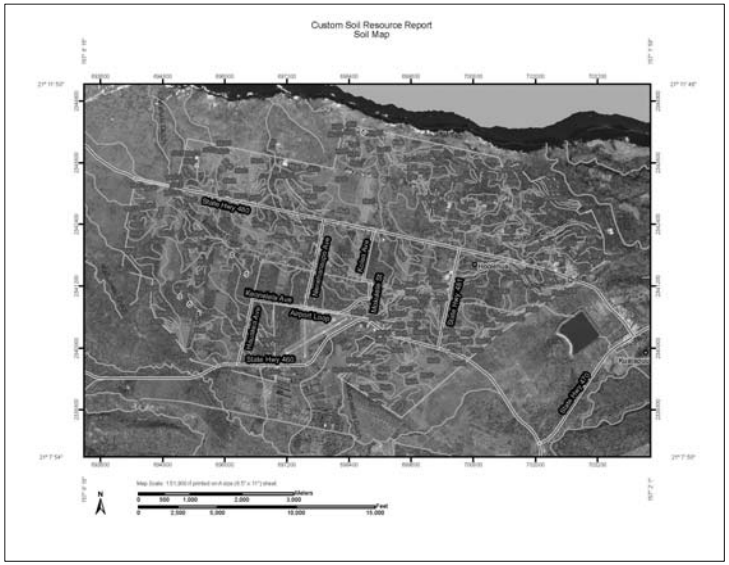

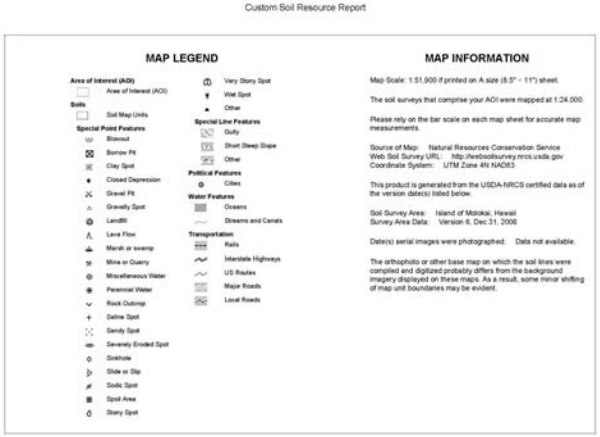

Map Unit Legend

Island of Molokai, Hawaii (HI950)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
GL	Gullied land	5.4	0.1%
HvA	Holomua silt loam, 0 to 3 percent slopes	238.2	3.0%
HvB	Holomua silt loam, 3 to 7 percent slopes	246.5	3.1%
HvC	Holomua silt loam, 7 to 15 percent slopes	54.8	0.7%
HvC3	Holomua silt loam, 7 to 15 percent slopes, severely eroded	30.2	0.4%
HyB3	Hoolehua silty clay loam, 3 to 10 percent slopes, severely eroded	8.4	0.1%
HzA	Hoolehua silty clay, 0 to 3 percent slopes	232.4	2.9%
HzB	Hoolehua silty clay, 3 to 7 percent slopes	300.1	3.8%
HzC	Hoolehua silty clay, 7 to 15 percent slopes	59.4	0.8%
KcB	Kalae silty clay, 2 to 7 percent slopes	210.1	2.7%
KcC	Kalae silty clay, 7 to 15 percent slopes	47.4	0.6%
KcC3	Kalae silty clay, 5-15 percent slopes, severely eroded	18.9	0.2%
KcD3	Kalae silty clay, 15 to 25 percent slopes, severely eroded	49.6	0.6%
KlcB	Kawaihapai silty clay loam, 2 to 7 percent slopes	14.9	0.2%
LaA	Lahaina silty clay, 0 to 3 percent slopes	381.3	4.8%
LaB	Lahaina silty clay, 3 to 7 percent slopes	640.4	8.1%
LaC	Lahaina silty clay, 7 to 15 percent slopes	239.6	3.0%
LaC3	Lahaina silty clay, 7 to 15 percent slopes, severely eroded	30.6	0.4%
LaD3	Lahaina silty clay, 15 to 25 percent slopes, severely eroded	42.8	0.5%
LaE3	Lahaina silty clay, 25 to 40 percent slopes, severely eroded	112.7	1.4%
MuA	Molokai silty clay loam, 0 to 3 percent slopes	1,603.8	20.3%
MuB	Molokai silty clay loam, 3 to 7 percent slopes	2,158.2	27.3%
MuB3	Molokai silty clay loam, 3 to 7 percent slopes, severely eroded	17.5	0.2%
MuC	Molokai silty clay loam, 7 to 15 percent slopes	560.5	7.1%
MuC3	Molokai silty clay loam, 7 to 15 percent slopes, severely eroded	113.4	1.4%
MvD3	Molokai silty clay loam, shallow variant, 15 to 25 percent slopes, severely eroded	250.4	3.2%
rRK	Rock land	5.8	0.1%
rRR	Rough broken land	98.0	1.2%

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Island of Molokai, Hawaii (HI950)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
rVT2	Very stony land, eroded	23.0	0.3%
WoB	Waihuna clay, 3 to 7 percent slopes	19.6	0.2%
WrB	Waikapu silty clay loam, 3 to 7 percent slopes	96.1	1.2%
WrC3	Waikapu silty clay loam, 7 to 15 percent slopes, severely eroded	1.2	0.0%
Totals for Area of Interest		7,911.0	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Island of Molokai, Hawaii

GL—Gullied land

Map Unit Setting
Elevation: 0 to 1,200 feet
Mean annual precipitation: 20 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Gullied land: 100 percent

Description of Gullied Land

Setting
Landform: V-shaped valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Head slope
Down-slope shape: Linear
Across-slope shape: Convex

Interpretive groups
Land capability (nonirrigated): 7e

Typical profile
0 to 60 inches: Silty clay loam

HvA—Holomua silt loam, 0 to 3 percent slopes

Map Unit Setting
Elevation: 100 to 1,000 feet
Mean annual precipitation: 15 to 20 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Holomua and similar soils: 100 percent

Description of Holomua

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Moderate (about 7.8 inches)

Interpretive groups
Land capability classification (irrigated): 1
Land capability (nonirrigated): 6c

Typical profile
0 to 2 inches: Silt loam
2 to 9 inches: Silt loam
9 to 20 inches: Silt loam
20 to 26 inches: Silty clay loam
26 to 37 inches: Silty clay loam
37 to 43 inches: Silty clay loam
43 to 53 inches: Silty clay loam
53 to 65 inches: Silty clay loam

HvB—Holomua silt loam, 3 to 7 percent slopes

Map Unit Setting
Elevation: 100 to 1,000 feet
Mean annual precipitation: 15 to 20 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Holomua and similar soils: 100 percent

Description of Holomua

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0

Available water capacity: Moderate (about 7.8 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 6c

Typical profile
0 to 2 inches: Silt loam
2 to 9 inches: Silt loam
9 to 20 inches: Silt loam
20 to 26 inches: Silty clay loam
26 to 37 inches: Silty clay loam
37 to 43 inches: Silty clay loam
43 to 53 inches: Silty clay loam
53 to 65 inches: Silty clay loam

HvC—Holomua silt loam, 7 to 15 percent slopes

Map Unit Setting
Elevation: 100 to 1,000 feet
Mean annual precipitation: 15 to 20 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Holomua and similar soils: 100 percent

Description of Holomua

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Moderate (about 7.8 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 6e

Typical profile
0 to 2 inches: Silt loam
2 to 9 inches: Silt loam
9 to 20 inches: Silt loam
20 to 26 inches: Silty clay loam
26 to 37 inches: Silty clay loam
37 to 43 inches: Silty clay loam
43 to 53 inches: Silty clay loam
53 to 65 inches: Silty clay loam

HvC3—Holomua silt loam, 7 to 15 percent slopes, severely eroded

Map Unit Setting
Elevation: 100 to 1,000 feet
Mean annual precipitation: 15 to 20 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Holomua and similar soils: 100 percent

Description of Holomua

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 6e

Typical profile
0 to 3 inches: Silt loam
3 to 14 inches: Silt loam
14 to 20 inches: Silty clay loam
20 to 31 inches: Silty clay loam
31 to 37 inches: Silty clay loam

37 to 47 inches: Silty clay loam
47 to 59 inches: Silty clay loam

HyB3—Hoolehua silty clay loam, 3 to 10 percent slopes, severely eroded

Map Unit Setting
Elevation: 400 to 1,300 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Hoolehua and similar soils: 100 percent

Description of Hoolehua

Setting
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Side slope, tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium material

Properties and qualities
Slope: 3 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Low (about 3.2 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 3c

Typical profile
0 to 3 inches: Silty clay loam
3 to 5 inches: Silty clay loam
5 to 11 inches: Silty clay loam
11 to 33 inches: Silty clay
33 to 60 inches: Silty clay

HzA—Hoolehua silty clay, 0 to 3 percent slopes

Map Unit Setting
Elevation: 400 to 1,300 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Hoolehua and similar soils: 100 percent

Description of Hoolehua

Setting
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Side slope, tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium material

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Low (about 3.2 inches)

Interpretive groups
Land capability classification (irrigated): 1
Land capability (nonirrigated): 3c

Typical profile
0 to 9 inches: Silty clay
9 to 15 inches: Silty clay
15 to 21 inches: Silty clay loam
21 to 27 inches: Silty clay
27 to 48 inches: Silty clay
48 to 63 inches: Silty clay

HzB—Hoolehua silty clay, 3 to 7 percent slopes

Map Unit Setting
Elevation: 400 to 1,300 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Hoolehua and similar soils: 100 percent

Description of Hoolehua

Setting
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Side slope, tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium material

Properties and qualities
Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Low (about 3.2 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 3c

Typical profile
0 to 9 inches: Silty clay
9 to 15 inches: Silty clay
15 to 21 inches: Silty clay loam
21 to 27 inches: Silty clay
27 to 48 inches: Silty clay
48 to 63 inches: Silty clay

HzC—Hoolehua silty clay, 7 to 15 percent slopes

Map Unit Setting
Elevation: 400 to 1,300 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Hoolehua and similar soils: 100 percent

Description of Hoolehua

Setting
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Side slope, tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium material

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Low (about 3.2 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 3e

Typical profile
0 to 9 inches: Silty clay
9 to 15 inches: Silty clay
15 to 21 inches: Silty clay loam
21 to 27 inches: Silty clay
27 to 48 inches: Silty clay
48 to 63 inches: Silty clay

KcB—Kalae silty clay, 2 to 7 percent slopes

Map Unit Setting
Elevation: 750 to 2,200 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 68 to 72 degrees F
Frost-free period: 365 days

Map Unit Composition
Kalae and similar soils: 100 percent

Description of Kalae

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Andesite and alluvium influenced by volcanic ash

Properties and qualities
Slope: 2 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Low (about 4.8 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 3c

Typical profile
0 to 9 inches: Silty clay
9 to 15 inches: Silty clay
15 to 26 inches: Silty clay
26 to 41 inches: Silty clay
41 to 52 inches: Silt loam
52 to 61 inches: Silt loam
61 to 66 inches: Silt loam

KcC—Kalae silty clay, 7 to 15 percent slopes

Map Unit Setting
Elevation: 750 to 2,200 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 68 to 72 degrees F
Frost-free period: 365 days

Map Unit Composition
Kalae and similar soils: 100 percent

Description of Kalae

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Andesite and alluvium influenced by volcanic ash

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Low (about 4.8 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 3e

Typical profile
0 to 9 inches: Silty clay
9 to 15 inches: Silty clay
15 to 26 inches: Silty clay
26 to 41 inches: Silty clay
41 to 52 inches: Silt loam
52 to 61 inches: Silt loam
61 to 66 inches: Silt loam

KcC3—Kalae silty clay, 5-15 percent slopes, severely eroded

Map Unit Setting
Elevation: 750 to 2,200 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 68 to 72 degrees F
Frost-free period: 365 days

Map Unit Composition
Kalae and similar soils: 100 percent

Description of Kalae

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Andesite and alluvium influenced by volcanic ash

Properties and qualities
Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Low (about 3.9 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 4e

Typical profile
0 to 4 inches: Silty clay
4 to 10 inches: Silty clay
10 to 25 inches: Silty clay
25 to 37 inches: Silt loam
37 to 46 inches: Silt loam
46 to 60 inches: Silt loam

KcD3—Kalae silty clay, 15 to 25 percent slopes, severely eroded

Map Unit Setting
Elevation: 750 to 2,200 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 68 to 72 degrees F
Frost-free period: 365 days

Map Unit Composition
Kalae and similar soils: 100 percent

Description of Kalae

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Andesite and alluvium influenced by volcanic ash

Properties and qualities
Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Low (about 3.9 inches)

Interpretive groups
Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e

Typical profile
0 to 4 inches: Silty clay
4 to 10 inches: Silty clay
10 to 25 inches: Silty clay
25 to 37 inches: Silt loam
37 to 46 inches: Silt loam
46 to 60 inches: Silt loam

KlcB—Kawaihapai silty clay loam, 2 to 7 percent slopes

Map Unit Setting
Elevation: 0 to 300 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Kawaihapai and similar soils: 100 percent

Description of Kawaihapai

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Basic igneous rock

Properties and qualities
Slope: 2 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water capacity: Moderate (about 7.2 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 2e

Typical profile
0 to 22 inches: Silty clay loam
22 to 32 inches: Sandy loam
32 to 54 inches: Sand

LaA—Lahaina silty clay, 0 to 3 percent slopes

Map Unit Setting
Elevation: 10 to 1,500 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 75 degrees F

Frost-free period: 365 days

Map Unit Composition
Lahaina and similar soils: 100 percent

Description of Lahaina

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): 1
Land capability (nonirrigated): 3c

Typical profile
0 to 15 inches: Silty clay
15 to 31 inches: Silty clay
31 to 60 inches: Silty clay

LaB—Lahaina silty clay, 3 to 7 percent slopes

Map Unit Setting
Elevation: 10 to 1,500 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Lahaina and similar soils: 100 percent

Description of Lahaina

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium

Properties and qualities
Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 3c

Typical profile
0 to 15 inches: Silty clay
15 to 31 inches: Silty clay
31 to 60 inches: Silty clay

LaC—Lahaina silty clay, 7 to 15 percent slopes

Map Unit Setting
Elevation: 10 to 1,500 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Lahaina and similar soils: 100 percent

Description of Lahaina

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 3e

Typical profile
0 to 15 inches: Silty clay
15 to 31 inches: Silty clay
31 to 60 inches: Silty clay

LaC3—Lahaina silty clay, 7 to 15 percent slopes, severely eroded

Map Unit Setting
Elevation: 10 to 1,500 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Lahaina and similar soils: 100 percent

Description of Lahaina

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 4e

Typical profile
0 to 5 inches: Silty clay
5 to 28 inches: Silty clay
28 to 60 inches: Stony silty clay loam

LaD3—Lahaina silty clay, 15 to 25 percent slopes, severely eroded

Map Unit Setting
Elevation: 10 to 1,500 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Lahaina and similar soils: 100 percent

Description of Lahaina

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium

Properties and qualities
Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e

Typical profile
0 to 5 inches: Silty clay
5 to 28 inches: Silty clay
28 to 60 inches: Stony silty clay loam

LaE3—Lahaina silty clay, 25 to 40 percent slopes, severely eroded

Map Unit Setting
Elevation: 10 to 1,500 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Lahaina and similar soils: 100 percent

Description of Lahaina

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium

Properties and qualities
Slope: 25 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e

Typical profile
0 to 5 inches: Silty clay
5 to 28 inches: Silty clay
28 to 60 inches: Stony silty clay loam

MuA—Molokai silty clay loam, 0 to 3 percent slopes

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 20 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Molokai and similar soils: 100 percent

Description of Molokai

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 7.0
Available water capacity: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): 1
Land capability (nonirrigated): 4c

Typical profile
0 to 15 inches: Silty clay loam
15 to 72 inches: Silty clay loam

MuB—Molokai silty clay loam, 3 to 7 percent slopes

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 20 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Molokai and similar soils: 100 percent

Description of Molokai

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 7.0

Available water capacity: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 4c

Typical profile
0 to 15 inches: Silty clay loam
15 to 72 inches: Silty clay loam

MuB3—Molokai silty clay loam, 3 to 7 percent slopes, severely eroded

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 20 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Molokai and similar soils: 100 percent

Description of Molokai

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 7.0
Available water capacity: Moderate (about 7.1 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 4e

Typical profile
0 to 6 inches: Silty clay loam
6 to 60 inches: Silty clay loam

MuC—Molokai silty clay loam, 7 to 15 percent slopes

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 20 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Molokai and similar soils: 100 percent

Description of Molokai

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 7.0
Available water capacity: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 4e

Typical profile
0 to 15 inches: Silty clay loam
15 to 72 inches: Silty clay loam

MuC3—Molokai silty clay loam, 7 to 15 percent slopes, severely eroded

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 20 to 25 inches
Mean annual air temperature: 72 to 75 degrees F

Frost-free period: 365 days

Map Unit Composition
Molokai and similar soils: 100 percent

Description of Molokai

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 7.0
Available water capacity: Moderate (about 7.1 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 6e

Typical profile
0 to 6 inches: Silty clay loam
6 to 60 inches: Silty clay loam

MvD3—Molokai silty clay loam, shallow variant, 15 to 25 percent slopes, severely eroded

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 20 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Molokai variant and similar soils: 100 percent

Description of Molokai Variant

Setting
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise

Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic igneous rock

Properties and qualities
Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 7.0
Available water capacity: Low (about 3.4 inches)

Interpretive groups
Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e

Typical profile
0 to 3 inches: Silty clay loam
3 to 17 inches: Silty clay loam
17 to 40 inches: Cobbly clay loam

rRK—Rock land

Map Unit Setting
Elevation: 0 to 6,000 feet
Mean annual precipitation: 15 to 60 inches
Mean annual air temperature: 57 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Rock land and similar soils: 55 percent
Minor components: 45 percent

Description of Rock Land

Setting
Landform: Pahoehoe lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, riser, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Basalt

Properties and qualities
Slope: 40 to 70 percent
Depth to restrictive feature: 8 inches to lithic bedrock
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.1 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 4 inches: Silty clay
4 to 8 inches: Silty clay
8 to 20 inches: Bedrock

Minor Components

Rock outcrop
Percent of map unit: 45 percent
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, tread, rise
Down-slope shape: Linear
Across-slope shape: Concave

rRR—Rough broken land

Map Unit Setting
Elevation: 0 to 4,000 feet
Mean annual precipitation: 20 to 200 inches
Mean annual air temperature: 61 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Rough broken land and similar soils: 100 percent

Description of Rough Broken Land

Setting
Landform: Gulches
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium and colluvium

Properties and qualities
Slope: 40 to 70 percent
Depth to restrictive feature: 20 to 55 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.5 inches)

Interpretive groups
Land capability (nonirrigated): 7e

Typical profile
0 to 8 inches: Silty clay
8 to 30 inches: Silty clay
30 to 60 inches: Bedrock

rVT2—Very stony land, eroded

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Very stony land, eroded, eroded, and similar soils: 100 percent

Description of Very Stony Land, Eroded, Eroded

Setting
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Aa lava and volcanic ash

Properties and qualities
Slope: 7 to 30 percent
Depth to restrictive feature: 5 to 35 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 10 inches: Extremely stony silty clay loam
10 to 30 inches: Extremely stony silty clay loam
30 to 40 inches: Bedrock

WoB—Waihuna clay, 3 to 7 percent slopes

Map Unit Setting
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 66 to 72 degrees F
Frost-free period: 365 days

Map Unit Composition
Waihuna and similar soils: 100 percent

Description of Waihuna

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 3s

Typical profile
0 to 1 inches: Clay
1 to 6 inches: Clay
6 to 12 inches: Clay
12 to 18 inches: Clay
18 to 25 inches: Clay
25 to 41 inches: Clay
41 to 53 inches: Clay
53 to 65 inches: Clay

WrB—Waikapu silty clay loam, 3 to 7 percent slopes

Map Unit Setting
Elevation: 100 to 1,250 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Waikapu and similar soils: 100 percent

Description of Waikapu

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 4c

Typical profile
0 to 12 inches: Silty clay loam
12 to 60 inches: Silty clay loam

WrC3—Waikapu silty clay loam, 7 to 15 percent slopes, severely eroded

Map Unit Setting
Elevation: 100 to 1,250 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition
Waikapu and similar soils: 100 percent

Description of Waikapu

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 4e

Typical profile
0 to 4 inches: Silty clay loam
4 to 60 inches: Silty clay loam

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United States Department of Agriculture

NRCS

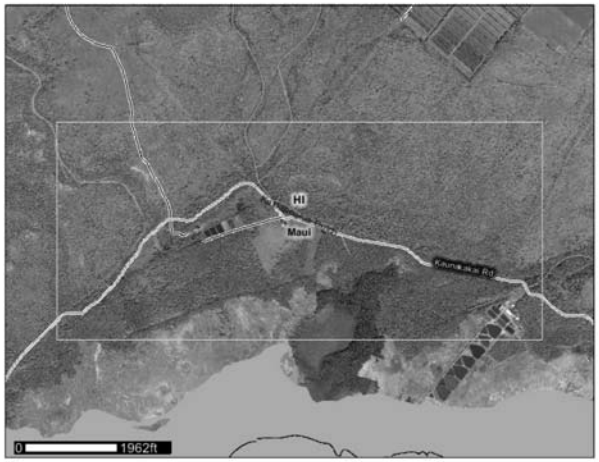
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Island of Molokai, Hawaii

Pala'au (Apana 1 & 2)



April 17, 2011

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

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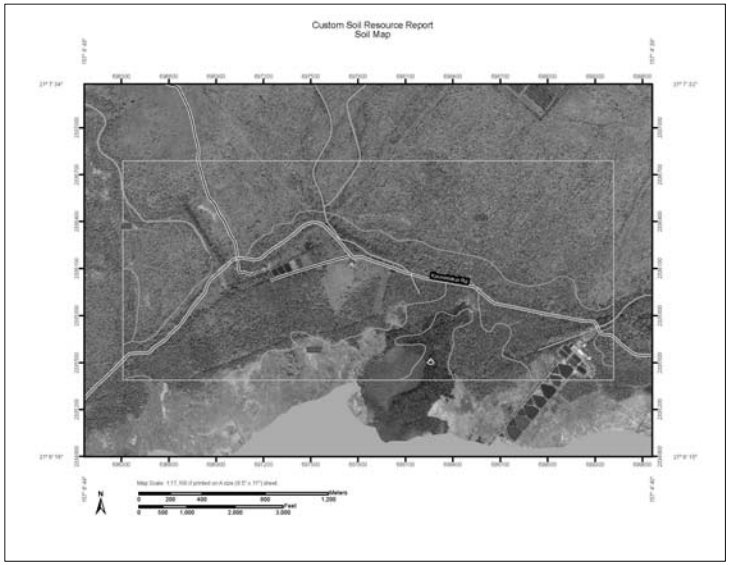

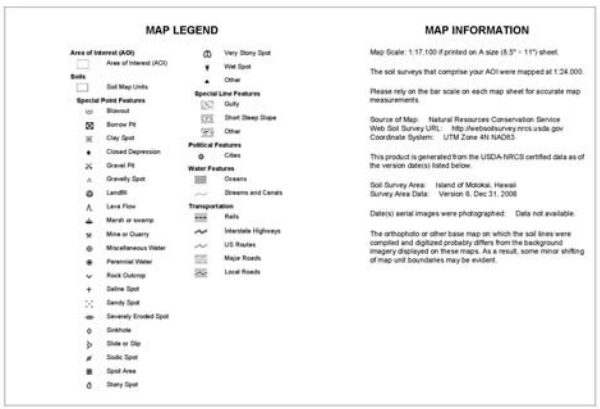

Map Unit Legend

Island of Molokai, Hawaii (HI950)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
KMW	Kealia silt loam	124.8	11.6%
MmA	Mala silty clay, 0 to 3 percent slopes	409.4	38.0%
MZ	Marsh	24.8	2.3%
rVS	Very stony land	11.0	1.0%
rVT2	Very stony land, eroded	506.9	47.1%
Totals for Area of Interest		**1,076.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that

have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Island of Molokai, Hawaii

KMW—Kealia silt loam

Map Unit Setting
Elevation: 0 to 10 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Kealia and similar soils: 45 percent
Kealia, deep water table and similar soils: 35 percent
Minor components: 20 percent

Description of Kealia

Setting
Landform: Salt marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 5.95 in/hr)
Depth to water table: About 12 to 42 inches
Frequency of flooding: Frequent
Frequency of ponding: Occasional
Maximum salinity: Moderately saline to strongly saline (16.0 to 32.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability (nonirrigated): 7w

Typical profile
0 to 3 inches: Silt loam
3 to 19 inches: Loam
19 to 63 inches: Fine sandy loam

Description of Kealia, Deep Water Table

Setting
Landform: Salt marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 5.95 in/hr)
Depth to water table: About 60 inches
Frequency of flooding: Occasional
Frequency of ponding: Occasional
Maximum salinity: Moderately saline to strongly saline (16.0 to 32.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Typical profile
0 to 3 inches: Silt loam
3 to 19 inches: Loam
19 to 63 inches: Fine sandy loam

Minor Components

Salt marsh
Percent of map unit: 20 percent
Landform: Salt marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave

MmA—Mala silty clay, 0 to 3 percent slopes

Map Unit Setting
Elevation: 0 to 100 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Mala and similar soils: 100 percent

Description of Mala

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 99 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): 1
Land capability (nonirrigated): 6c

Typical profile
0 to 7 inches: Silty clay
7 to 40 inches: Stratified silty clay
40 to 60 inches: Sand

MZ—Marsh

Map Unit Setting
Elevation: 0 to 800 feet
Mean annual precipitation: 12 to 150 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Marsh and similar soils: 100 percent

Description of Marsh

Setting
Landform: Marshes
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Maximum salinity: Nonsaline to moderately saline (0.0 to 16.0 mmhos/cm)

Available water capacity: Very high (about 16.2 inches)

Interpretive groups
Land capability (nonirrigated): 8w

Typical profile
0 to 10 inches: Mucky peat
10 to 60 inches: Mucky peat

rVS—Very stony land

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Very stony land and similar soils: 100 percent

Description of Very Stony Land

Setting
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Aa lava and volcanic ash

Properties and qualities
Slope: 7 to 30 percent
Depth to restrictive feature: 0 to 10 inches to paralithic bedrock; 0 to 35 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0.5 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 5 inches: Extremely stony silty clay
5 to 9 inches: Bedrock

rVT2—Very stony land, eroded

Map Unit Setting
Elevation: 0 to 1,500 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition
Very stony land, eroded, eroded, and similar soils: 100 percent

Description of Very Stony Land, Eroded, Eroded

Setting
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Aa lava and volcanic ash

Properties and qualities
Slope: 7 to 30 percent
Depth to restrictive feature: 5 to 35 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 10 inches: Extremely stony silty clay loam
10 to 30 inches: Extremely stony silty clay loam
30 to 40 inches: Bedrock

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APPENDIX C

Literature Review of Previous Archaeological Work — Appendices
Select DHHL Lands
Island of Moloka'i
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TABLE OF FISHING RIGHTS CLAIMS

Helu LCA No.	Claimant; Location; and Resource Claimed
Crown	Crown; ʻUalapuʻe, Molokaʻi. Konohiki Fishery.
237 U	Loika at ʻUalapuʻe, Molokaʻi. A lot in the ʻ*ili* of Kupa, bounded makai by a pond. A pond named Kaluaʻaha at Kaluaʻaha; "the enclosure of that loko is ancient, I have seen A. Paki and his own men working before the death of Nāhiʻenaʻena and it has been intact to this time..." Also adjoining pond of Niʻaupala.
3821	Puʻupuʻu at ʻUalapuʻe, Molokaʻi. Lot bounded on side by pond in Hoʻokupualiʻi.
3836	Paele (3792 B), at ʻUalapuʻe, Molokai. Lot bounded on side by the pond in ili of Kalokoia.
3840	Paaluhi at ʻUalapuʻe, Molokaʻi. A lot bounded on side by a pond in ili of Puuhanau.
3975	Hulihee at ʻUalapuʻe, Molokaʻi. A lot bounded on side by a pond in ili of Kaukeanu
4078	Kahaiau at ʻUalapuʻe, Molokaʻi. Lot bounded on side by pond in Naulu.
4164	Kalolou at ʻUalapuʻe, Molokaʻi. A lot bounded on side by pond in ili of Kupa.
4194	Kuluwaimaka at ʻUalapuʻe, Molokaʻi. A lot bounded on side by the pond of Hulihee.
4209	Kauhikoakoa at ʻUalapuʻe, Molokaʻi. Lot bounded on side by pond.
5147	Kaiu at ʻUalapuʻe, Molokaʻi. A lot bounded *makai* by pond.
Crown	Crown; Kalamaʻula, Molokaʻi. Konohiki Fishery.
No Helu	Kupaa; Kalamaʻula, Molokaʻi. Land in the ʻ*ili* of Ohaipilo, bounded on east by Kinipaa Pond, and on shore by Ohaipilo Pond.
7779	Kaleleiki at Makakupaʻia iki, Molokaʻi. Konohiki Fishery.

APPENDIX D

TABLE OF UTM COORDINATES OF PREVIOUSLY RECORDED ARCHAEOLOGICAL SITES WITHIN DHHL AHUPUA'A

Ahupua`a	TMK	SIHP No.	Site/Feature Type	No. of Features	Easting	Northing	Origin of GPS Location Information	Comment	Within Select DHHL TMKs
`Ualapu`e	(2) 5-6-006:017	0181	Heiau		724729.3714	2330903.227	Summers 1971; NPS 2011		Yes
`Ualapu`e	(2) 5-6-002:027	0183	Kahua Maika		725613.4246	2330595.348	Summers 1971		Yes
`Ualapu`e	(2) 5-6-003:035	0184	Halemahana Fishpond		725156.004	2330023.572	State GIS shapefile (accessed 2011)		No
`Ualapu`e	(2) 5-6-001:001	0185	`Ualapu`e Fishpond		725314.3419	2330230.291	State GIS shapefile (accessed 2011)		No
`Ualapu`e	(2) 5-6-002:007	1625	Partial Enclosure	1	725102.1403	2330306.622	Figure 3 and 5 from Moore and Kennedy 1994		No
`Ualapu`e	(2) 5-6-002:007	1626	Wall	2	725089.8017	2330435.575	Figure 3 from Moore and Kennedy 1994		No
Kapa`akea	(2) 5-3-003:014-015	1600	Complex	8	706618.2905	2333133.974	Figure 2 from Tomonori-Tuggle 1983.		No
Kamiloloa	(2) 5-4-002:014	0133	Kaloko`eli Fishpond	1	707653.6477	2332141.558	State GIS shapefile (accessed 2011)		No
Kamiloloa	(2) 5-4-003:003	0910			711289.6051	2335120.619	Figure 3 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0911			711477.1785	2335297.961	Figure 3 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0912			710919.7634	2334837.175	Figure 3 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0913			710994.7928	2334758.735	Figure 3 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0921	Complex	6	709428.9266	2331949.952	Figure 4 from Hommon & Ahlo 1983; Figure 4 from Tuggle 1993.		Yes
Kamiloloa	(2) 5-4-003:003	0922	Complex	3	709111.8767	2332563.775	Figure 4 from Hommon & Ahlo 1983; Figure 4 from Tuggle 1993.		Yes
Kamiloloa	(2) 5-4-003:003	0923	Mound	3	708984.1235	2332513.98	Figure 4 from Hommon & Ahlo 1983; Figure 4 from Tuggle 1993.		Yes
Kamiloloa	(2) 5-4-003:003	0924	Modified Outcrop	1	709104.722	2332779.469	Figure 4 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0925	Complex	8	708561.0382	2332406.115	Figure 4 from Hommon & Ahlo 1983; Figure 4 from Tuggle 1993.		Yes
Kamiloloa	(2) 5-4-003:003	0926	Wall	1	708644.4005	2332820.372	Figure 4 from Hommon & Ahlo 1983; Figure 4 from Tuggle 1993.		Yes
Kamiloloa	(2) 5-4-003:003	0928	Complex	2	709451.4867	2332587.123	Figure 4 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0929	Complex	6+	710064.9636	2332837.666	Figure 4 from Hommon & Ahlo 1983		Yes

Ahupua`a	TMK	SIHP No.	Site/Feature Type	No. of Features	Easting	Northing	Origin of GPS Location Information	Comment	Within Select DHHL TMKs
Kamiloloa	(2) 5-4-003:003	0942	Complex	6	709307.5878	2332070.108	Figure 4 from Hommon & Ahlo 1983; Figure 4 from Tuggle 1993.		Yes
Kamiloloa	(2) 5-4-003:003	0943	Complex	11	709584.4231	2332360.811	Figure 4 from Hommon & Ahlo 1983; Figure 4 from Tuggle 1993.		Yes
Kamiloloa	(2) 5-4-003:003	0944	Complex	15+	708790.0815	2332237.756	Figure 4 from Hommon & Ahlo 1983; Figure 4 from Tuggle 1993.		Yes
Kamiloloa	(2) 5-4-003:003	0945	Complex	30+	708556.9078	2332264.88	Figure 4 from Hommon & Ahlo 1983; Figure 4 from Tuggle 1993.		Yes
Kamiloloa	(2) 5-4-003:003	0946	Enclosure	1	708421.8636	2332218.981	Figure 4 from Hommon & Ahlo 1983; Figure 4 from Tuggle 1993.		Yes
Kamiloloa	(2) 5-4-003:003	0955			708740.5013	2334161.91	Figure 3 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0956			709528.3097	2334172.142	Figure 3 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0957			709436.2282	2334028.904	Figure 3 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0958			709371.4301	2333930.001	Figure 3 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0959			710114.9029	2332937.568	Figure 3 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0960			710749.2421	2333957.285	Figure 3 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0961			710442.3038	2333824.278	Figure 3 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0962	Mound & Terrace	2	708125.7	2333171.364	Figure 4 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0963	C-Shape	1	708329.4469	2333249.449	Figure 4 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0964	Wall & Mound	2	708815.7514	2333343.413	Figure 4 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0965	Cave	1	708300.9449	2333450.232	Figure 4 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0966	Modified Outcrop	1	708291.8017	2333407.564	Figure 4 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0967	Terrace	1	708439.6169	2333105.838	Figure 4 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0968	Complex	13	708587.4321	2333157.65	Figure 4 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0969	Stone Mound	3	708540.1922	2333078.409	Figure 4 from Hommon & Ahlo 1983		Yes
Kamiloloa	(2) 5-4-003:003	0970	Complex		708632.0204	2332913.074	Figure 4 from Hommon & Ahlo 1983; Figure 4 from Tuggle 1993.		Yes
Kamiloloa	(2) 5-4-003:003	0978	Complex	9+	708565.5587	2332417.297	"Figure 3. Sites of the Project Area." map		Yes
Kamiloloa	(2) 5-4-003:003	0979	Complex	2+	708593.969	2332718.278	"Figure 3. Sites of the Project Area." map		Yes
Kamiloloa	(2) 5-4-003:003	0980	Complex	4	708609.2162	2332526.321	"Figure 3. Sites of the Project Area." map		Yes

Ahupua`a	TMK	SIHP No.	Site/Feature Type	No. of Features	Easting	Northing	Origin of GPS Location Information	Comment	Within Select DHHL TMKs
Kamiloloa	(2) 5-4-003:003	0981	Complex	8	708953.9772	2332565.681	"Figure 3. Sites of the Project Area." map		Yes
Kamiloloa	(2) 5-4-003:003	0982	Complex	4+	708386.8554	2332280.975	"Figure 3. Sites of the Project Area." map		Yes
Kamiloloa	(2) 5-4-003:003	0983	Complex	3+	708656.4477	2332507.108	"Figure 3. Sites of the Project Area." map		Yes
Kamiloloa/ Makakupa`ia Border	(2) 5-4-003:003	0977			710319.5285	2332958.03	Figure 3 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-006:025	0135	Alii Fishpond	1	709845.4927	2331369.781	State GIS shapefile (accessed 2011)		No
Makakupa`ia	(2) 5-4-003:036	0136	Kaoaini Fishpond	1	710549.3528	2331209.252	State GIS shapefile (accessed 2011)		No
Makakupa`ia	(2) 5-4-003:003	0914	Complex	11+	710257.9809	2331750.953	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0915	Complex	6+	710278.2836	2331858.141	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0916	Rock Shelter	1	710147.3552	2332020.723	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0917	Complex	3+	710044.0756	2331956.183	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0918	Complex	3	710022.4842	2331821.237	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0919	Complex	6	709965.1106	2331794.116	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0920	Complex	5	709918.1262	2331772.657	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0927	Complex	3+	710317.1305	2332427.895	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0930	Cupboard	1+	710068.2227	2332348.763	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0932	Complex	7	710155.6307	2331797.847	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0933	Crevice Burial	1	710202.0286	2331878.284	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0934	Wall	2	710233.6816	2332037.988	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0935	Complex	4+	710197.7123	2331944.468	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0936	Complex	4	710082.6104	2331878.284	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0937	Complex	2	709989.0902	2331794.835	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0938	Complex	2	709972.1045	2331616.12	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0939	Complex	2+	709916.3269	2331846.427	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0940	Complex	3+	709995.4951	2331930.993	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0941	Complex	3+	709939.7175	2331939.989	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0947	Stone Mound	1	710354.5386	2331999.141	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0948	Stone Mound	2	710361.7325	2332040.865	Figure 4 from Hommon & Ahlo 1983		Yes

Ahupua`a	TMK	SIHP No.	Site/Feature Type	No. of Features	Easting	Northing	Origin of GPS Location Information	Comment	Within Select DHHL TMKs
Makakupa`ia	(2) 5-4-003:003	0949	Complex	2+	710508.4874	2332514.222	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0950	Stone Mound	1	710239.4367	2332196.253	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0951?	Complex	4+	710124.3349	2332118.559	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0951?	Complex	8+	710150.2329	2331745.667	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0952	Complex	6+	710261.0183	2332278.263	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0953	Terrace	1+	710374.6814	2332389.049	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0954	Complex	5+	710371.8039	2332430.773	Figure 4 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-003:003	0976			710786.7568	2332859.128	Figure 3 from Hommon & Ahlo 1983		Yes
Makakupa`ia	(2) 5-4-016:034	T-072	Cairn	1	711210.6038	2332004.029	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-016:022, 053	T-077	Shelter/Windbreak	1	710891.9595	2331580.94	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-078	Shrine	1	710913.2024	2331727.871	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-079	Complex	7	710861.8653	2331547.306	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-162			710614.0308	2331541.995	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-163			710651.2059	2331920.828	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-016:013	T-164			710930.9049	2332359.849	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028, (2) 5-4-016:002, 003	T-165			710796.3662	2331439.321	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-166			710782.2042	2331400.375	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-167			710559.1531	2331483.577	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-168			710847.7033	2332414.726	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-169			710401.6012	2331561.468	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-170			710357.345	2331655.291	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-171			710422.8441	2331688.925	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:003, 028	T-172			710371.507	2331757.965	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-173			710589.2473	2331931.449	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-174			710615.801	2331989.867	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028	T-175			710658.2869	2331965.084	Weisler and Kirch 1980		No
Makakupa`ia	(2) 5-4-003:028, (2) 5-4-016:011	T-176			710741.4885	2332150.96	Weisler and Kirch 1980		No

Ahupua`a	TMK	SIHP No.	Site/Feature Type	No. of Features	Easting	Northing	Origin of GPS Location Information	Comment	Within Select DHHL TMKs
Kalama`ula	(2) 5-2-010:001	0126	Heiau		707934.8167	2339343.208	Summers 1971; Figure 2 from Hommon & Ahlo 1983		Yes
Kalama`ula	(2) 5-2-010:001	0127	Kahua Maika		706878.7772	2338642.71	Summers 1971; Figure 2 from Hommon & Ahlo 1983		Yes
Kalama`ula	(2) 5-2-010:001	0128	House Sites		707098.0016	2338824.268	Summers 1971; Figure 2 from Hommon & Ahlo 1983		Yes
Kalama`ula	(2) 5-2-008:086	0800	Complex	7+	703293.9123	2335529.845	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:086	0801	Complex	8	703281.2222	2335493.015	Figure 2 from Tomonori-Tuggle 1983		Yes
Kalama`ula	(2) 5-2-008:052, 085-088, 999	0802	Wall	1	703222.4688	2335146.433	Figure 2 from Hommon & Ahlo 1983; "Figure 4. Site Locations." map.	East end, segment 3	Yes
Kalama`ula	(2) 5-2-008:052, 085-088, 999	0802	Wall	1	703180.2147	2335160.791	Figure 2 from Hommon & Ahlo 1983; "Figure 4. Site Locations." map.	East end, segment 4	Yes
Kalama`ula	(2) 5-2-008:052, 085-088, 999	0802	Wall	1	703300.9956	2335083.437	Figure 2 from Hommon & Ahlo 1983; "Figure 4. Site Locations." map.	NWestern end, segment 1	Yes
Kalama`ula	(2) 5-2-008:052, 085-088, 999	0802	Wall	1	703249.6021	2335133.817	Figure 2 from Hommon & Ahlo 1983; "Figure 4. Site Locations." map.	NWestern end, segment 2	Yes
Kalama`ula	(2) 5-2-008:052, 085-088, 999	0802	Wall	1	702854.5942	2335242.523	Figure 2 from Hommon & Ahlo 1983; "Figure 4. Site Locations." map.	NWestern end, segment 5	Yes
Kalama`ula	(2) 5-2-008:052, 085-088, 999	0802	Wall	1	703393.2451	2334934.916	Figure 2 from Hommon & Ahlo 1983; "Figure 4. Site Locations." map.	SEastern end, segment 1	Yes
Kalama`ula	(2) 5-2-008:052, 085-088, 999	0802	Wall	1	703290.1389	2335097.007	Figure 2 from Hommon & Ahlo 1983; "Figure 4. Site Locations." map.	SEastern end, segment 2	Yes
Kalama`ula	(2) 5-2-008:052, 085-088, 999	0802	Wall	1	703095.7404	2335170.48	Figure 2 from Hommon & Ahlo 1983; "Figure 4. Site Locations." map.	SEastern end, segment 5	Yes
Kalama`ula	(2) 5-2-008:052, 085-088, 999	0802	Wall	1	703194.4641	2335156.041	Figure 2 from Hommon & Ahlo 1983; "Figure 4. Site Locations." map.	West end, segment 3	Yes
Kalama`ula	(2) 5-2-008:052, 085-088, 999	0802	Wall	1	703138.8235	2335166.219	Figure 2 from Hommon & Ahlo 1983; "Figure 4. Site Locations." map.	West end, segment 4	Yes
Kalama`ula	(2) 5-2-011:001	0891	Pond	1	702594.9949	2334509.716	Summers 1971; Figure 2 from Hommon & Ahlo 1983		No
Kalama`ula	(2) 5-2-010:001	0901			706043.7681	2338704.832	Summers 1971; Figure 2 from Hommon & Ahlo 1983		Yes
Kalama`ula	(2) 5-2-010:001	0902			707002.0646	2339014.669	Summers 1971; Figure 2 from Hommon & Ahlo 1983		Yes
Kalama`ula	(2) 5-2-010:001	0904	Stone Cairn	1	703415.0296	2336919.397	Summers 1971; Figure 2 from Hommon & Ahlo 1983		Yes

Ahupua`a	TMK	SIHP No.	Site/Feature Type	No. of Features	Easting	Northing	Origin of GPS Location Information	Comment	Within Select DHHL TMKs
Kalama`ula	(2) 5-2-010:001	0905	Wall	1	704538.3147	2336668.256	Summers 1971; Figure 2 from Hommon & Ahlo 1983		Yes
Kalama`ula	(2) 5-2-010:001	0906	Stone Alignment	1	705194.7894	2335146.971	Figure 2 from Hommon & Ahlo 1983		Yes
Kalama`ula	(2) 5-2-010:001	0907	Ditch	1	704497.2189	2337152.274	Summers 1971; Figure 2 from Hommon & Ahlo 1983		Yes
Kalama`ula	(2) 5-2-010:001	0908	Stone Alignment	7+	705515.4813	2337170.538	Summers 1971; Figure 2 from Hommon & Ahlo 1983		Yes
Kalama`ula	(2) 5-2-010:001	0975			707798.581	2339010.717	Figure 2 from Hommon & Ahlo 1983; Figure 2 from Dye 1998		Yes
Kalama`ula	(2) 5-2-008:094, 112; (2) 5-2-009:013-014, 016, 019-020, 024-027, 029; (2) 5-2-032:050-051, 068-070; (2) 5-2-033:050-057, 061	1025	Complex	No Data	703739.7774	2334271.222	Figure 2 from Tomonori-Tuggle 1983.		Yes
Kalama`ula	(2) 5-2-009:001	1026	Coconut Grove	No Data	703758.4463	2334089.2	Figure 2 from Tomonori-Tuggle 1983.		No
Kalama`ula	(2) 5-2-009:018	1028	Wood Structure	No Data	704005.8094	2333986.521	Figure 2 from Tomonori-Tuggle 1983.		No
Kalama`ula	(2) 5-2-009:012	1660			704004.5033	2334170.586	Figure 3 from Dye 1998.		No
Kalama`ula	(2) 5-2-009:012	1661	Complex	24+	704135.8623	2334198.785	Figure 3 from Dye 1998.		No
Kalama`ula	(2) 5-2-008:048	1700	Complex	4	702840.0883	2335621.386	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:048	1701	Complex	4	702792.473	2335804.04	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:099	1702	Complex	6	702889.7906	2335712.909	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:048	1703	Complex	7	702813.0343	2335735.424	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:048	1704	Semi-Enclosure	1	702787.4412	2335817.458	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:049	1705	Enclosure & Stone Mound	2	702849.4996	2335839.262	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:049	1706	Complex	4	702896.6723	2335786.114	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:099	1707	Complex	6	702986.4054	2335727.201	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:084	1708	Complex	4	703155.5983	2335784.437	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:049, 084, 999	1709	Complex	7	703079.493	2335714.621	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:048	1710	Complex	4	702743.8326	2335485.819	"Figure 4. Site Locations." map		Yes

Ahupua`a	TMK	SIHP No.	Site/Feature Type	No. of Features	Easting	Northing	Origin of GPS Location Information	Comment	Within Select DHHL TMKs
Kalama`ula	(2) 5-2-008:099	1711	Complex	6	702996.9615	2335547.403	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:085	1712	Complex	6	703024.0181	2335552.584	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:099	1713	Complex	5	702860.3673	2335497.501	"Figure 4. Site Locations." map.	NW corner.	Yes
Kalama`ula	(2) 5-2-008:085	1714	Complex	9	703136.7758	2335588.586	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:085	1715	Complex	6	703069.784	2335513.726	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:085	1716	Complex	9	702971.4365	2335275.455	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:086	1717	Complex	6	703104.9229	2335316.961	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:085	1718	Complex	3	703010.5127	2335297.964	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:085	1719	Complex	5	703019.1478	2335359.561	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:085	1720	Complex	12	703136.434	2335487.757	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:052	1721	Wall/Auwai	2	703217.7546	2335176.497	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:087	1722	Complex	1	703246.293	2335008.322	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:087	1723	Modified Outcrop	1	703361.8112	2335310.187	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:052	1724	Complex	3	703300.4062	2335304.814	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:052	1725	Wall & Stone Mound	2	703296.5684	2335261.063	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:087	1726	Semi-Enclosure	1	703459.6754	2335453.849	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:079	1727	Semi-Enclosure	1	703568.0163	2335567.155	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-010:001	1728	Complex	15	703675.9196	2335466.659	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:088, 089	1729	Mounds (3 total)	A	703606.4673	2335203.634	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:088, 089	1729	Mounds (3 total)	B	703652.7525	2335175.582	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:088	1730	Wall	1	703664.5807	2335271.983	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-033:026-027, 046, 048-057, 089	1731	Irrigation Flume	1	703512.1273	2334612.314	"Figure 4. Site Locations." map.	NWestern end, segment 1.	Yes
Kalama`ula	(2) 5-2-033:026-027, 046, 048-057, 089	1731	Irrigation Flume	1	703487.9028	2334897.956	"Figure 4. Site Locations." map.	NWestern end, segment 2.	Yes
Kalama`ula	(2) 5-2-033:026-027, 046, 048-057, 089	1731	Irrigation Flume	1	703903.1222	2334320.95	"Figure 4. Site Locations." map.	SEastern end, segment 1.	Yes

Ahupua`a	TMK	SIHP No.	Site/Feature Type	No. of Features	Easting	Northing	Origin of GPS Location Information	Comment	Within Select DHHL TMKs
Kalama`ula	(2) 5-2-033:026-027, 046, 048-057, 089	1731	Irrigation Flume	1	703525.4487	2334816.622	"Figure 4. Site Locations." map.	SEastern end, segment 2.	Yes
Kalama`ula	(2) 5-2-008:089	1732	Mound	1	703760.3879	2335054.869	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:089	1733	Historic Scatter	1	703618.9325	2334969.062	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-010:001	1734	Stone Mound & Alignment	2	704138.7126	2335132.496	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:089	1735	Wall	1	703725.8476	2334994.424	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:089	1736	Modified Outcrop	1	703665.402	2334973.7	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:089	1737	Boulder Concentration	1	703601.0776	2335092.924	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-032:029, 067	1738	Mound Complex	6	704039.6378	2334770.788	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-032:066	1739	Mound	1	704098.169	2334720.074	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-032:032	1740	Complex	4	704157.5964	2334822.741	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-032:012, 013	1741	Complex	7	704429.4414	2334664.556	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-032:013	1742	Terrace/Enclosure	2	704489.1546	2334673.718	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-032:007	1743	Mound Complex	5	704250.9526	2334537.868	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-032:005	1744			704197.9308	2334451.606	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-032:052	1745	Mound	1	703987.022	2334373.54	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-032:023	1746	Enclosure Complex	3+	704216.7198	2335013.703	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-032:044, 045	1747	Enclosure Complex	3+	704144.9377	2334567.414	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-032:009	1748	Enclosure	1	704331.8981	2334554.782	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:086	1749		A	703080.169	2335187.435	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-008:086	1749		D	703049.6584	2335192.616	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-033:032, 033, 040	1750	Complex	6	703731.3387	2334571.931	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-033:028	1751	Terrace & Mound	2	703845.163	2334449.907	"Figure 4. Site Locations." map.	Point 1 of 3.	Yes

Ahupua`a	TMK	SIHP No.	Site/Feature Type	No. of Features	Easting	Northing	Origin of GPS Location Information	Comment	Within Select DHHL TMKs
Kalama`ula	(2) 5-2-033:028	1751	Terrace & Mound	2	703843.1243	2334429.52	"Figure 4. Site Locations." map.	Point 2 of 3.	Yes
Kalama`ula	(2) 5-2-033:028	1751	Terrace & Mound	2	703832.9306	2334435.126	"Figure 4. Site Locations." map.	Point 3 of 3.	Yes
Kalama`ula	(2) 5-2-033:023	1752	Complex	4+	703916.0091	2334491.701	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-033:048	1753	Complex	4	703452.6213	2334483.589	"Figure 4. Site Locations." map		Yes
Kalama`ula	(2) 5-2-010:001	T-001			704575.304	2334721.463	"Figure 4. Site Locations." map	Unrecorded Site	Yes
Kalama`ula	(2) 5-2-010:001	T-002			703696.0467	2335550.522	"Figure 4. Site Locations." map	Unrecorded Site	Yes
Kalama`ula	(2) 5-2-008:049	T-004			702862.9176	2335874.484	"Figure 4. Site Locations." map	Unrecorded Site	Yes
Ho`olehua	(2) 5-2-023:007	0011	Caterpillar Stones	2	700262.1349	2341496.889	Summers 1971; "Fig. 3 Historic Buildings and Archaeological Site" map		Yes
Ho`olehua	(2) 5-2-007:035	1004?	Former DHHL Office at Hoolehua		702239.8196	2342260.726	"Fig. 3 Historic Buildings and Archaeological Site" map		Yes
Ho`olehua	(2) 5-2-023:007	1004?	Moloka`i Baptist Church		700358.2054	2341482.001	"Fig. 3 Historic Buildings and Archaeological Site" map		Yes
Ho`olehua	(2) 5-2-007:046	1006	Former Sacred Heart Church		702307.2867	2342084.513	"Fig. 3 Historic Buildings and Archaeological Site" map		Yes
Ho`olehua	(2) 5-2-015:001	1008	Moloka`i High School		702599.2049	2341528.328	"Fig. 3 Historic Buildings and Archaeological Site" map		Yes
Pala`au	(2) 5-2-016:007 and (2) 5-2-013:003	0008			705254.5862	2343549.015	Summers 1971		No
Pala`au	(2) 5-2-007:090	0010			703872.7853	2342258.454	Summers 1971		No
Pala`au	(2) 5-2-007:028, 076	0013	Kahua Maika		703377.7119	2341730.182	Summers 1971		Yes
Pala`au	(2) 5-2-007:041	0014	Heiau		701707.7817	2343271.127	Summers 1971		Yes
Pala`au	(2) 5-2-006:069	0015	Ko`a		698005.4672	2344879.282	Summers 1971		No
Pala`au	(2) 5-2-005:019	0016	Heiau		694478.0177	2345228.509	Summers 1971		No
Pala`au	(2) 5-2-002:035	0017	Complex		694208.6854	2345329.007	Summers 1971		No
Pala`au	(2) 5-2-002:035	0018	Ko`a		692749.467	2345312.927	Summers 1971		No
Pala`au	(2) 5-2-007:063	0107	Holua Slide		702003.2433	2340762.417	Summers 1971		No

Ahupua`a	TMK	SIHP No.	Site/Feature Type	No. of Features	Easting	Northing	Origin of GPS Location Information	Comment	Within Select DHHL TMKs
Pala`au	(2) 5-2-011:001	0117	Kahokai Fishpond		701964.9634	2334707.978	State GIS shapefile (accessed 2011)		No
Pala`au	(2) 5-2-011:001	0118	`Ohaipilo Fishpond		702132.3844	2334747.63	State GIS shapefile (accessed 2011)		No
Pala`au	(2) 5-2-006:069	0843	Wall	1A	697529.685	2344742.157	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	1B	697567.7441	2344738.335	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	1C	697597	2344739.089	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	1D	697645.8228	2344723.089	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	1E	697559	2344758.911	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	1F	697650	2344791.089	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	1G	697644	2344739.089	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	1H	697628	2344749.089	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Boulder	2	697650	2344749.911	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	3A	697622	2344852.089	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	3B	697597.9003	2344862.05	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	3C	697564	2344872.05	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	3D	697557.844	2344871.078	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	3E	697535	2344885.139	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	3F	697482	2344929.416	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	4	697525	2344870.185	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Complex	4	697529.685	2344742.157	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Enclosure	5	697516.6302	2344867.185	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Enclosure	6A	697512	2344871.555	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Enclosure	6B	697512.792	2344874.312	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Enclosure	6C	697516	2344872.896	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	7A	697509	2344887.104	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	7B	697501	2344885.234	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	7C	697499	2344884.234	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	8	697492.844	2344894.078	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	9	697497.844	2344894.078	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	10	697456	2344798.078	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	11	697406.7226	2344811.139	Table 2 from Hartzell 2000.		No

Ahupua`a	TMK	SIHP No.	Site/Feature Type	No. of Features	Easting	Northing	Origin of GPS Location Information	Comment	Within Select DHHL TMKs
Pala`au	(2) 5-2-006:069	0843	Wall	12	697579.2431	2344813.996	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	13A	697709.844	2344702.922	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Alignment	13B	697719	2344716.078	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Alignment	13C	697715	2344727.941	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Alignment	13D	697713	2344720.059	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Alignment	13E	697705	2344715.059	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Depression	13F	697689.883	2344719.059	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	14	697608	2344789.059	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Alignment	15	697638.844	2344794.234	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:069	0843	Wall	16	697468.792	2344864.104	Table 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:063	1624	Complex	2	696752.7034	2344294.344	Figure 2 from Hartzell 2000.		No
Pala`au	(2) 5-2-006:063	1623	Complex	3	698140.2324	2343967.344	Figure 2 from Hartzell 2000.		No

APPENDIX E

From Summers 1971.

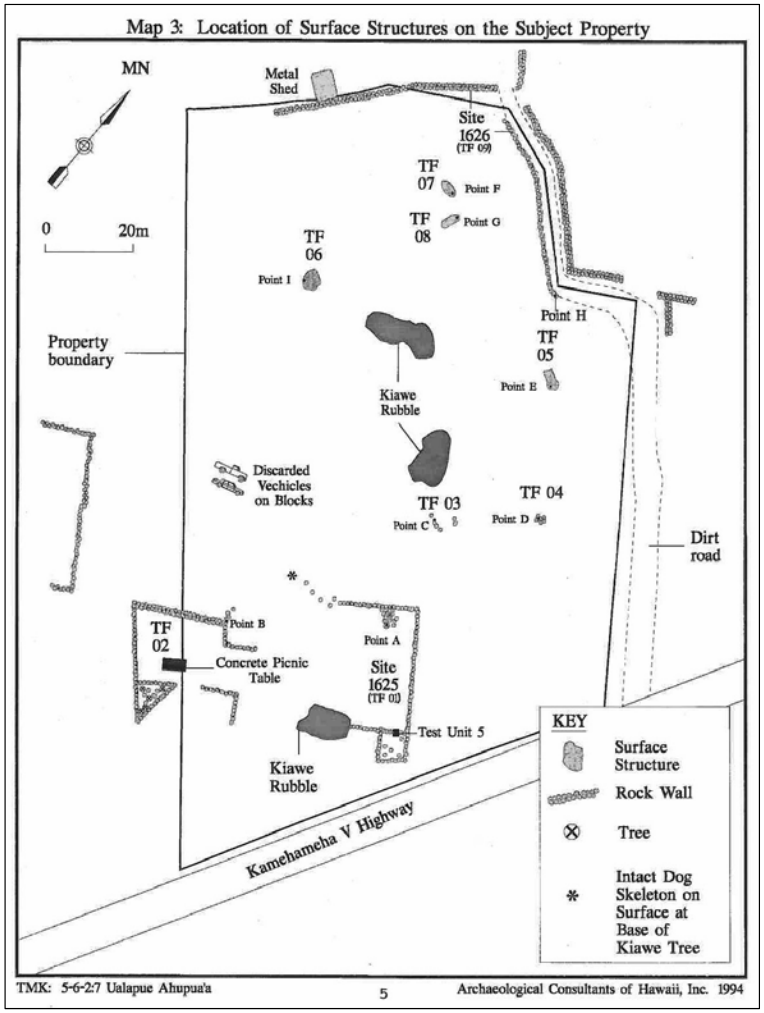


Figure 3 from Moore and Kennedy 1994.

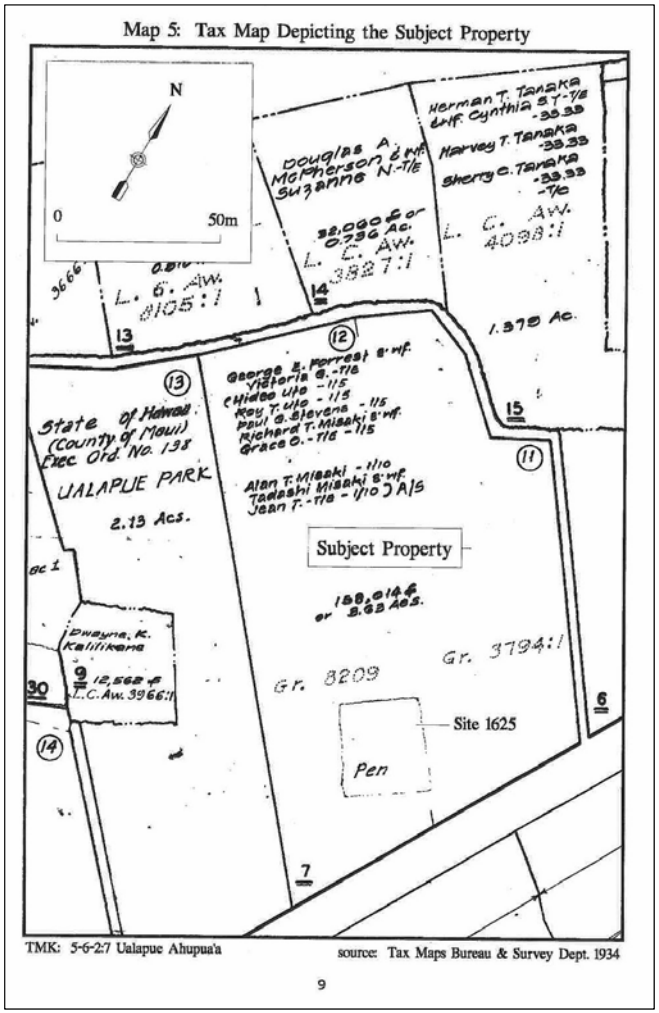


Figure 5 from Moore and Kennedy 1994.

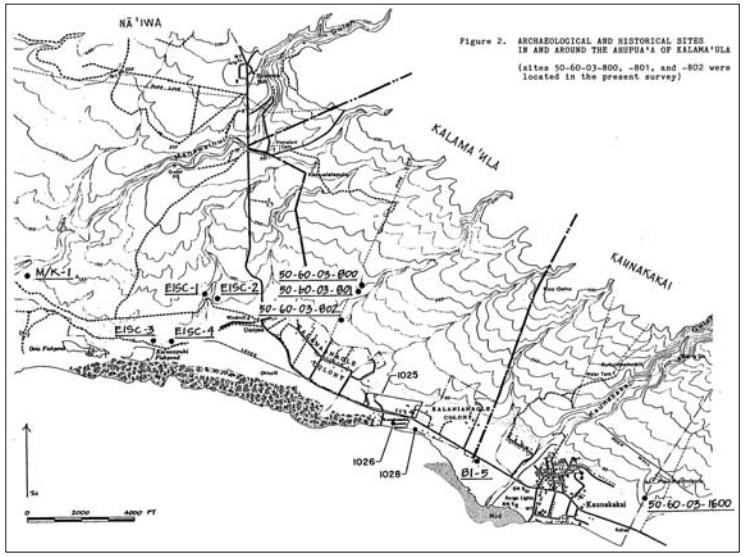


Figure 2 from Tomonori-Tuggle 1983.

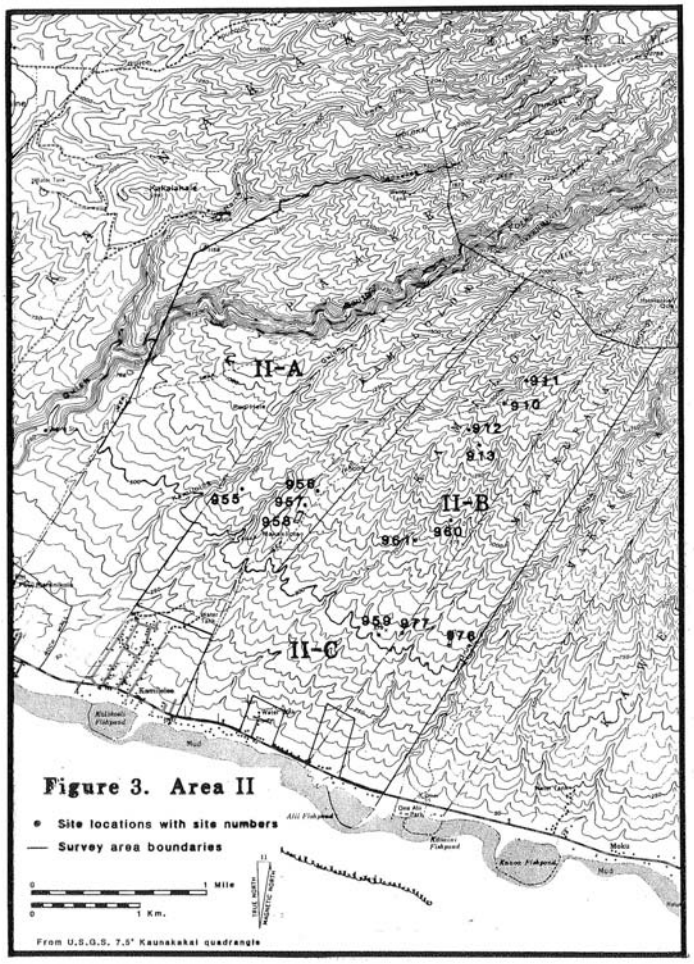


Figure 3 from Hommon and Ahlo 1983.

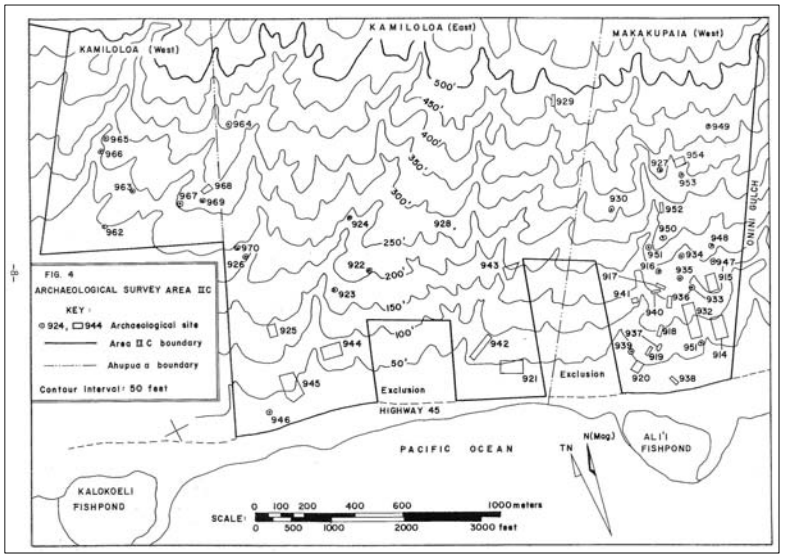


Figure 4 from Hommon and Ahlo 1983.

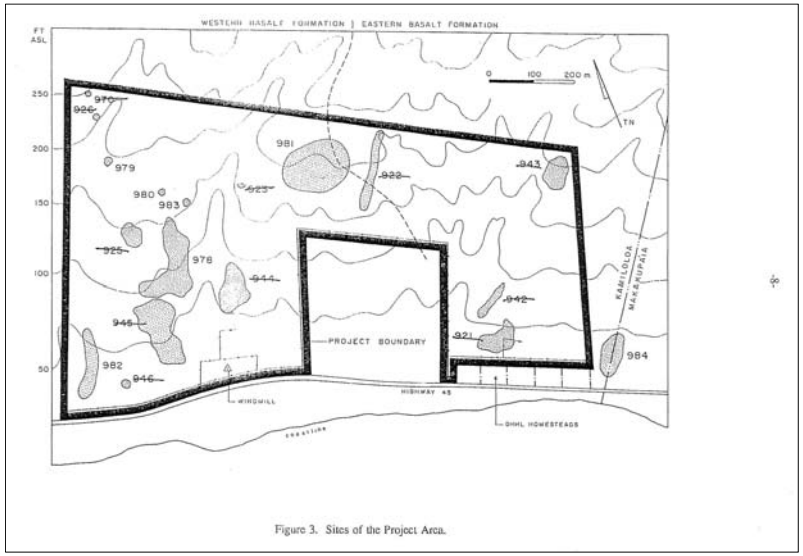


Figure 3. Sites of the Project Area.

Figure 3 from Tuggle 1993.

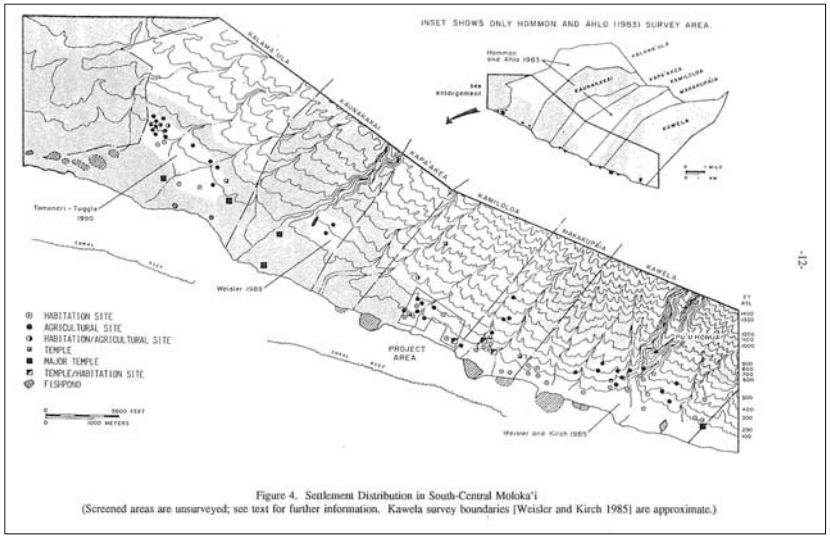
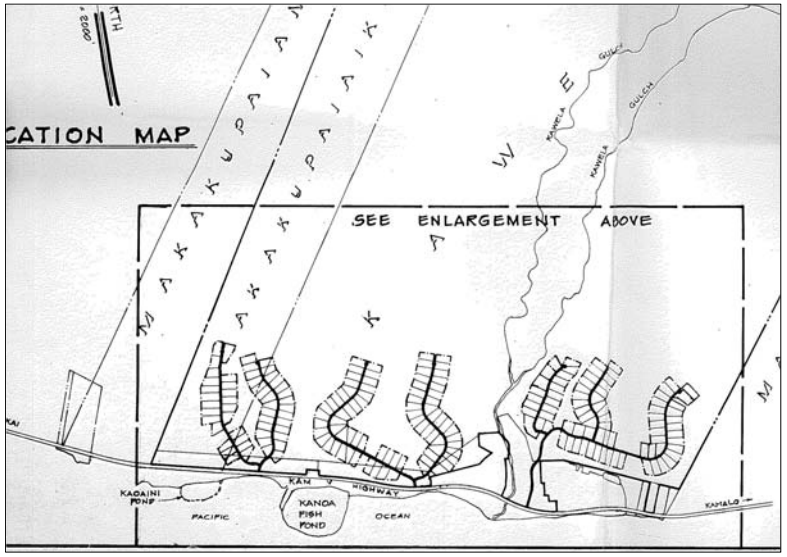
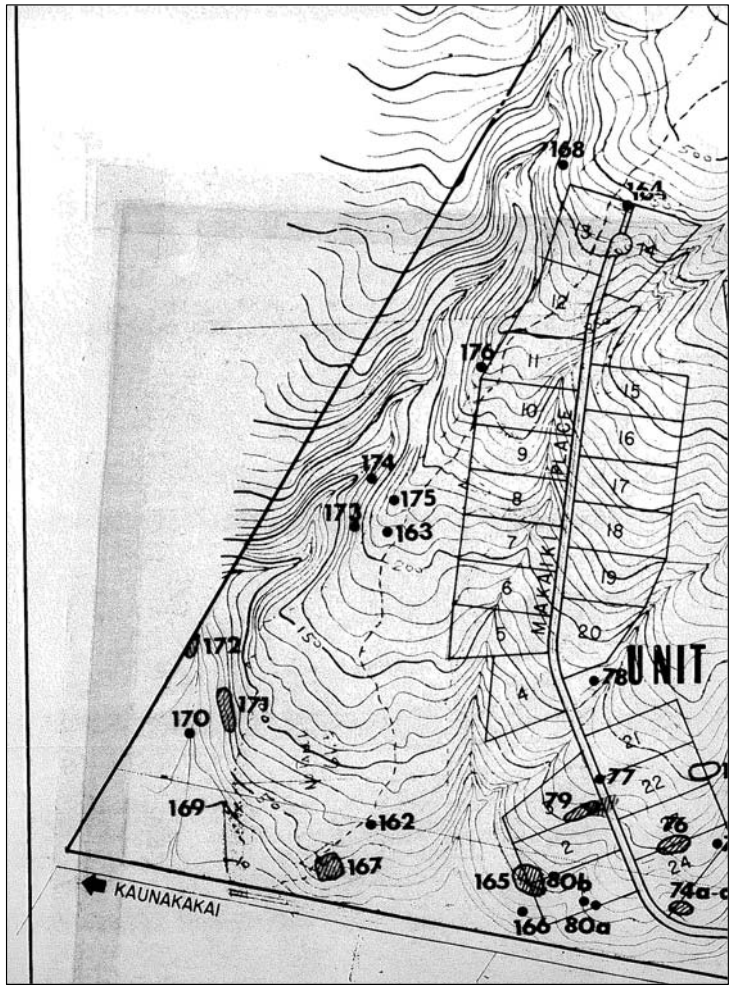


Figure 4. Settlement Distribution in South-Central Moloka'i
(Screened areas are unsurveyed; see text for further information. Kawela survey boundaries [Weisler and Kirch 1985] are approximate.)

Figure 4 from Tuggle 1993.



Location map from Weisler and Kirch 1980.



Makakupa'ia Ahupua'a of inset from location map, Weisler and Kirch 1980.

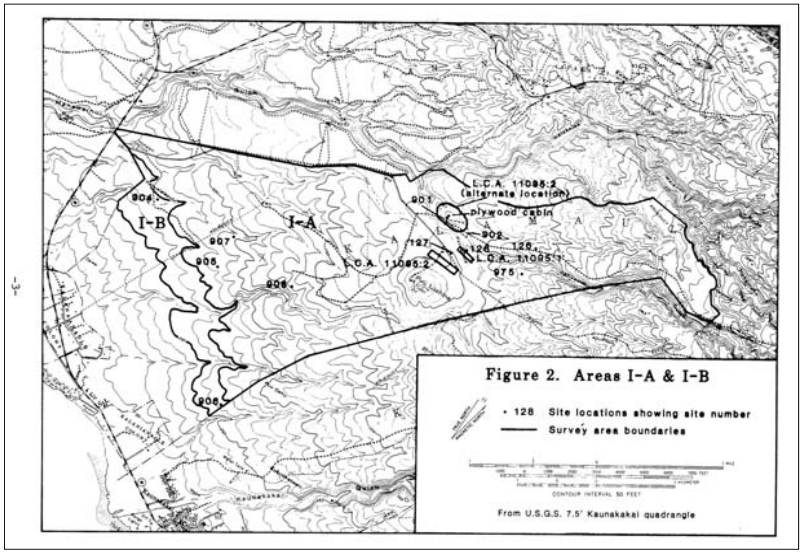


Figure 2 from Hommon and Ahlo 1983.

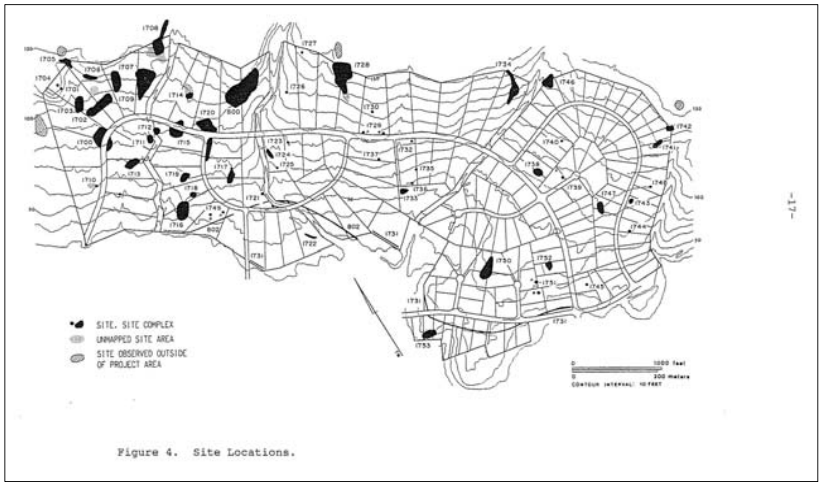


Figure 4 from Tomonori-Tuggle 1990.

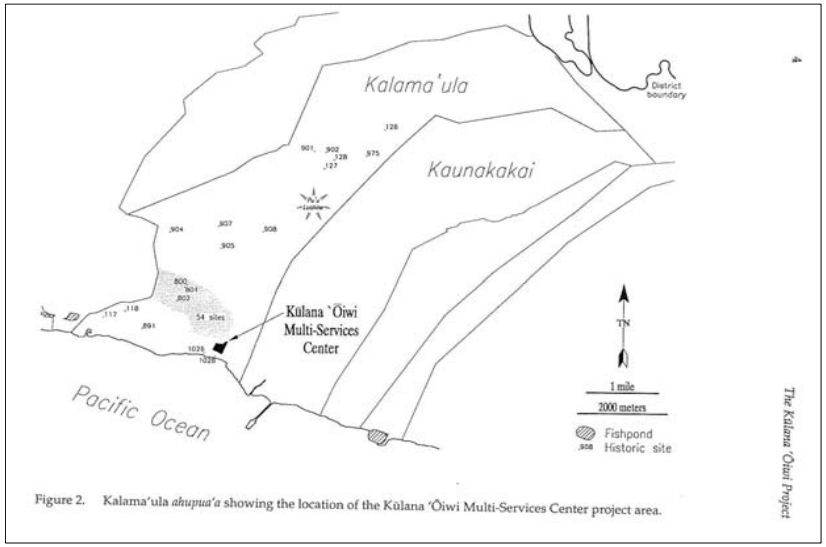


Figure 2. Kalama'ula *ahupua'a* showing the location of the Kūlana 'Ōiwi Multi-Services Center project area.

Figure 2 from Dye 1998.

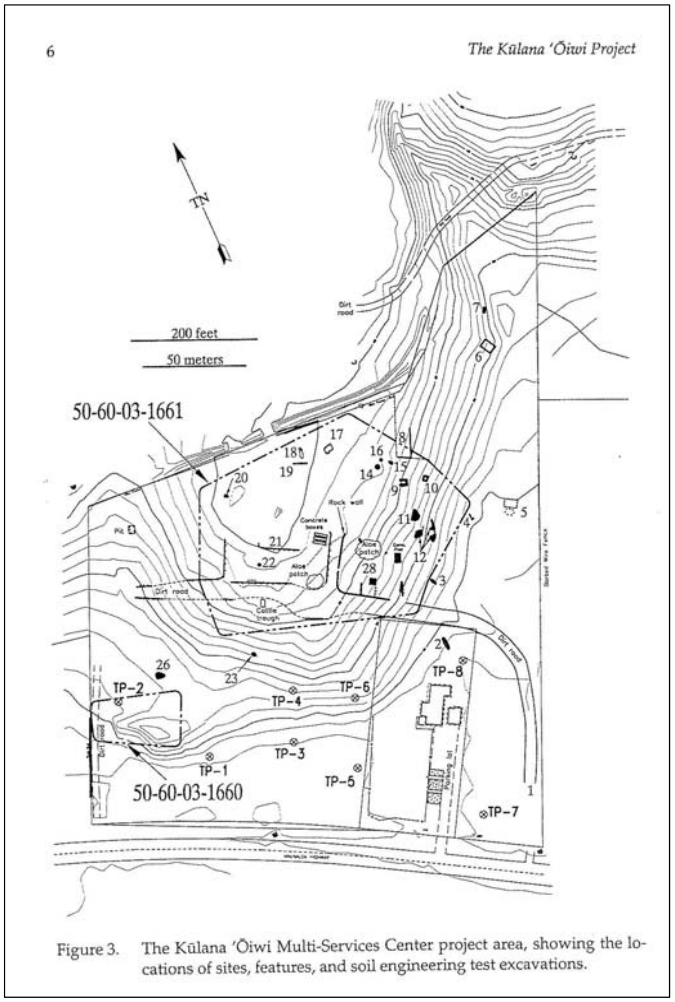
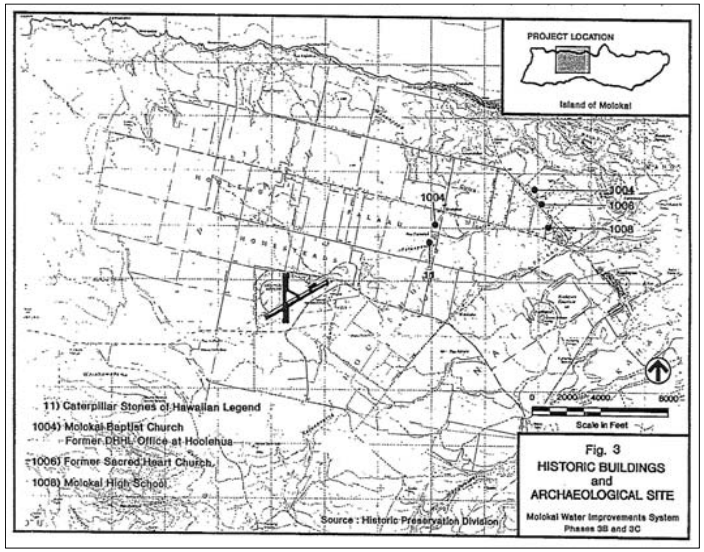


Figure 3. The Kūlana 'Ōiwi Multi-Services Center project area, showing the locations of sites, features, and soil engineering test excavations.

Figure 3 from Dye 1998.



"Fig. 3 Historic Buildings and Archaeological Site" from ????.

Table 2. Supplemental Inventory Survey Features, Site 50-60-02-843

Feature	Dimensions (L x W/Th x H) (m)	Description	Function	UTM Coordinates
1A	55.5 x 1.0 x 0.5	wall, stacked-faced	boundary/possibly religious	E 97530, N 2344742
1B	43.0 x 0.8 x 0.6	wall, stacked-faced	boundary/possibly religious	E 97568, N 2344738
1C	51.6 x 0.8 x 0.7	wall, stacked-faced	boundary/possibly religious	E 97597, N 2344739
1D	20.0 x 0.7 x 0.6	wall, stacked-faced	boundary/possibly religious	E 97646, N 2344723
1E	67.0 x 0.7 x 0.9	wall, stacked-faced	boundary/possibly religious	E 97559, N 2344759
1F	54.0 x 1.2 x 0.8	wall, stacked-faced	boundary/possibly religious	E 97650, N 2344791
1G	21.0 x 2.0 x 2.0	wall, stacked-faced	boundary/possibly religious	E 97644, N 2344739
1H	48.0 x 2.0 x 2.0	wall, stacked-faced	boundary/possibly religious	E 97628, N 2344749
2	1.9 (dia.) x 1.8	boulder	prominent natural feature	E 97650, N 2344750
3A	19.0 x 0.9 x 1.0	wall, stacked-faced	boundary	E 97622, N 2344852
3B	37.0 x 4.0 x 1.5	wall, stacked-faced	boundary	E 97598, N 2344862
3C	18.0 x 0.8 x 0.6	wall, stacked-faced	boundary	E 97564, N 2344872
3D	3.5 x 1.0 x 0.8	wall, stacked-faced	boundary	E 97558, N 2344871
3E	53.0 x 1.0 x 1.1	wall, stacked-faced	boundary	E 97535, N 2344885
3F	66.4 x 1.0 x 0.5	wall, stacked-faced	boundary	E 97482, N 2344929
4	11.2 x 1.3 x 1.3	wall, stacked-faced	temporary habitation	E 97525, N 2344870
5	Ext. 5.0 (dia.) Int. 2.0 (dia.) x 0.8	enclosure, circular	temporary habitation	E 97517, N 2344867
6A	Ext. 6.3 x 6.0 x 0.6 Int. 5.0 x 2.0 x 0.6	enclosure, oval	habitation/activity area	E 97512, N 2344871
6B	Ext. 2.5 (dia.) Int. 1.5 (dia.) x 0.6	enclosure, circular	habitation/activity area	E 97513, N 2344874
6C	Ext. 4.0 x 3.5 x 0.3 Int. 2.5 x 1.5 x 0.3	enclosure, oval	habitation/activity area	E 97516, N 2344873
7A	4.0 x 1.3 x 1.4	wall, stacked-faced	retaining wall	E 97509, N 2344887
7B	3.5 x 0.9 x 0.6	wall, stacked-faced	retaining wall	E 97501, N 2344885
7C	6.7 x 1.0 x 0.8	wall, stacked-faced	retaining wall/terrace	E 97499, N 2344884
8	11.0 x 3.0 x 0.9	wall, stacked-faced	retaining wall/terrace	E 97493, N 2344894
9	8.8 x 0.8 x 1.4	wall, stacked-faced	retaining wall	E 97498, N 2344894
10	30.0 x 1.0 x 0.8	wall, stacked-faced	water diversion	E 97456, N 2344798
11	4.5 x 0.7 x 1.1	wall, stacked-faced	retaining wall	E 97407, N 2344811
12	19.5 x 1.0 x 1.0	wall, stacked-faced	retaining wall	E 97579, N 2344814
13A	16.8 x [na] x [na]	wall, stacked-faced	water control	E 97710, N 2344703
13B	24.0 x [na] x [na]	alignment	water control	E 97719, N 2344716
13C	5.6 x [na] x [na]	alignment	water control	E 97715, N 2344728
13D	25.2 x [na] x [na]	alignment	water control	E 97713, N 2344720
13E	16.0 x [na] x [na]	alignment	water control	E 97705, N 2344715
13F	32.0 (dia.) x 0.4	depression	planting area	E 97690, N 2344719
14	9.4 x [na] x [na]	wall, stacked-faced	retaining wall	E 97608, N 2344789
15	7.5 x 0.5 x 0.4	alignment	slope retention	E 97639, N 2344794
16	23.0 x 1.0 x 0.4	wall, stacked-faced	boundary/retaining wall	E 97469, N 2344864

Table 2 from Hartzell 2000.

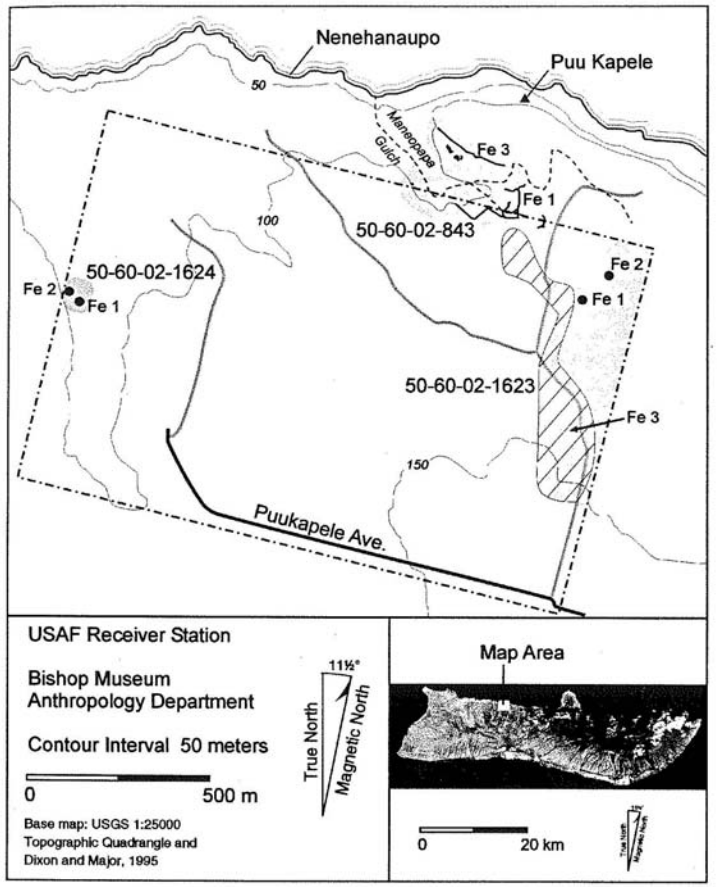


Figure 2. Historic Properties, USAF Receiver Station.

Figure 2 from Hartzell 2000.

Appendix F

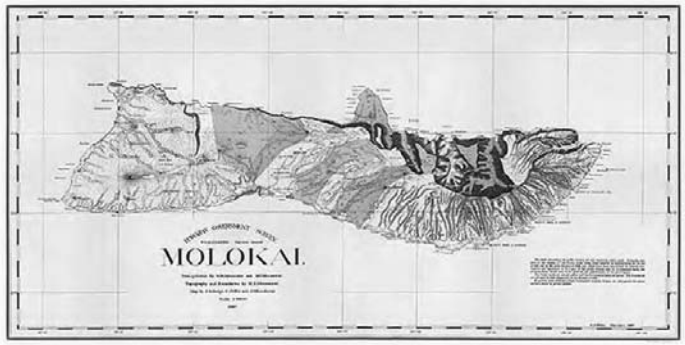
CULTURAL IMPACT ASSESSMENT

Pacific Legacy

Historic Preservation

CULTURAL IMPACT ASSESSMENT FOR THE PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS WATER SYSTEM, PĀLĀʻAU, HOʻOLEHUA, NĀʻIWA, KAHANUI, AND KALAMAʻULA AHUPUAʻA, MOLOKAʻI ISLAND

[TMK (2) 5-2-002:999; (2) 5-2-005:999; (2) 5-2-006:999; (2) 5-2-007 por.; (2) 5-2-008 por.; (2) 5-2-009 por.; (2) 5-2-010 por.; (2) 5-2-012 por.; (2) 5-2-013 por.; (2) 5-2-021:999; (2) 5-2-023:009; (2) 5-2-024:999; (2) 5-2-025: 999; (2) 5-2-032 por.; and (2) 5-2-033 por.]



Pacific Legacy: Exploring the past, informing the present, enriching the future.

CULTURAL RESOURCES CONSULTANTS

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Kailua, O'ahu
Hilo, Hawai'i

California Offices:
Business Office
Bay Area
Sierra/Central Valley

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CULTURAL IMPACT ASSESSMENT
FOR THE
PROPOSED IMPROVEMENTS
TO THE DEPARTMENT OF
HAWAIIAN HOME LANDS WATER SYSTEM,
PĀLĀʻAU, HOʻOLEHUA, NĀʻIWA, KAHANUI,
AND KALAMAʻULA AHUPUAʻA, MOLOKAʻI ISLAND

[TMK (2) 5-2-002:999; (2) 5-2-005:999; (2) 5-2-006:999;
(2) 5-2-007 por.; (2) 5-2-008 por.; (2) 5-2-009 por.;
(2) 5-2-010 por.; (2) 5-2-012 por.; (2) 5-2-013 por.;
(2) 5-2-021:999; (2) 5-2-023:009; (2) 5-2-024:999; (2) 5-2-025: 999;
(2) 5-2-032 por.; and (2) 5-2-033 por.]

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January 2016

ABSTRACT

As part of the Environmental Impact Statement process, PBR Hawaiʻi has requested a Cultural Impact Assessment (CIA) for the proposed Hoʻolehua Water System PWS 230 Improvements, located on various Department of Hawaiian Homes Lands (DHHL) properties [TMK (2) 5-2-002:999; (2) 5-2-005:999; (2) 5-2-006:999; (2) 5-2-007:029, 030, 035, 039, 040, 055, 076-080, 082-085, 090, 999; (2) 5-2-008:001, 002, 004-006, 029, 043, 044, 046, 079, 084, 086, 091, 099, 102, 122, 123, 999; (2) 5-2-009:012, 016, 018, 026, 999; (2) 5-2-010:001-004, 007; (2) 5-2-012:034, 035, 999; (2) 5-2 013:010, 020, 021; (2) 5-2-021:999; (2) 5-2-023:009; (2) 5-2-024:999; (2) 5-2-025: 999; (2) 5-2-032:068, 070; and (2) 5-2-033:047-053, 058, 061] in the *ahupuaʻa* of Pālāʻau, Hoʻolehua, Nāʻiwa, Kahanui, and Kalamaʻula in the central portion of the Island of Molokaʻi. Under Act 50, the Hawaiʻi State Department of Health "Guidelines for Cultural Impact Assessments" mandate that the subject property be studied as well as surrounding areas where construction or development have impact potential. These guidelines also recommend personal interviews with traditional cultural practitioners and knowledgeable informants on cultural practices. This assessment is based upon archival research alone. Every attempt was made to locate and speak with individuals knowledgeable about the cultural practices in the vicinity of the project area, but no interviews were scheduled or conducted.

The results of archival research indicate that the central portion of Molokaʻi, including the Pālāʻau, Hoʻolehua, Nāʻiwa, Kahanui, and Kalamaʻula Ahupuaʻa, has a long and rich cultural and legendary history. However, little is mentioned of the specific properties in which the DHHL Water System Improvements are to be made. Further, it is uncertain that the locations in which the activities occur are within the Area of Potential Effect (APE). Hence, the proposed development of the DHHL Water System Improvements Project is not forecasted to significantly impact any ongoing cultural practices.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Frontispiece: 1897 W.D. Alexander, Hawaiian Government Survey Map of Molokai. [Note text: "The lands comprising the public domain are now classed as public lands. Formerly, they were of two classes, (1) the Crown lands, being those reserved by Kamehameha III for his private use in the great division of 1848, and which have been transferred by descent, conveyance and legislation to be a part of the public domain, and (2) Government lands, the revenues from which were to be used for the maintenance of the government. The Crown Lands are colored yellow and the Government lands are green. The boundaries are the same as were designated in the division of 1848. In general these lands have Land Commission Awards, Grants, etc. throughout the choice sections owned by private parties."

1.0 INTRODUCTION

Pacific Legacy, Inc., under contract to PBR Hawai'i, conducted a Cultural Impact Assessment (CIA) as part of the Environmental Impact Statement (EIS) for the proposed Department of Hawaiian Home Lands Water System Improvements project. The subject areas are located in the *ahupua'a* of Pālā'au, Ho'olehua, Nā'iwa, Kahanui, and Kalama'ula [TMK (2) 5-2-002:999; (2) 5-2-005:999; (2) 5-2-006:999; (2) 5-2-007:029, 030, 035, 039, 040, 055, 076-080, 082-085, 090, 999; (2) 5-2-008:001, 002, 004-006, 029, 043, 044, 046, 079, 084, 086, 091, 099, 102, 122, 123, 999; (2) 5-2-009:012, 016, 018, 026, 999; (2) 5-2-010:001-004, 007; (2) 5-2-012:034, 035, 999; (2) 5-2 013:010, 020, 021; (2) 5-2-021:999; (2) 5-2-023:009; (2) 5-2-024:999; (2) 5-2-025: 999; (2) 5-2-032:068, 070; and (2) 5-2-033:047-053, 058, 061] in central Moloka'i (Figure 1).

1.1 PURPOSE

In keeping with Articles IX and XII of the state constitution, the goal of a CIA is to promote and protect cultural beliefs, practices, and resources of Native Hawaiians as well as other ethnic groups and collective groups (OEQC 2011: 3-4). The general purpose of this CIA is to protect and preserve all cultural practices and resources within the project area and surrounding areas that may be impacted by the proposed project. To do so, cultural practices, features, and practitioners must be identified and assessed for potential impacts by the Proposed Action and alternative options. Finally, recommendations are provided to mitigate the potential impacts.

In the State of Hawai'i, under Chapter 343 HRS, and Act 50, SLH 2000, a CIA is required as part of the EIS process, and has the stated purpose to:

1. require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and
2. amend the definition of "significant effect" to include adverse effects on cultural practices.

According to these guidelines, types of cultural practices and beliefs may include those relating to subsistence, commercial, residential, agricultural, access-related, recreational, as well as religion and spirituality. The guidelines further state that cultural resources subject to a CIA may include: "traditional cultural properties or other types of historic sites, both manmade and natural, including submerged cultural resources, which support such cultural practices and beliefs" (OEQC 2011:4). To determine the effects of the proposed development on cultural practices, resources, and beliefs, the following tasks are undertaken:

1. identify and consult with individuals and organizations knowledgeable about cultural practices that may have taken place in the area;
2. conduct archival research about traditional practices that may have been conducted in the area;
3. describe the cultural practices that took place within the potentially affected area;

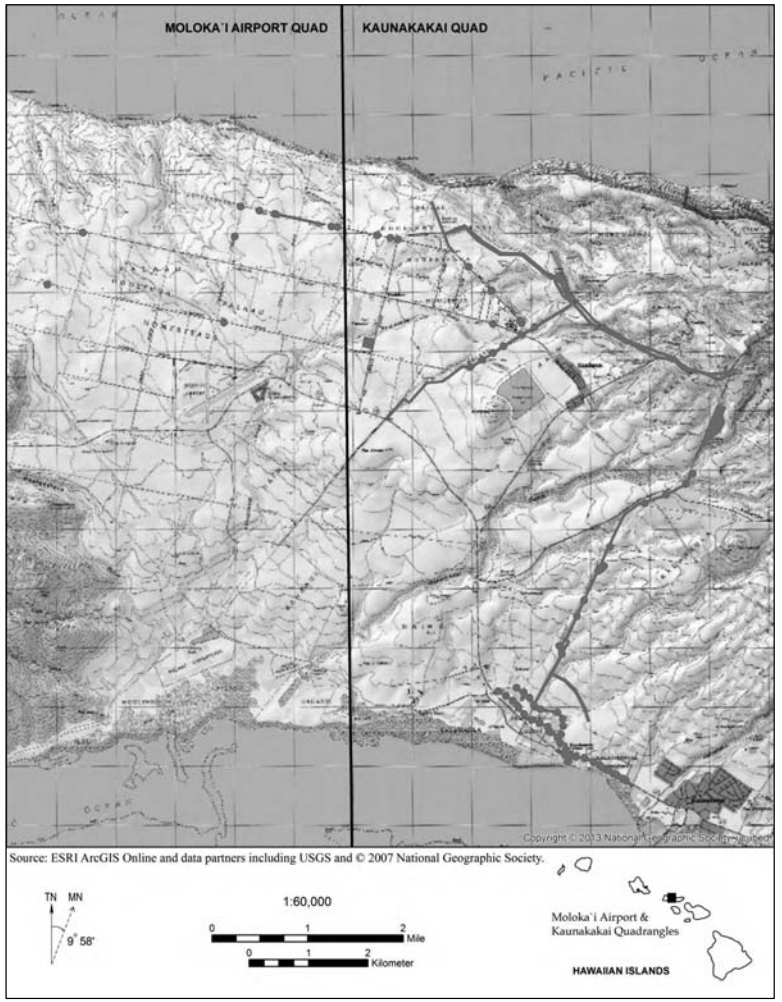


Figure 1. Topographic map showing project APE.

DRAFT - Cultural Impact Assessment
Proposed Water System Improvements
Pālā'au, Ho'olehua, Nā'iwa, Kahanui, and Kalama'ula Ahupua'a, Moloka'i
January 2016 1

4. assess the impact of the proposed development on the cultural practices that may have taken place within the potentially affected area; and
5. prepare a report on the findings resulting from the above investigations.

Appendix A provides a copy of the Guidelines for Assessing Cultural Impacts, adopted by the State of Hawai'i Environmental Council in 1997 and amended in 2000 (OEQC 2011).

1.2 METHODS

According to the Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts (OEQC 2011), it is recommended that preparers of CIA implement the following protocol:

1. identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or ahupua'a;
2. identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;
3. receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;
4. conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;
5. identify and describe the cultural resources, practices and beliefs located within the potentially affected area; and
6. assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices and beliefs identified.

These methods were strictly adhered to in the subject assessment. A rigorous effort was made to identify and locate persons knowledgeable about traditional practices that took place in the past or that are currently taking place in project area and broader geographical area that could potentially be impacted by the expansion project. The Office of Hawaiian Affairs (OHA) was consulted for a list of potential cultural informants, as well as various civic clubs. Appendix B provides a listing of potential cultural informants and their detailed contact history. Contact information was found for 17 individuals and organizations, all of which were solicited for participation. While several attempts at contact were made, no response was received from those asked to participate.

1.3 PROJECT AREAS

The proposed Moloka'i Water System Improvements project will include actions to improve reliability and functionality of water delivery to the 2,400 users connected to the Ho'olehua Water System—PWS No. 230 on Moloka'i Island. Proposed actions to the water system will occur at seven discontiguous areas located in portions of the *ahupua'a* of Pālā'au, Ho'olehua, Nā'iwa, Kahanui, and Kalama'ula in central Moloka'i (Figure 1 and Figure 2). Presented below is a brief description of the project Area of Potential Effect (APE) for the proposed Water System Improvements project.

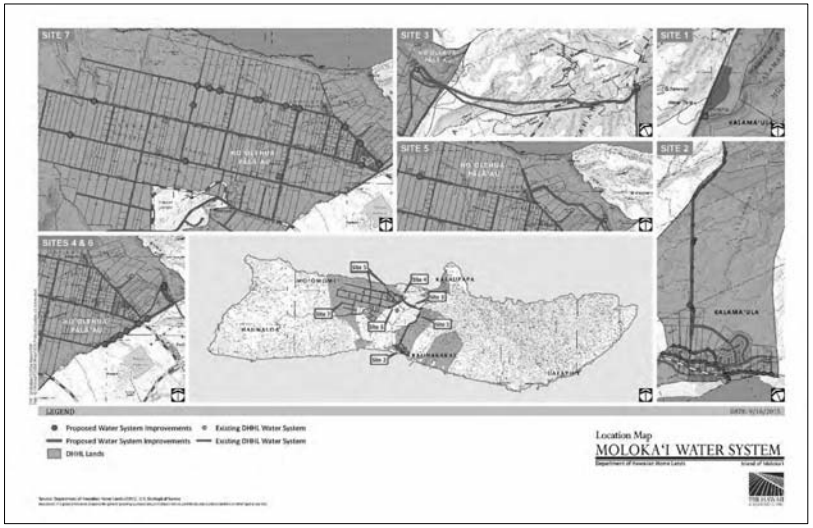


Figure 2. Location of project areas (courtesy of PBR Hawai'i).

Project Area 1 - Well Site Improvements

1-A 200,000 Gallon Storage Tank: This task includes the installation of 200,000-gallon storage tank and ancillary equipment to connect to the existing system, excavation, and disposal of overburden/construction debris. The new tank will be located adjacent to the existing 100,000-gallon tank on a hillside at the well site. The proposed storage tank is necessary to ensure uninterrupted supply of water to Kalamaʻula residents. This tank will augment, not replace existing storage facilities.

1-B Above-Ground Fuel Storage Tank (fuel AST): Currently, the water system has an emergency generator to supply electricity for pump operation when grid supplied energy is not available. The generator has fuel storage capacity to operate the generator for a maximum of 24-hours. A fuel AST would augment the existing capacity, increasing operational time of the generator during emergencies. Tasks associated with this action include the installation of a fuel AST at the well site, fuel lines connecting the tank to existing generator system, automation equipment, security fencing, excavation, and disposal of overburden/construction debris.

1-C Well Site Compound Modifications: The existing well site compound does not have adequate space to accommodate a new 200,000 gallon storage tank, ~~chlorination facility,~~ a fuel AST, and ancillary equipment associated with the solar energy system. Activities associated with this task include the redesign and construction of a roadway system for security and access, excavation, disposal of overburden/construction debris.

1-D Booster Pump Replacement: The existing booster pumps have reached their estimated useful life. Pump failure is a concern. This task requires the replacement of the existing booster pumps and ancillary equipment. It is anticipated that activities associated with the task will include grading, excavation, disposal of construction debris, demolition debris and overburden, as well as installation of a concrete pad, connection to the supervisory control and data acquisition (SCADA) and electrical systems as well as the existing water system. Reuse of existing site preparations such as a pre-existing concrete pad will be implemented if possible.

1-E Energy System Modifications: A one-megawatt solar system will be built on approximately seven acres within a 25-acre area at the well site identified for solar production by DHHL. This system would be comprised of approximately 3,500 to 4,000 fixed ground-mounted solar panels (depending on panel efficiency). An inverter bank will convert the DC output of the solar panels into AC that can be used to drive the existing pumps. The system will include an energy storage system to allow for pump operation at night or on cloudy days. The system will be connected to the Maui Electric Company grid for redundancy as well as to the existing diesel backup generators located at the well site. It is anticipated that the system will not export electricity to the Maui Electric Company grid. The existing electrical panels are nearing the end of their expected useful life. They will be replaced to meet existing requirements and modified as necessary to accommodate additional solar requirements.

Project Area 2 - Kalamaʻula Improvements

2-A All-Weather Roadway to Kalamaʻula Tank: The access road to the existing 200,000 gallon tank in Kalamaʻula is unpaved and severely eroded, hampering access for maintenance and operations. This task will modify the existing dirt roadway with the installation of a 3,000 linear feet (LF) of all-weather roadway from Hāʻena Street to the reservoir. The new roadway will follow the existing road corridor. Tasks included in this action will include roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

2-B Kalamaʻula Transmission Main and Lateral Replacements: The conveyance system in Kalamaʻula is not a looping system, occasionally resulting in lower pressure, and water sitting in pipes for a longer than optimal period of time. Additionally, portions of the existing galvanized transmission lines are over 30 years old and have reached the end of their useable life. This task will include the installation of new larger capacity mains and 15 laterals along approximately 5,600 LF in Kalamaʻula. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

2-C Valves Replacement: One Pressure Relief Valve (PRV), 20 Gate Valves (GV), 9 Air Relief Valves ARV) and associated ancillary equipment in Kalamaʻula have reached the end of their useful life due in part to the harsh environmental conditions. This task will include replacing PRV, GV, and ARV valves and realigning manholes as necessary. This project will also require limited excavation at each valve site and debris disposal.

2-D Fire Hydrants: Harsh environmental conditions have reduced the life expectancy of most fire hydrants in the coastal are of Kalamaʻula. Replacement of the deteriorated hydrants will improve fire protection capabilities in the areas. This task will include the replacement of approximately 30 fire hydrants.

Project Area 3 - Kauluwai Tank and Transmission Improvements

3-A Kauluwai Tank Transmission Main: A section of the 6-inch main transmission line at the existing 1.0 MG Kauluwai tank is approximately 12 feet above the lowest portion of the tank. As a result, the water stored at the base of the tank cannot be utilized. This task would redesign and replace the lower main increasing the useable storage capacity to the tank design capacity. Some excavation and associated disposal of debris is also anticipated. It is anticipated that completion of this tank will reduce water stagnation in the bottom of the tank.

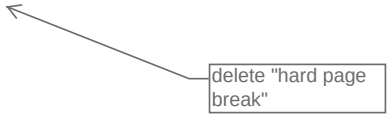
3-B Kauluwai to Hoʻolehua Transmission Main: The existing main was constructed utilizing a 6-inch transite (asbestos) pipe. Integrity of the existing pipe is a concern. This task requires the replacement of 11,000 LF of piping. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

Project Area 4 – Hoʻolehua Tank Site Improvements

4-A Ho‘olehua Tank Improvements: The tanks should be modified to improve safety and automation. This task, 4-A has been subdivided into four subtasks as described below. In addition to the subtasks described, this task will include site preparation, installation of ancillary equipment and disposal of construction debris/overburden.

4-A-1 Automation of Level and Flow Control Valves: Water flow from 1.0 MG reservoir to the two 3.5 MG tanks located in Ho‘olehua requires manual operation of a gate valve. Changes in demand require manual adjustments. This sub-task would connect these tanks to the SCADA system and allow for automated adjustments providing more consistent water delivery. The sub-task will also include construction of a new control valve vault, installation and connection of control equipment to existing system and ancillary equipment.

4-A-2 Replacement of Exposed Vertical Piping and Valves: Some of the exposed pipes and valves are corroded. This sub-task would assess and replace corroded ancillary equipment.



4-A-3 Exterior Ladder: The exterior ladder is unsafe. This sub-task would replace or repair the existing ladder and safety railing system to meet OSHA safety requirements.

4-A-4 Tank Repair: There are two 3.5 MG tanks located at Site #4 that were placed in operation approximately 80 years ago. While the tanks are still operational, the concrete is showing signs of wear and is crumbling in some areas. Rebar supports show substantial rusting. This sub-task would repair the tanks.

4-B All-Weather Roadway to 3.5 MG tanks: The existing access road to the 3.5MG tanks in Ho‘olehua is unpaved and located on non-DHHL lands owned by Kualapu‘u Ranch and subject to their authorization. This task will develop a new road within DHHL landholdings. The new roadway will extend from Pālā‘au Road approximately 5,280 LF to the 3.5 MG tanks. Tasks included in this action will include grubbing, grading, roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

Project Area 5 – Ho‘olehua Transmission and Fire Protection Improvements

5-A Ho‘olehua to Veterans’ Cemetery to Lihi Pali Avenue Transmission Main: The existing water main is comprised of a mix of one to three inch pipes of various materials. It does not extend to the Veterans’ Cemetery, nor does it provide service to several homesteads along the northern extent of Lihi Pali Avenue. This task would include the replacement of the existing main and extend service to Veterans’ cemetery and then on to Lihi Pali Avenue with approximately 11,000 LF of 8-inch main. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

5-B Fire Protection: The Veterans’ Cemetery as well as the homesteads in this section of Ho‘olehua do not have fire protection. This task would improve brush fire protection as well as provide fire protection for existing homes in the vicinity through the installation of 17 fire hydrants between Ho‘olehua and the Veterans’ Cemetery. Tasks included in this action will include excavation, disposal of overburden/construction debris in addition to the installation of fire hydrants.

5-C Pu‘ukapele Transmission Main: The existing 1.25 inch galvanized transmission line is over 30 years old and has reached its useable life. Main breaks interrupt service to the areas. This task includes the replacement of approximately 3,350 LF of transmission main and laterals, and the installation of two new fire hydrants. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals not being replaced.

Project Area 6 – Ho‘olehua Pressure Breaker Tank Facility Improvements

6-A All-Weather Roadway to the Pressure Breaker Tank: The existing access road to the 19,500 gallon pressure reducer tank in Ho‘olehua is unpaved and inaccessible during heavy rains. This task will modify an existing dirt roadway. Approximately 7,920 linear feet (LF) of all-weather roadway will be installed from the intersection of Kūle‘a and Mo‘omomi Avenue to Farrington Avenue. The new roadway will follow an existing,

overgrown road corridor. Tasks included in this action will include grubbing, grading, roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

6-B **Ancillary Equipment Improvements:** Several of the equipment located at the Pressure Breaker Tank Facility such as the butterfly valves have reached the end of their useful life. This task will replace equipment in kind. This project may include limited excavation, disposal of demolition/construction debris and replacement of equipment.

Project Area 7 – Hoʻolehua Maintenance Yard Improvements, and Scattered Valve and Hydrant Replacements

7-A **Valve and Hydrant Replacement:** Seven Pressure Relief Valve (PRV), seven Gate Valves (GV), five In-line Valves (IV)11 Air Relief Valves (ARV), up to five fire hydrants and associated ancillary equipment in Hoʻolehua have reached the end of their useful life. This task will include replacing hydrants, PRV, GV, IV, ARV valves and realigning manholes as necessary. This project will also require limited excavation at each valve site and debris disposal.

7-B **Maintenance Yard Improvements:** The Maintenance Building, built in 1969 is not large enough to house necessary equipment and materials needed to maintain the water system. Based on an evaluation of the existing structure, the deterioration of support structures dictated building replacement rather than expansion of the existing. This task will include the demolition of the existing structure, re-use of the existing concrete pad and expanding it to accommodate a 4,800 square foot warehouse type facility. In addition, critical equipment necessary for emergency maintenance, safety and operations of the water system will be stocked/housed at this facility. At a minimum, the equipment identified will include a forklift, front-end loader and replacement pumps. A fire hydrant and water meter will be installed to provide fire protection for the building and surrounding DHHL lands. An additional concrete pad, up to 2,400 square feet, will be constructed to accommodate outside storage, loading, unloading, and parking. Tasks included in this action will include grubbing, grading, excavation, disposal of demolition, overburden, and construction debris as well as the installation of fire hydrant and ancillary equipment and construction of the building and concrete pad.

2.0 ARCHIVAL RESEARCH SUMMARY

This section is a synthesis of records documenting traditional and mythological accounts associated with the DHHL Water System Improvements Project lands and surrounding areas, as well as historic documentation and archaeological record. The names and locations of *ahupuaʻa* used in this section of the report are largely derived from information in *Place Names of Hawaiʻi* (Pukui et al. 1974).

2.1 Pre-European Contact Cultural Landscape

The island of Molokaʻi is imbued with elaborate oral traditions that account for the pre-Contact history of the island as well as its many colorful legends and myths. According to Pukui et al. (1976:156), Molokaʻi is also referred to as *Molokaʻi nui a Hina* (great Molokaʻi, child of Hina) and *Molokaʻi pule oʻo* (lit. Molokaʻi [of the] potent prayer). It has been documented that some Molokaʻi *kūpuna* disagree with the conventional spelling for Molokaʻi. According to Kirkendall and Cleghorn (2009:95), two interviewees suggested the correct spelling is Molokai, meaning "the sea," although the conventional spelling since the resurgence of Hawaiian language classes in the 1970s and 1980s added the ʻ*okina*.

The origin of Molokaʻi itself has many interpretations (Fornander 1916-1917, 1919-1920; Pukui et al. 1976; Kamakau 1991). In "The Song of Pakui," Molokaʻi Island is said to be born of Wākea, who is seen as the ancestor of all Hawaiians, and his third wife, Hina (Fornander 1919-1920:360). Another traditional account of the island's origin as told by the historian Kahakuikamoana. In the tradition of Opuukahonua, Hinanuiakalana birthed Molokaʻi with Kuluwaiea of Haumea as the father (Fornander 1916-1917:2). Alternatively, according to Fornander (1916-1917:12) some historians maintain that Wākea put his hands together and himself created the island. Yet another oral tradition holds that the islands were all magically grown from pieces of coral by a fisherman named Kapuheeuanui under the instruction of a priest named Lauliala'amakua (Fornander 1916-1917:22).

Beckwith (1976) writes of one of the early mythos of Molokaʻi in the story of Pahulu, the goddess who once ruled over Lānaʻi, Molokaʻi, and a portion of Maui. In her account of this tale,

> Pahulu was a goddess who came in very old times to these islands and ruled Lanai, Molokai, and a part of Maui. That was before Pele, in the days when Kane and Kanaloa came to Hawaii. Through her that "old highway" (to Kahiki), starts from Lanai. As Ke-olo-ewa was the leading spirit on Maui who possessed people and talked through them, so Pahulu was the leading spirit on Lanai. Lani-kaula, a prophet (kaula) of Molokai, went and killed off all the akua on Lanai. Those were the Pahulu family. Some say there were about forty left who came over to Molokai. The fishpond of Ka-awa-nui was the first pond they built on Molokai…Three of the descendants of Pahulu entered trees on Molokai. These were Kane-i-kaulana-ula (Kane in the red sunset), Kanei-ka-huila-o-ka-lani (Kane in the lightning), and Kapo. About four hundred trees sprang up in a place

> where no trees had been before, but only three of these trees were entered by the gods. The Lo family of Molokai, a family of chiefs and kahunas, are descended from Pahulu. Many of them are well-known persons today (Beckwith 1976:108).

Molokaʻi has also always been known as a center for learning, from training of priests to the tradition of *hula*. Molokaʻi was known in pre-Contact times, as far back as the tenth century, as producing powerful *kāhuna* (Beckwith 1976:10,108; James 2001:121) and prophets (Summers 1971:13). In the story of Pahulu, "…About the time of Liloa and Umi, perhaps long before, chiefs flocked to Molokai. That island became a center for sorcery of all kinds. Molokai sorcery had more mana (power) than any other. Sorcery was taught in dreams. All these Molokai aumakua were descendants of the goddess Pahulu…" Beckwith (1976:108). Though the exact location is not known, aspiring *kāhuna* were apprenticed at Kēʻieʻie in Mahana, which is in east central Kaluaʻkoi Ahupuaʻa. According to James (2001), in the 12th century, Kaikololani, a warrior chief of Maui, brought his war fleet to Molokaʻi and slaughtered scores of its people, which prompted the priests of Kēʻieʻie to deliver a deadly prayer, killing all warriors, save for Kaikololani, who returned to Maui to tell the tale of Molokaʻiʻs great *kāhuna*. This story particularly upholds the island's poetic name of *Molokaʻi pule oʻo*. The famous sorcerer, prophet, and counselor, Lanikaula, was born in Pukoʻo and laid to rest in Keopukaloa, Molokaʻi, sometime in the late-16th century. He is credited with killing all of the *akua* on Lānaʻi (Beckwith 1976:108, 110-111). Molokaʻi is also said to be the birthplace of the *hula* (Handy and Handy 1972:511; James 2001:121). It is said that a *wahine* from Molokaʻi, named Laka, sometimes seen as a goddess or a manifestation of Kapo, was the creator of the *hula.* She is also credited with starting the first and most revered *hula* school at Mauna Loa, on the west end of Molokaʻi.

Beckwith (1976) brings up some additional tales from pre-Contact Molokaʻi, such as the story of Kao-hele, a noted runner from Molokaʻi who was renowned for his remarkable skills. In the tale of Kao-hele, she outlines his feats, stating:

> Kao-hele, noted runner of Molokai, is pursued in vain by Kahekili's men when they come to make war on Molokai. They station relays, but he outdistances them all, hence the saying, "Combine the speed to catch Kaohele" (E kuʻi ka mama i loaa o Kaohele). At one time chiefs and people are crowded at a famous cliff for the sport of leaping into the bathing pool below, and Kaohele, finding himself headed for this cliff and closely pursued, leaps across to the opposite bank, a distance of thirty-six feet. Kao-hele is runner and protector for four chiefs who live at the heiau of Kahokukano on Molokai and have a fishpond mountainward. He is killed by a slingstone in a battle with men from Hawaii but his chiefs escape (Beckwith 1976:339)

This tale not only hints to the fitness and athleticism of Molokaʻiʻs men, but how courageous and dedicated they are to their chiefs. Another tale is the "Legend of Kana and the rescue of Hina" that largely takes place on the island of Molokaʻi (Beckwith 1976:464).

Although Molokaʻi was typically subject to rule by Oʻahu and Maui chiefs, who often fought for control over the small island, at times it was politically independent (Kirch 1985:7). The first recorded ruling chief of the island is Kamauaua, believed to have ruled sometime in the 13th century (Summers 1971:5; Fornander 1880). Later, there were a number of internal wars between chiefs of Koʻolau and Kona in the centuries that followed his victory. Though all failed

to hold power for long, there were episodes of external conquest by chiefs of Oʻahu, Maui, and Hawaiʻi (see Summers 1971 for details of these histories). Summers (1971) presents some of the genealogical information from the prehistoric era and details the connections obtaining between Maui Island and Molokaʻi which date back to the 16th century and Kihaāpiʻilani.

There were a number of factors that gave Molokaʻi a reasonable amount of importance within the larger sociopolitical system of pre-Contact Hawaiʻi. The island's central position, and because it was most often without a strong political center, caused Molokaʻi to be a pawn in the 18th century pre-contact wars of conquest. The island was a resource base for the support of armies and a staging area as they moved among the larger islands in the chiefly wars (Tuggle 1993a:10). An abundance of fish, as evidenced by the density of fishponds, was likely a lure to the island. Some of the most impressive *heiau* in all of Hawaiʻi were built facing the numerous fishponds along the southern coast, which indicates the importance of these fishponds to the ruling chiefs in pre-Contact history. Another indicator is the presence of fine quality basalt which was extensively quarried on the western end of the island (ibid).

2.1.1 The Natural World

Conversely, the mundane, or lifeways and land use, of pre-European contact Hawaiians are also part of the cultural landscape and are interpreted through archaeological research in conjunction with oral histories and recorded traditional accounts. Handy and Handy (1991) provide some commentary on general land use patterns of ancient Hawaiians that are applicable to the general project area. As marine resources represent the main source of protein in the traditional Hawaiian diet, Handy and Handy (1991) suggest that upland agriculture was typically preceded by or correlated with the productiveness of an area's coastal fishing grounds. *Mauka* lands were intensively developed in areas where coastal fishing grounds were easily accessed. On Molokaʻi, the windward *pali* coast was famous for taro while the western plateau and southern coast of the island was planted in sweet potato (Handy and Handy 1991).

Traditionally in Hawaiʻi, environmental zones were perceived and determined by various natural features and resource criteria (Handy and Handy 1991:54-56). The following is a summary of Handy and Handy (1991:54-56) description of the terrestrial environmental zones:

1. *Ko Kaha Kai*: Land by the sea, or coastal region providing marine resources (fish and other marine animals, seaweed and salt). "Kaha was a special term applied to areas facing the shore but not favorable for planting.
2. *Kula*: The plains or sloping lands (without trees) above the coastal region.
   a) *Kula kai:* Seaward plains.
   b) *Kula uka*: Inland or upland slopes (towards the mountains).
3. *Kahawai:* The place (having) water. The area beyond or intersecting the *kula* lands. This upland zone provided suitable agricultural sites and abundant naturally occurring resources which were used for religious, domestic, and economic purposes.
4. *Wao:* Wilderness
   a) *Wao kanaka:* Region of man. Lower forest, providing hard wood (*koa*) for spears, utensils, and logs for canoes; *lau hala* (pandanus leaves) for thatch and mats; *māmaki* for bark cloth (*tapa*); *kukui* (candlenut) for oil; wild yams, roots, and sandalwood.

b) *Wao akua*: Region of deities. …remote, awesome, seldom penetrated, source of supernatural influences, both evil and beneficent.
c) *Wao ma'ukele*: Rain forest. Here grew giant trees and tree ferns (*'ama'u*) under almost perpetual cloud and rain.

The DHHL Water System Improvements Project lands are predominantly located in the following environmental zones: *Ko Kaha Kai, Kula kai,* and *Kula uka.*

2.1.2 Life in the Ahupua'a

With great variations of geological features, each *ahupua'a* had its own dynamic resource management system that was based on traditional customs upheld by the *kapu* system, or ancient religious law. The *ahupua'a* typically extended form the coast to the nearest mountain top or ridge and resources from the land and sea were equally distributed within the *ahupua'a.* Lyons (1875) describes the geographic nature of the *ahupua'a* as well as the movement of resources from mountain to sea and vice versa, stating:

> The Ahupuaa ran from the sea to the mountain, theoretically. That is to say the central idea of the Hawaiian division of land was emphatically central, or rather radial. Hawaiian life vibrated from *uka,* mountain, whence came wood, kapa, for clothing, olona, for fish line, ti-leaf for wrapping paper, *ie* for rattan lashing, wild birds for food, to the *kai,* sea, whence came *ia*, fish, and all connected therewith. Mauka and makai therefore fundamental ideas to the native of an island (Lyons 1875: 104).

Thus, resources needed for daily life were best grown in or collected from the habitats that they were best suited for and likely distributed, through trade, gifting, or taxes, from *mauka* to *makai* or vice versa within the *ahupua'a.*

The *ahupua'a* was also an important socio-political unit in the pre-Contact era, each unit with its own hierarchy. Kirch (1985) holds that *moku* were independent chiefdoms, divided into a number of radial land divisions, referred to as *ahupua'a,* with subdivisions of *'ili* and *mo'o* within. According to Kirch (1985),

> Each ahupua'a was controlled by a lesser chief, who in turn appointed one or more stewards to oversee production, organize work parties, collect tribute, and in other ways represent the chief. Ahupua'a were economically self-sufficient to some degree, although differences in the local resource base (agricultural land, water resources, stone for tools, and so on) resulted in differences in the production patterns of individual land sections. Within the ahupua'a, there were yet smaller sections and divisions, especially the 'ili and mo'o, which were held and worked by extended households or groups of commoners.

According to Handy and Handy (1991), for the purpose of taxation, the chief political subdivision of the pre-Contact era was the *ahupua'a,* which was generally under the management of the *konohiki* (steward or caretaker). The term *ahupua'a* itself is derived from the fact that each coastal *ahupua'a* boundary was marked with an altar (*ahu*) which held a carved wooden effigy of a pig (*pua'a*) head during the Makahiki festival, when harvest tributes (taxes) were offered to the god of rain. Handy and Handy (1991) refer to the lower chief who represented the *ahupua'a* as *ali'i 'ai ahupua'a*, which translates to English as "chief who eats the

ahupua'a" (1991:48). Yet, according to Malo (1951:142) the *konohiki* was tasked with collecting levies from the *maka'āinana* (commoners; literally "people that attend the land") of the *ahupua'a* for the king and of the *ali'i 'ai ahupua'a.* The word *konohiki* is defined by Pukui and Elbert (1986) as the, "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" (1986:166). Thrum (1924) wrote that the *konohiki* was a local representative or steward of the landlord owner whose privileges and duties were, "…practically those which go with that position in any land and in common with his brethren today in Russia or Ireland he had his failings and was not always popular among his fellows…" (1924:60).

Handy and Handy (1991) liken the *ahupua'a* tenure system to western share cropping, where "sharing between the chief and tenant was comprehensive and reciprocal in benefits" (1991:48).

2.1.3 Traditional Hawaiian Land Divisions

The pre-Contact economy of the Hawaiian Islands was based upon agricultural production that worked within a tiered system of land divisions (Lyons 1875; Malo 1951; Handy and Handy 1991; Kirch 1985). In 1875, Curtis J. Lyons, the distinguished surveyor published an article in *The Islander* on land issues, which identified the *ahupua'a* as the principal subdivision in a *moku* (district). In this article, he states:

> ...Its name is derived from the *Ahu* or altar; (literally, pile, *kuahu* being the specific term for altar) which was erected at the point where the boundary of the land was intersected by the main road, *alaloa,* which circumferenced each of the islands. Upon this altar at the annual progress of the *akua makahiki* (year god) was deposited the tax paid by the land whose boundary it marked, and also an image of a hog, *puaa,* carved out of kukui wood and stained with red ochre. How long this was left on the altar, I do not know, but from this came the name, *ahupua'a,* of the pile of stones, which title was also given to the division of land marked thereby…(Lyons 1875:103-104).

The islands are divided into several sections called *moku* (districts), in which are particular subdivisions referred to as *'okana* (a portion) or *kalana* (a division) (Lyons 1868:67-68; Malo 1951:16-17). According to Curtis J. Lyons (1868) in *Nūpepa Kuakoa*, these units are further divided into *ahupua'a*, which are the main units of traditional Hawaiian land division. Within *ahupua'a* are *'ili*, followed by *'ili pa'a, 'ili kūpono, 'ili lele, lele, mo'o, mo'o 'āina, paukū, kīhāpai, kō'ele,* and *kuleana* (Pukui and Elbert 1986). However, in some cases, the *'ili kūpono* or *kū* were a type of sovereign *'ili* within an *ahupua'a* that were not made to pay tribute to the chief (Thrum 1890:106). Within the *paukū* are dry land patches, referred to as *kō'ele*, *hakuone*, and *kuakua* (cultivated specifically for the chief; listed from smallest to largest). In general, high elevations or mountains are called *mauna,* but mountains or mountain summits located centrally on the island are termed *kuahiwi*, while the peaks or ridges on top of the *kuahiwi* are called *kualono.* In 1868, Lyons continues to describe the geography of the typical *ahupua'a* as well as the Hawaiian names for these geological features, stating:

> The place where trees are small below the fern belt is termed kuahea (hillock section); below it is the wao (wild place), also called waonahele (wilderness) and wao eiwa (ninth wilderness). The place where trees grew taller below the wao eiwa is the wao maukele, and a little below it again is the waoakua (spirit

region); next below that is where voices increase and, hence, called wao kanaka (people's sphere), because there the people cultivate food. Below that is apaa, and next is ilima (where this plant of the Sida genus is found), and below it is pahu (stake or land mark). Below pahu is kula (open country) adjoining habitations, and seaward of the village is the shore, where it joins the sea. Such was the island divisions by the ancient people of Hawaii.

…Places that stand high up in this and that locality are called puu (mounds or peaks) ; if they stand in a row they are a lalani puu, or pae puu (a line or range of peaks or hills)…High places of the earth lying narrow is a lapa (ridge), or kua lapa (shoulder ridge). If the ridges are many they are called olapalapa (rough protuberances). Deep places lying lengthwise are called kahawai, awawa, or owawa (streams, valleys or ditches). Lengthy, solitary places are called alanui (roads), and kuamoo (paths), and if it continues circuiting the island it is a highway. In places where the path is steep it is called piina or hoopiina (ascending path), kooku (hill slope), and auku (up hill road). Descending paths are termed ihona, alu, kalua, and hooihona, and the place where men would rest is oioina (a resting place). Places where water flows continually are streams (kahawai). Inland places are kumu (source) and seaward places are called nuku (point or outlet). Where water is led to places of cultivation, that is called an auwai (watercourse); where the water joins the sea is a muliwai (river) ; waters borne within the land are lokos (lakes or ponds) (C.J. Lyons 1868 as cited in Thrum 1921:67-68).

Perhaps the ancient Hawaiians created names for an array of topographical features and slight variations within the *ahupua'a* as a way to help keep the dynamic *mauka-makai* economic structure organized.

The project areas are spread across five *ahupua'a* - Pālā'au, Ho'olehua, Nā'iwa, Kahanui, and Kalama'ula – the names of which each have a traditional meaning. According to Pukui et al. (1974:176) Pālā'au literally translates as "wooden fence" or "enclosure" and is the name of a three land divisions in the Airport and Kaunakakai quadrangles, north central and southwest Moloka'i; State park overlooking Ka-laupapa peninsula and containing the phallic stone Ka-ule-o-Nānāhoa. Ho'olehua literally translates as "acting the expert," and is the name of a village, land divisions, and Hawaiian homestead area near Moloka'i airport, as well as "said to be named for a chief (see Hikauhi)" (Pukui et al. 1974:51-52). The meaning of Nā'iwa is literally "the frigate birds" but "perhaps named for the beauty of the birds" (Pukui et al. 1974:160) common to these three land divisions in the Kaunakakai quadrangle. The literal translation of Kahanui is simply "large place" with land section in the Airport Kaunakakai, and Kamalō quadrangles (Pukui et al. 1974:63). Kalama'ula is actually a "variant name for Kau-ka hōkū, Kona, Hawai'i." On Moloka'i, Kalama'ula, literally "the red torch or red lama tree," is the first of the Moloka'i homesteads and a land division in the Kaunakakai quadrangle (Pukui et al. 1974:74).

2.1.4 Traditional Names of the Winds of Moloka'i

According to Handy and Handy (1991), the gourd is a personification (*kino lau*) of Lono, the Hawaiian god of agriculture and fertility. "Lono is the gourd; the cosmic gourd is the heavens whence some winds, clouds, and rain" (Handy and Handy 1991:220). In a rite called the

"Gourd Prayer" (*Pule Ipu*), a male child was blessed in order that he grow with the vigor of the gourd vine. Lines in the *Pule Ipu* refer to the gourd Lono-kui-kui, Lono-the-punisher, and his wife, Ka-papa-ia-kea, who bore him 12 children. They "dwelt in an underground cavern (*lua*), in which grew famous gourds (his children)….One of these gourd-children…was undoubtedly the great wind-gourd named La'a-ma'o-ma'o. La'a-ma'o-ma'o (Distant-La'a), or Ka-ipu-makani-a-La'a-ma'o-ma'o (the-wind-gourd-of-the-far-away-heavens-of-La'a) was a name for the sky and its horizons whence come the winds and rains" (Handy and Handy 1991:219-220).

Traditional Hawaiian stories and legends (*mo'olelo*) have been told and retold; shortened and changed; published in turn-of-the-century Hawaiian language newspapers; and collected for books. In 1902, Moses Kuaea Nakuina published *Moolelo Hawaii o Pakaa a me Ku-a-Pakaa, na Kahu Iwikuamoo o Keawenuiauni, ke Alii o Hawaii, a o na Moopuna hoi a Laamaomao* wherein he retold a "traditional legend collected from various sources, edited, and expanded" (Nakuina 1992:vii) upon in order to preserve its knowledge. In 1992, an English version of Nakuina's *mo'olelo* was published as *The Wind Gourd of La'amaomao: The Hawaiian Story of Pāka'a and Kūapāka'a, Personal Attendants of Keawenuia'umi, Ruling Chief of Hawai'i and Descendants of La'amaomao*, with the translation done by Esther T. Mookini and Sarah Nākoa.

This mo'olelo retells the story of Pāka'a and Kūapāka'a, who were personal attendants to the ruling chief of Hawai'i, Keawenuia'umi. Pāka'a was the son of a Hawai'i Island ali'i, Kūanu'uanu, and La'amaomao, a "cherished keiki, brought up with care and refinement" in a family of status on Kaua'i (Nakuina 1992:2). Before the birth of his son, Kūanu'uanu returned to Hawai'i Island and La'amaomao was shunned by most of her 'ohana and left to care for Pāka'a alone in a cave by the beach. When Pāka'a was a boy, he pestered his mother, always asking 'who is my father?' When La'amaomao finally answered she told him, "as for your real father, you must look for him. I'll tell you this: to find him, you must look to the east, where the sun rises and a certain local wind blows. Your father lives there." Pāka'a determined that he would search for his father when he was "old enough to travel the seas between the islands" (Nakuina 1992:2).

As he grew up, Pāka'a worked hard to help his mother and learned the ways of a fisherman. Pāka'a was clever and determined and when he learned that an *ali'i* of Kaua'i would be touring the islands, he asked his mother's permission to join the traveling company. "'Ae, go,' said his mother. 'But go with humility and modesty;…and when you arrive in the presence of Keawenuia'umi, you'll know you've arrived at the place where your father lives'" (Nakuina 1992:14). Then:

> La'amaomao lifted the lid of a large calabash and took out a small, long, highly polished gourd in a woven bag. The gourd was covered securely. She turned to her keiki and said, "I'm giving you this gourd which belonged to your extraordinary kupunawahine for whom I was named. Her bones are inside the gourd. While she was alive, she controlled all the winds of the islands-she had them under a supernatural power. She gathered all the winds and put them into this gourd, where they're still kept. She memorized one by one the names of all the winds from Hawai'i to Ka'ula. On windless days, she could remove the cover and call out the name of a wind, and the wind in this gourd would blow. This gourd, called 'the wind gourd of La'amaomao,' was famous.

Before she died, she entrusted me to put her bones inside this gourd and care for them until I had a child. Then I was to give the gourd to the child to watch over. You're my only child, so now I'm giving the gourd to you. You must look after it according to the wishes of your extraordinary kupunawahine.

You must care for this gourd because it has been handed down from the kupuna. This gourd has great value-you may not think so now, but when you sail with the ali'i and arrive at an area where no wind blows and the canoes are becalmed, say that the winds are at your command; all you have to do is call, and the winds will blow.

When you're laughed at, remove the lid of the gourd and call for a wind. The wind will blow and bring the canoes to shore. The ali'i will be grateful to you, and you'll be loved and valued by him.

Before Pāka'a sailed off, La'amaomao taught him the names of all the winds, along with the prayers, songs and chants concerning them, and when she was done, Pāka'a had memorized everything. Then he took the wind gourd and tied it with a cord he had made, prepared his other things for the voyage, and left home (Nakuina 1992: 14-15).

The "grand traveling company" landed first at Waikīkī and from O'ahu, then continued on to Moloka'i, Maui, and eventually, Hawai'i Island, where he found his father in the chief's court (Nakuina 1992:15). He trained under his father, Kūanu'uanu, to become a *kahu iwikuamo'o* (personal attendant). When his father died, Pāka'a took on the role of *kahu* for the old *ali'i*. There were those jealous of Pāka'a's position and skill and eventually, he fell out of favor with the old *ali'i* and his court. Pāka'a left Hawai'i Island, taking the wind gourd his mother had given him, and sailed to Moloka'i where he met and married Hikauhi. They had a son named Kūapāka'a, who was dutiful and learned all his father had to teach (Nakuina 1992).

Many years after Pāka'a left Hawai'i Island, the old *ali'i* became tired of the poor service and greedy manners of his *kahu* and went in search of Pāka'a. Word traveled that Keawenuia'umi was searching for him, so Pāka'a and Kūapāka'a "gathered their supplies for catching uhu…took along with them the wind gourd of La'amaomao" (Nakuina 1992:30) and paddled out in their fishing canoe to await the entourage of his *haku* (master, lord). A fleet of canoes ladened with the people of Keawenuia'umi's court was approaching and each time they encountered a canoe, Kūapāka'a would ask his father, 'Is this perhaps my haku?' and Pāka'a would reply, 'It is not your haku' (Nakuina 1992:33). Kūapāka'a asked that same question throughout the night and finally Pāka'a said, 'When you see the first rays of the sun, you'll see your haku' (Nakuina 1992:33). At first light, Pāka'a ordered Kūapāka'a to call out to his *haku*, and the *keiki* began to chant:

The canoe is yours,
Great Hawai'i of Kāne,
Great Hawai'i, land of the sun,
The sun emerges, emerges,
The sun emerges at Ha'eha'e,
With a strong affectionate love for my haku,
Not my real haku,
But a companion of the giddy sun,

The Kona sun without food,
Its loved one has arrived,
Arrived along with Hilo of Kāne,
Hilo of Kāneakapu,
Hilo, land of Kanilehua,
Beloved companion of Keawenuia'umi mā,
There sits Keawenuia'umi,
The canoe is yours
(Nakuina 1992:37-38).

Once greetings were exchanged, the *keiki*, Kūapāka'a, asked Kahikuokamoku, the Kuhina Nui, to bring the canoe fleet ashore, because, "'Tomorrow is a calm day for sailing; today will be stormy: there are thick cumulus clouds resting above Kawainui and the ridge of Wailau; when these clouds are blown with full force, a terrible storm will rage; when the clouds are at rest again, then good weather will follow'….There were no clouds yet-only the clouds in the wind gourd" (Nakuina 1992:38). The Kuhina Nui asked, "how is it a calm day like today can be a bad day for sailing? The sky is clear, the mountain tops are exposed, and the banks of clouds are asleep at the horizon" (Nakuina 1992:39). Kūapāka'a responded, "This will be a stormy day, a windy day. You came here from Hawai'i with the winds from there; Hawai'i is a windy land and they blow here from behind you." The Kuhina Nui challenged Kūapāka'a, a *keiki* of Moloka'i, on his knowledge of the winds of Hawai'i Island. Kūapāka'a chanted the names of the winds for the west side of the island; he chanted the names of the winds for the east side of the island. Kahikuokamoku asked his advisers if it would storm and they contradicted Kūapāka'a. Encouraged by a look from his *haku*, Kūapāka'a chanted the rest of the names of the winds of Hawai'i; he called out the names of the O'ahu winds (Nakuina 1992). Still the kānaka were uncertain and Kūapāka'a was challenged to recite the names of the winds of Kaua'i. As thunder and wind roared in the distance, "Keawenuia'umi told Kūapāka'a, 'Your chanting is delightful, ē ke keiki, but you blundered when you called for a wind. I told you I'm searching for my kahu, Pāka'a, and you called out, 'Bring here, bring here the wind,' so now that a wind is coming I won't come ashore with you.' …Let's go.'"

"The kānaka readied their paddles to go as their ali'i had ordered, but Lapakahoe didn't want to go because he was fascinated by the keiki's chanting, so when the kānaka in the middle and astern began to paddle, Lapakahoe quickly ordered the kānaka toward the bow…to hold back on their paddles to prevent the canoe from moving. The pebbles stirred, and the sand scattered on the sea bottom beneath the canoe, but the canoe remained in the same place, as if it were anchored."

Kūapāka'a looked at Lapakahoe, then said to Pāka'a, "The ho'okele ordered the kānaka to paddle, but some of them are holding back with their paddles, so the canoe is stalled."

Keawenuia'umi was getting very angry at the keiki and commanded the kānaka to paddle. Kūapāka'a told his father, "The ali'i os very angry with me and has shouted at the hoewa'a to paddle on."

His father said, "Chant," so the keiki chanted:

Hurry! hurry!! hurry!!!
The sky is oppressive,
The earth is distressed,

Harmful spirits in the light,
The mischievous ones rise,
The mischievous ones tarry,
The ʻiwa is aloft,
It's a windy day, it's going to rain,
The water flows, the ʻōpae surface,
The rocks are exposed;
Where the sea rages, the moi remains,
Where the sea spurts, the ʻanae spawns,
Where the tide is low, the pūloa is struck,
The pāki'i is stepped on, the ʻulae is trampled,
The ʻina is pried up, the wana is hooked,
The honu comes up for air on a windy day,
Where the tides rises, the manini remains,
Where the shoals are rocky, the uoa turns over,
Where the sea is blue, the manō swims,
At the deep-sea fishing grounds, kāhala is hooked,
Where chewed kukui nut is spit to calm the sea, the uhu is netted,
Caught by those in front, silently, noisily,
The rain borne on the Mālua wind falls,
The winds turn over,
Haualialia of Kaunakakai,
Ihuahu of Kawela,
Akani at Wāwāʻia,
Pohaku-kupukupu at Kamalō,
Reaching Kalaʻe Loa of Lehua,
ʻUalapuʻe, a step away
From Kaluaʻaha and Mapulehu[1]
(Nakuina 1992:48-49).

Now, Pākaʻa had a plan of revenge that required the *ali'i* who had blackened his name to Keawenuiaʻumi, go ashore. When asked, the advisors to Keawenuiaʻumi continued to respond,

> "ʻAʻole, there's no storm coming-the keiki is wahaheʻe-a liar. Where are the clouds? Where are the cloud banks? Where is the rain? Where is the wind? Where is the thunder? Where is the lightening? What makes you think the keiki is telling the truth? This is your day to sail to Kaʻula, where you'll find your kauwā, Pākaʻa." (Nakuina 1992:52).

Pākaʻa urged Kūapākaʻa to improvise another chant of terrible storms and rough seas; a chant of the destruction and death of the party; but they were still resistant to taking shelter on the island. Finally, Pākaʻa tells his son to "call out the names of the winds of Maui and Molokaʻi":

There, there, the windy clouds rest,
The Paliale is Hilo's wind,
Pākiʻele is of Waiākea,
Hāna's winds are ʻAimaunu,

[1] Pākaʻa's knowledge of fishing grounds and fishing is revealed in this chant, which also alludes to his plan to catch the two hoʻokele (whom he refers to as the uhu) with his carefully laid plot. The places named at the end of the chant are located along Molokaʻi's southeast and south-central coast, where Pākaʻa lived and fished.

Kaomi, Kāpae,
Hoʻolua, Lauawaawa, Paiolopaowa, Halemauu,
Kui, Kona;
Koholā-lele as well,
ʻAi-loli is of Kaupō,
Moaʻe is of Kahikinui,
Papa is of Honuaʻula,
Nāulu is at Kanaloa,
Hau descends from the uplands of Kula,
It's the wind of that place,
Searching the pili,
Nau is the wind of Kula,
ʻUlalena is at Piʻiholo,
ʻŪkiu is of Makawao,
The Puukoa rain is at Kokomo,
The Elehei rain is at Liliko'i,
The gentle, cool rain there,
Haule-aku is at Mauoni,
Hau-aku is at Keālia,
Kaumuku is of Papawai,
Olaukoa is at Ukumehame,
The wind that tears apart the hale at Olowalu,
Kilihau is the rain there,
Kololio is of Waikapū,
Iʻa-iki is of Wailuku,
ʻOʻopu is of Waiheʻe, The Kauaʻula wind blows,
Roaring up the cliffs of Kahakuloa,
Of Waiuli at Honolua,
Pohakea is at Māhinahina,
Līlīlehua is at the cliffs,
ʻImihau is of Kekaʻa,
Nahu is at Kāʻanapali,
Unuloa fills the sail,
Maʻaʻa is of Lahaina,
Settling at Kamaiki,
Moaʻeaʻe-aku is at the cliffs,
Alani is of Liloa,
Paʻalā is of Kaha,
The children of Ku and Naiwi,
Kaiāulu is at Pulupulu,
Holio is on the plains,
Holio is the wind,
Laukoaie is on the plains,
Holo-kaomi is at Poamaʻi,
The wind that doubles up is of the lowlands,
Kupa and Okea are the winds,
Paiolua is of the ocean,
Hoʻolua, Moaʻe,
Kaʻele are at Pālāʻau,
Haualialia is there,
Laumaomao is at Punakou,

Lawelawe-maile is at Kekaha,
Halealono is at Kaluakoʻi,
The Iki-aea is at Hoʻolehua,
The Kuapa is at Moʻomomi,
The Kiola-Kapa wind of Kaeleawaa,
Waikaloa is the wind
At Puʻupāpaʻi, Puʻuanahulu, Kaʻamola,
The wind that buffets the canoes of Molokaʻi,
Makaolehua at Kaluaʻaha,
The Puʻu-lolo at Mapulehu,
Puʻu-makani at ʻAhaʻino,
Pakaikai is the wind that blows at Wailua,
Hoʻolua is at Hālawa,
Hoʻolua-noe is at Hālawa,
Hoʻolua-kele is at Hālawa,
Hoʻolua-pehu is at Hālawa,
Hoʻolua-kaʻipou is at Hālawa,
Hoʻolua-wahakole is at Hālawa,
Hikipua is at Hālawa,
Hakaano is at Hālawa,
Laukamani is at Hālawa,
Puʻuohoku is at Hālawa,
Okia is at Hālawa,
Ualehu is at Hālawa,
Laiku is at Hālawa,
Nāulu is at Hālawa,
Kēhau is at Hālawa,
Koipali is at Hālawa,
Līanu is at Hālawa,
ʻEhukai is at Hālawa,
Haualiʻaliʻa is of Kaunakakai,
Pai is of Kamiloloa,
Ihuanu is of Kawela,
Ekahanui is of Kamalō,
Akani is of Wāwāʻia,
Pohakupukupu is of Kaʻamola,
Heakai is of Kalaeloa,
Makaolehua is of Ualapuʻe,
Kipukaholo is of Kaluaʻaha,
Waikōloa is of Mapulehu,
Hukipepeiao is of Kūpeke,
Launahelehele is of Honomuni,
Mauna-i-heleia is of Kainalu,
Kēhau is of Waialua,
Alopali is of Honouli,
Puuahoku is of Moakea,
Kololio is of Keōpuka,
Hoʻolua is of Halawa-nui,
Lau-kamani is of Hālawa-iki,
Hoʻolua-puakakalo is of Kaahakualua,
Kaaki is of Pāpala-loko,

Leia is of Kipipua,
Ekepue is of Wailau,
Puʻupilo is of Pelekunu,
Kiliʻoʻopu is of Makaluhau,
Kaupu-moa-ula is of Kalawao,
Koki-lae is of Kalaupapa,
Drink the water of birth in the uplands,
Makakuapo is of Nihoa,
Aikupala is of Kahanui,
Noe-ka-maile brings calm,
Kumumaʻomaʻo is of Kaluakoʻi,
Hoʻolua is that Moaʻe bringing clouds,
Hoʻolua is that Moaʻe bringing clouds,
Turning at Kalāʻau cape,
ʻŪkiukiu is of Kalamaʻula,
Making a new path there,
Burning the ʻai of that hot plain,
Paʻū-pili brings calm to Īloli,
Striking the sea at low tide
When the iʻa are gathered,
The burden of the Moaʻe wind,
The Moaʻe stays in the uplands,
The Moaʻe is at Kona,
Hoʻolua is at Koʻolau,
We float in the calm,
At the cape of Kalāʻau, the wind turns,
The deep hole foams up,
Koa is of Mālei,
It blows here and there on the coral reef,
Mālualua is of Hale-o-Lono,
Kumumaʻomaʻo is the Hoʻolua in the forest,
A roaring wind of Kona and Koʻolau,
The Koʻolau winds will bring you to the channel-edge,
The small canoes will be swamped,
Destroyed along with the large canoes,
The genitals will be dulled, the scrotums will shrivel up,
The hoʻokele will be disgraced,
The kāhuna will be disgraced,
The expert readers of storm signs,
That appear and persist,
That float and persist,
The small ukana, the large ukana,
The bailing cups carelessly left behind,
You'll come to rest on the shore of Haunama,
The kānaka with the long thighs,
The kānaka with the short thighs,
The fisherman of Kookoo-na-moku,
Crabs will tread on your teeth, and sleep,
The deaf aliʻi's life will be ended by the storm,
Ah! Come ashore through the channel,
While you're near, the haku,

While I'm near, the kauwā,
Await the calm day
For this is Welehu, the stormy month,
Makali'i, Kā'elo, Kaulua,
A red glow bursts forth,
In Nana the sea is calm,
Welo and Ikiiki[2]
Are when the fishermen's lines are wet,
Look how the ocean is far,
The island is near,
Bring the canoe ashore,
Search for Pāka'a, find Pāka'a,
Papai, Waimea, Moloka'i are stormy.
(Nakuina 1992:-54-58).

After another exchange between the canoes, "banks of clouds rose, storm clouds flew overhead, the skies darkened, lightening flashed, thunder roared, rain pelted down, and blustery winds blew-a terrible storm! (Nakuina 1992:63). In the end, "Pāka'a was victorious over his enemies who had come between him and his hānai. With the help of Kūapāka'a, his keiki, Pāka'a returned to enjoy the comforts and honors and carry out the responsibilities of an ali'i of Hawai'i" (Nakuina 1992:106).

In consonance with the *mo'olelo* of the Wind Gourd of La'amaomao, there are several named winds specific to the *ahupua'a* of the project areas (Table 1).

Location	Name of Wind	Translation/Meaning	Comment
Ho'olehua	Iki-aea	iki = small, little, slightly aea = to rise up; to raise the head; to come up from under water	-
Kahanui	Aikupala	Translation uncertain	-
Kalama'ula	'Ūkiukiu	Perhaps the same as 'Ūkiu, but a rain associated with Hikilei, Kaua'i; Diminutive 'Ūkiu wind; to blow gently, as this wind. Māewa ana ka 'Ūkiukiu o Honokoa, the gentle breeze of Honokoa flutters	Note: the Hawaiian Dictionary (Pukui and Elbert 1986:366) attributes the wind to Kaua'i while Nakuina (1992:57) locates it in the Kalama'ula *ahupua'a*
Pālā'au	Ho'olua	-lua = Name of a strong, north wind associated with Makaiwa, Kaua'i; Hāna, Maui; and Hālawa, Moloka'i. At Hālawa the name may be qualified by Iho, Ka'i, Kele, Pehu, Wahakole (Nak. 69). Ho'olua nui, big Ho'olua wind; *fig.*, to talk loudly and to no purpose	Note: the Hawaiian Dictionary (Pukui and Elbert 1986:213) attributes the wind to Hālawa while Nakuina (1992:56) locates it in the Pālā'au *ahupua'a*
	Moa'e	Trade wind. Moa'e kū, strong Moa'e	-
	Ka'ele	name of a wind of Ka-lele-wa'a, Moloka'i	-

[2] "Welehu is approximately November, the first month in the six-month rainy season called Ho'oilo (see note 43). Makali'i-about December; Ka'elo-about January; Kaulua-about February; Nana-about March; Welo-about April; Ikiiki-about May" (Nakuina 1992:115-116).

2.1.5 Traditional Mo'olelo

Ancient *mo'olelo* related to an *ahupua'a* help to explain the traditional names, what kinds of natural resources were found within, what stories and mythological figures are associated with them, as well as the chronicles and conflicts that may have occurred there. These facets of the cultural landscape help to provide a connection for modern day cultural practitioners to the land and their ancestors who dwelt in these *ahupua'a*. In addition, traditional *mo'olelo* about each *ahupua'a* is integral to understanding the cultural, historic, and spiritual significance of these lands.

Pālā'au and Ho'olehua Ahupua'a

The pre-Contact subsistence economy of the general area likely revolved around the cultivation of *'uala* (sweet potato, *Ipomoea batatas*). The people of Pālā'au and Kalama'ula were known for their skills in sweet potato cultivation (Summers 1971:38). The volcanic soil was considered good for *'uala* cultivation and rainfall during winter months would generally have provided ideal growing conditions. Numerous place names in the area reflect the importance of *'uala*, such as Kualapu'u (Sweet Potato Hill) and Pu'u Kape'elua (*pe'elua*, a caterpillar or army worm pest that feeds on the leaves of the *'uala*). According to Summers (1971: 36), "In the old days, Ho'olehua 2 was noted for growing sweet potatoes (Handy, 1940:157) and, on the plain where Moloka'i Airport is now located, Kamehameha I is said to have trained his warriors" (Cooke, 1949:112).

Cultural historian Harriet Ne told a story which was recounted by Major and Dixon (1995:28) about the *pe'elua* in which a young woman named Pele is visited nightly by a lover who disappears each morning. In order to find him, the villagers tie a piece of *kapa* (bark cloth) to his back. After searching, they find that he has changed into a giant *pe'elua,* with the *kapa* on his back to show that it is the same person. They burn him, which caused the giant caterpillar to burst, and myriad small *pe'elua* come crawling forth, eating the tender leaves of the *'uala* crops. To this day, caterpillars can be seen around the hill and it is considered the source of plagues of caterpillars that strip the crops of leaves every few years (Major and Dixon 1995:28). This is the story behind the "Caterpillar Stones" which are on top of the hill called Pu'u Kape'elua (Summers 1971:37).

Kalama'ula Ahupua'a

Few oral accounts have been recorded specifically about the *ahupua'a* of Kalama'ula. In the legend of According to Pukui et al. (1976:74), the name Kalama'ula literally translates to English as, "the red torch" or "red lama tree." However, Pukui and Elbert (1986) translate Kalama'ula to mean "a stone", or *humu'ula*, which is a red stone (jasper) that is used for adzes (as cited in Bush et al. 2001:9).

One story that takes place in pre-Contact Moloka'i and possibly the *ahupua'a* of Kalama'ula is the story of Manini-holo-kuaua, who was renowned as a swift thief (Beckwith 1976:10). In this story, the thief's *mo'o* grandmother is named Kalama-ula. The tale was written such:

> Manini-holo-kuaua…is known as a noted thief of Molokai, so strong he can carry away a whole canoe on his back and so swift he can escape all pursuit. His mo'o grandmother, Kalama-ula, lives in a cave in the uplands which opens and shuts at command, and it is his custom to run with his booty to this cave and hide it away there. When Ke-lii-malolo,

> the fleet runner of Oahu, comes to Molokai on a visit and in contempt of warnings leaves his canoe unguarded while he goes in for a bath, Manini lays claim to it and carries it away with all it contains to his cave in the uplands, into which he disappears before its owner can overtake him. Ke-liʻi-malolo engages the help of the two supernatural sons of Halulu, Kama-aka-mikioi and Kama-aka-ulu-ohia, and sails with them to Molokai. Manini, in con-tempt of his grandmother's warning, seizes their canoe also, but is overtaken by one of the men, who overhears his command and orders the cave to shut just as he is entering so that he is caught and crushed within its jaws. Within the cave are found innumerable possessions (Beckwith 1976:10).

Another tale from Kalamaʻula, "The Five Red Rays of Kalamaʻula," was recounted by Harriet Ne (Ne and Cronin as cited by Bush et al. 2001:9). In this tale, the name Kalamaʻula was explained as the name of a large, red rock. Near this rock, the love-stricken daughter of a Kalamaʻula area chief fell asleep awaiting her lover, a commoner she was forbidden to see. After being awakened by the sun's rays, she realized her lover did not meet her, so she struck the rock in anger and the rock was permanently emblazoned with five red rays of the sun.

2.2 HISTORIC ERA

The first descriptions of Molokaʻi are from Captain Cook. These descriptions were focused on the south western coast, as they harbored off of Kalaeloa, located near Kamola Ahupuaʻa. They described a scene with shelter from the trade winds, little wood, and yams (Cook 1785). About a decade later, Captain Vancouver described Molokaʻiʻs south shore and stated that the valleys appeared "verdant and fertile", with an abundant population and successful agriculture (Vancouver 1798: 201-203). William Ellis, an English Protestant missionary, arrived on Molokaʻi in the early 19th century and provided further commentary on the environment and people of Molokaʻi, indicating that there was little level topography, yet some areas evidence fertility, and estimated a population that exceeded Lānaʻiʻs (Ellis 1917).

However, Molokaʻi was known as the Lonely Isle in the early 1800s, since it was not a common destination for foreign ships at the same time as the other major islands were discovering the novelty of foreign goods. Early population estimates range from 3,000 to 8,000 around the turn of the century (DeLoach 1970:126). The large discrepancy is due to population fluctuations caused by war and the introduction of foreign disease, and the difficulty in traversing the countryside to obtain a reliable count. By the end of the 19th century, the population had decreased dramatically to approximately 2,500 as vast amounts of people moved to the city centers on the more populated islands (DeLoach 1970:133).

European interaction and influence on the indigenous population of Molokaʻi began 31 years after Vancouver's sojourn around the island. Molokaʻi was not immune to the influx of missionaries and other outsiders that came to islands. The plantation and ranching era on Molokaʻi are inexplicably intertwined due to the course of history which shaped the commercial ventures of the 1800s and 1900s. The first 130 years of western impact was a time of trial and error in pursuit of a suitable cash crop, which would allow the island to participate in Hawaiʻiʻs new commercial economy. The difficulty was mostly due to the lack of sufficient quantities of fresh water in areas of potential large-scale agricultural production. Because no monetary

enterprise was a lasting success, the majority of the population maintained the old ways (DeLoach 1970:130). During this time, the island's population center shifted from the fertile east coast to the central south coast, and the land between Kalamaʻula and Kūmimi was said to be the most populated (Summers 1971).

R. W. Meyer was, perhaps, one of the most innovative and influential individuals in the history of plantation/agriculture on Molokaʻi. Meyer was a multi-lingual immigrant from Germany who arrived on Molokaʻi in the 1840s. He married a local woman of Hawaiian and Samoan decent, and together settled in the uplands of Molokaʻi in Kalaʻe. His commercial ventures began with the introduction of a cattle ranch stocked with longhorn cattle, which he shipped to Honolulu (Judd 1936). Although Meyer's efforts at animal husbandry were less than successful, he was quite successful in horticulture. He grew a variety of crops including: coffee, corn, wheat, and potatoes. His crowning achievement was the construction of a horse drawn sugar mill, which still stands, and has been restored. This unique sugar mill is on the National Register of Historic Places, thereby assuring R.W. Meyer a place in the early written histories of Molokaʻi (Kirkendall and Cleghorn 2009).

Between 1870 and 1900, several larger-scale sugar plantations were started on Molokaʻi. One was at Moanui, which burned down. Another mill operated at Kamalō, but evidence suggests that by 1900, neither were in operation. Remnants of the pier at Kamalō and stone ruins at Moanui are visible today. In 1898, the American Sugar Company incorporated and started a sugar plantation on the plains of Molokaʻi. Subsequently, the American Sugar Company constructed a harbor and pier, as well as a railroad from the end of the pier to Pālāʻau on the Hoʻolehua plateau. The initial property was on 750 acres of which 500 were planted in young sugar cane. Water, or lack thereof, proved to be a reoccurring theme for the plantation. To address this issue, the company excavated irrigation ditches and dug wells in the lowlands, with steam pumps of 10,000,000 gallon capacity to lift the water (Judd 1936). This rapid removal of water decimated the freshwater aquifer, and drew brackish and sea water inland to the fields. As this unfortunate event destroyed the cane crops, American Sugar Company was forced into economic demise (Kirkendall and Cleghorn 2009). Sugar cultivation attempts at Kamalō and Moanui were more successful, albeit, by a small margin.

Continued economic distress created a need for another economic outlet. By 1920, Molokaʻi Ranch comprised the chief economic venture on the island in the form of beef cattle. Its success came at the decline of sheep, honey, and taro exports. According to Cooke (1949), the total area devoted to cattle production and grazing included 89,428.811 acres, 64,104.811 of which were fee simple and 25,324 constituted leased Government lands.

However, the first 20 years of the 20th century were not without economic trouble. A severe drought threatened the entire operation in 1908 (Cooke 1949). George Paul Cooke, soon-to-be ranch manager, stated that only 13.94 inches of rain fell at Kualapuʻu; the lowest since Governmental recordation began. At least five hundred head of cattle were lost to thirst and starvation. Ranch stockholders did not receive a positive dividend on their investments until ten years after the drought (Cooke 1949).

A proposal by Hawaiian Pineapple Company Ltd. was submitted to lease these lands for pineapple production upon the expiration of government land leases in Hoʻolehua, Pālāʻau, and Kalamaʻula in 1918. In 1922, pineapple cultivation on Molokaʻi spread to the west end of the *ahupuaʻa* of Kaluakoʻi. Lands above the five hundred foot elevation were leased to Libby, McNeill, and Libby for pineapple. Libby established a cable landing at Puʻu Kaiʻaka, north of Pāpōhaku Beach because of poor roads and transport systems. A few years later, Libby's expansion allowed for excavation and construction of a channel and wharf at Kaumanamana serving tug boats and barges, which was named "Kolo," as Kaumanamana proved difficult to pronounce (Cooke 1949).

The California Packing Company (CPC) obtained a lease to raise pineapples at Kalae and Puʻu o Hoku at about the same general time frame (1919). In 1927, CPC lands expanded through additional lease agreements for lands at Nāʻiwa and Kahanui. Additionally, a CPC ranch employee camp was constructed at Kualapuʻu and the company took over ranch lands and the camp at Maʻālehu, renaming it Kīpū (Kirkendall and Cleghorn 2009).

In 1920, Molokaʻi Ranch, under G.P. Cooke, tried their hand at dairy farming as the Mapulehu Dairy (Cooke 1949). The dairy cows were raised on corn and alfalfa, which proved to be successful. Raw milk from the Mapulehu Dairy was exported to Leahi Home (tuberculosis hospital) in Honolulu. This venture flourished for a number of years until 1933, when someone poisoned 16 of the cows with arsenic in the feed. The operation closed in Mapulehu, and moved to Kauluwai, which was in operation until at least 1949 (Cooke 1949).

By the mid 19th century, Europeans were established on Molokaʻi, and able to purchase lands after the Māhele, which legislated private property ownership in the islands. However, Hawaiian royalty also expressed interest in the island. Kamehameha V was a frequent visitor, and purchased land from Hawaiians on Molokaʻi for his country home, Malama, located on the beach near Kaunakakai. The platform is still visible, although unmarked. At his death, the estate of Kamehameha V (Lot Kapuāiwa) came to Charles R. Bishop through his wife, Bernice Pauahi Pākī Bishop. Through a *hui* action with individuals A.W. Carter, A.S. Hartwell, W.R. Castle, and J.B Castle, the group amassed approximately 70,000 acres of fee simple land (Cooke 1949; Judd 1936; Tuggle 1993b). The king also purchased cattle, which roamed the island at will due to their status as *kapu*.

The Hawaiian Homes Act was established in 1921, in a clear effort to allow native Hawaiians the opportunity to boost their standard of living by providing an economic outlet via homesteading (Kirkendall and Cleghorn 2009). Properties became available as homestead lands on Molokaʻi in Kalamaʻula Ahupuaʻa, which was initially called the Kalanianaʻole Settlement. Subsequently, other homestead areas were made available in Hoʻolehua and Pālāʻau Ahupuaʻa, on former Molokaʻi Ranch lands. Molokaʻi Ranch leased these lands primarily for the raising of pineapples. At this time, just 40 acre plots in Hoʻolehua were made available to applicants. In the spirit of self-sufficiency, homesteaders raised cattle, horses, sheep, chickens, pigs, and vegetables (Kirkendall and Cleghorn 2009). Seventy-nine homesteading families came to Molokaʻi in the first year deeming the program a success (DeLoach 1970:136). The island has since maintained a more traditional way of life than other islands thanks to its relatively low

population of which a high percentage is native Hawaiian, and there is a strong sentiment against outside interference in land affairs.

Perhaps one of the darker periods in the history of Molokaʻi is when the Leper Colony in Kalaupapa was fully active. The colony was initiated the mid-19th century, but remained in use well into to the modern era even after leprosy was later established as the treatable Hansen's disease. The story of over a thousand people brutally banished to die on a remote peninsula in Molokaʻi for contracting a misunderstood disease, is somewhat balanced by the enduring altruism of Father Damien and other attendees as well as the perseverance of those who suffered from the disease.

Pālāʻau and Hoʻolehua Ahupuaʻa

The early post-Contact history for the entire central region of Molokaʻi is very obscure though there is a fair amount history in regards to the early ranching days of the mid-1800s with the advent of commercial ranching and agriculture.

The waters along the north coast of Pālāʻau 2 are considered to be rich with marine life, though they are very rough during most of the year. Fish could have been collected with nets and *ʻopihi* (*Cellana* genus) are reportedly found in abundance along with sea urchin, *heʻe* (octopus), and *ula* (spiny lobster, *Panulirus* spp.). Passageway to the shore is not easily accessible. There are only a handful of paths and all are extremely dangerous (Major and Dixon 1995:26).

In view of the fine fishing grounds in deep water and on the reefs and shoals within reasonable distance from the islands, it is surprising that there are no vessels engaged in fishing. Several attempts have been made to establish vessel fisheries, but for various reasons they have met with failure.

Maly and Maly (2003:489) write about the short-lived endeavor of commercial vessel fishing off the coast of Pālāʻau 1. This interesting story provides a rare account of this coast and its resources during the end of the 19th Century. The story is outlined as follows:

> The last attempt was in 1898, when a number of persons in Honolulu formed a company and, at a cost of $6,600, had the gasoline schooner *Malolo* built to engage in this business. She was fitted out with six seines and one bag net, at a cost of $1,000, and carried a crew of four men. The fishermen were Japanese, who were hired at Honolulu. They had their own boats and lines, and the schooner towed them to the fishing grounds. A station was established at Palaau district, on Molokai, and an old fish pond there was purchased with the purpose of cleaning it out and using it for catching fish which came in through the entrance. It was the intention of the company to hire fishermen on the islands to work the nets, while the Japanese would engage in line-fishing, and the schooner would make regular trips to Honolulu with the catch. The fishing was to be done on the reefs about the west and south sides of the island of Molokai.
>
> Difficulty was at once encountered in the unreliability of the Japanese crew, who would go to Lahaina and other places and sell their catch. Another crew was collected, composed largely of white men, mostly beach combers, and they were taken to the fishing grounds, to work the nets principally. This plan also failed, owing to ignorance of the business on the part of the crew, and a third effort was made, this time with a crew of

> native Hawaiians and South Sea islanders secured at Lahaina. Twelve of these men were put on the island of Lanai and supplied with boats, nets, lines, and provisions. After a few hauls the vessel left for Honolulu with the catch, the understanding with the fishermen being that they were to continue fishing to secure a second cargo during her absence. When the vessel returned, however, half of the fishermen had deserted and the few remaining were carried to Lahaina. The whole business was abandoned in August, 1899, after the failure of an effort to get another gang on Maui.
>
> The captain of the vessel says there was no lack of fish at any time, and if the fishermen could have been properly trained to the work the experiment would have been a brilliant success. Most of the fishing was done with trolling and hand lines, as the nets would not work well on the coral reefs, frequently tearing, and the numerous sharks about the reefs also did much damage to them (Maly and Maly 2003:489-490).

Although this commercial venture was not successful, the account provides insights on how prolific the marine resources were in this area in the Historic era. Further, the story mentions modifications to the fishpond and the addition of a fishing station to the location.

The introduction of large mammals such as cattle, sheep and deer, in the nineteenth century would have caused a profound change in eating habits. In 1851, 200 cattle and 200 horses were roaming the island, and in 1852, the first sheep were introduced as Kamehameha IV and V intensified ranching throughout the latter half of the century (Major and Dixon 1995:40). Deer were introduced to the island by Kamehameha V in 1868, after which a thirty year *kapu* (taboo, in this case a royal prohibition on hunting) followed. Deer had become a common ingredient of the diet by the early twentieth century and have become thoroughly integrated into cultural lore and tradition (ibid: 25).

The Molokaʻi Ranch ran herds of sheep and cattle over most of central and west Molokaʻi and the Ranch's holdings in Kaluakoʻi, Pālāʻau, and elsewhere in the island remained the largest bloc of land in private ownership on Molokaʻi until May of 2008, when the Ranch ceased all its operations on the island. During the early Homestead days, 6,000+ acres covering much of the central and west parts of the island were divided into pasture land as part of the Pālāʻau community pasture.

Although livestock were kept, agriculture was the focus of Homesteading. The livestock never contributed as much to the economy as crops, especially the primary cash crop, pineapple. For years, favorable contracts with Libby, McNeill, and Libby and the California Packing Corporation allowed Hawaiian Homesteaders to reap profits, causing an influx of Kalamaʻula residential Homestead lot holders to apply for and receive agriculture lots in Hoʻolehua.
In the late 19th Century, Rudolph Wilhelm Meyer, who managed Molokaʻi Ranch for the Bishop family, began obtaining his own lands for pasturage. Meyer experimented with growing a diverse variety of cultivars within the next decade. Sugar cane became a major export for Hawaiʻi during this period and Meyer followed suit, cultivating sugar cane in 30 acres of his lands and building a small sugar mill of unique design in 1876 to process his cane into sugar and molasses. The Meyer Sugar Mill, although modest in size, is one of the last surviving 19th Century sugar mills. Meyer continued sugarcane production, from field to mill, until 1890. By 1890, Meyer acquired 2,936 acres in Kalaʻe, which is less than a mile east (ca. 1.5 kilometer) of the Hoʻolehua-Pālāʼau Homestead (Bluestone 1978).

Hoʻolehua was the first area to receive Hawaiian homesteads following the passage of the Hawaiian Homes Commission Act of 1920. Thirteen homesteaders settled in Hoʻolehua in February of 1923. Tomatoes, corn, watermelons, sweet potato and cucumbers were some of the first crops to be cultivated in the area. With the aid of irrigation water piped in from the windward side of the island, Molokaʻi has been promoted as the "breadbasket of Hawaiʻi" (Major and Dixon 1995:28).

The land of Pālāʻau was once known for its *kalo*. Summers (1971) quotes a native writer who said that taro was planted at Pālāʻau by Hoʻolepanui, a favorite of Kamehameha I, and his men who came from Hawaiʻi, after Kamehameha I had conquered Oʻahu.

> It was said that when one ascended to the top of Kaʻana and looked down on Pālāʻau on a clear moonlight night, the taro patches seen below are as close together as the stars above. Each patch made by the men of Hawaiʻi was named and the biggest one in the center of the many little ones was called Pehu. There is a tale attached to this name. These patches were planted only with the best liked varieties of taro: the *piko, haokea, kai, nohu* and ʻ*owene*. These were hard and long-rooted taros that did well in these brackish water patches. In mashing the taro the stone was worked back and forth (ʻ*anai*) instead of bringing the stone down on the mass (*ka Nupepa Kuʻokoʻa, 1922c*, as cited in Summers 1971:77).

Sugarcane cultivation was experimented in Pālāʻau 1 and possibly in parts of Pālāʻau 2 as well near the end of the 1880s. The American Sugar Company (ASCO) was a failure after a short run, and the company's holdings later became part of what is known as Molokaʻi Ranch.

There was once a village known a Pālāʻau located in Pālāʻau 2 along the coast, which may have been quite extensive in the early 19th century. The village was abandoned suddenly in 1853 after all of the men in the village were implicated in rustling, and were sentenced to five year terms in jail on Oʻahu. Pālāʻau was never reoccupied. The families of the jailed men followed them to Oʻahu. This ʻ*apana* appears to have been the population center for the *ahupuaʻa* in the 19th century, according to historical and contemporary ethnographic sources. Springs were known in the area to flow year round and an area just beyond the reef was considered a good natural harbor.

Kalamaʻula Ahupuaʻa

Kalamaʻula is commonly mentioned in the history of Molokaʻi. There is a reference to Kalamaʻula and the general Kaunakakai area as a place of military encampments during the 18th century wars of conquest. Kamehameha I had a base camp at Kaunakakai, and it was from this camp that his troops prepared to launch for his conquest of Oʻahu. One of his chiefs, Keʻeaumoku, was encamped at Kalamaʻula at the same time (Kamakau 1961:43; 70-71; 159; 171-172). Another reference to the area made by Kamakau (1961:149; 388), is in regards to the reconciliation between Kamehameha I, and Kalola, the mother of Kīwalaʻō, the defeated chief of Hawaiʻi. After Kamehameha had successfully conquered Maui, he traveled to Molokaʻi to secure the allegiance of the island's chiefs. At this time, he also met with Kalola, who was staying at Kalamaʻula, to persuade her to approve of his taking her granddaughter, the sacred Keōpūolani, as his wife. Shortly after Kalola agreed to the taking of Keōpūolani, she died and is said to have been buried in a cave at Kalamaʻula.

Kalamaʻula was also known for its sweet potato plantations. A Hawaiian writer described the cultivation of sweet potatoes in a 1922 Ka Nūpepa Kuʻokoʻa:

> …In these land divisions (kalana) of Kalamaʻula and Palaʻau in early days there were sweet potatoes on all the rocky (ʻaʻa) high lands and from these places came the sweet potato eaters who knew potato cultivation… there are two favorites of the sweet potato consumers of Kalamaʻula and Palaʻau, the kala and the kalaponi. (cited in Summers 1971:38)

Aside from dry land sweet potato cultivation, land use for the area likely centered on exploitation of marine resources and irrigated agriculture along stream bottoms and along the coastal plain. Rental receipts between the years of 1858 and 1861 show that rents collected by the *Konohiki* of Kalamaʻula include payment for coconut trees, taro patches, a squid fishery and a fishpond (Hommon and Ahlo 1983:14-15). In a review of documented fisheries and fishing rights recorded in the Mahele ʻĀina, Maly and Maly (2003) compiled a list of claims to ocean resources and fishing rights for the entire state. Of the 123 claims filed on Molokaʻi, Kalamaʻula contained two of these claims, one of which was granted to the Crown. A listing of Molokaʻi ocean resource and fishing right claims is provided in Appendix C. Fishing remains an active form of subsistence in Kalamaʻula to this day (Tomonari-Tuggle 1990:9).

The Kamehameha coconut grove called Kapuāiwa is located along the shore, just southeast of the Kalanianaʻole Colony, and is believed to have been planted by Lot Kapuāiwa (Kamehameha V), grandson of Kamehameha I in the 1860s. The king maintained a home, Hale Malama, on the beach in nearby Kaunakakai and had a strong affection for the island. The grove originally consisted of approximately 1,000 coconut trees, covering an area of approximately 10 acres. The trees were to represent each warrior that served under his rule and provided shelter for a freshwater spring that was used for bathing by the *aliʻi* (Group 70 2005: 5-9). As late as the 1920s, there were numerous known freshwater springs located within the coconut grove, but due to erosion, the shoreline has eroded and all but one of the springs can be observed flowing in the ocean (Bush et al. 2001:9). Several hundred descendants of the original trees now make up Kapuāiwa Grove.

The Kalanianaʻole homestead was developed in 1922. It was named after Prince Jonah Kūhiō Kalanianaʻole, its main promoter and supporter of the Hawaiian Homes Commission Act, which was a homesteading program enacted by the U.S. Congress in 1921. This program was created to place native Hawaiians, defined as "any descendant of not less than one-half part of the blood of the races inhabiting the Hawaiian Islands previous to 1778," on designated lands. The Kalanianaʻole homestead was to be a trial run for the concept of Hawaiian homesteading. In 1928, the homestead was deemed a success and plans were carried out to develop

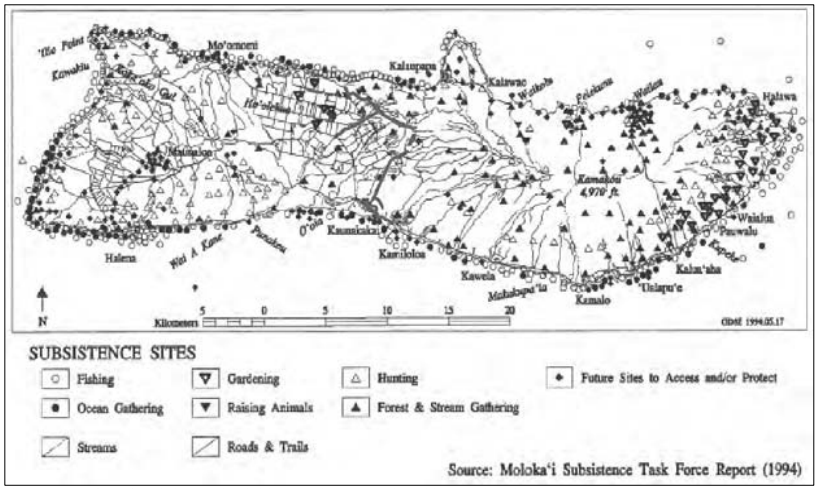


Figure 3. Location of "subsistence" activities practiced on Molokaʻi in 1994, in relation to the project areas (after McGregor 2012:48).

homesteads on all islands. During the first phase of development, twenty-two farm lots and thirty-three residential lots were established and in 1924, a second, larger phase was underway in what is now the Hoʻolehua-Pālāʻau Homesteads. By 1930, difficulties for farmers became apparent in the form of insect and pest problems, not to mention the high salinity in the spring water being pumped in for irrigation. It was soon realized that the area was not suitable for agriculture and the agricultural leases were exchanged for land at Hoʻolehua (Tomonari-Tuggle 1990:11). The lots in the Kalaniana'ole homestead were then reserved for residential lots.

2.2.1 Land Court Awards

Private land ownership was established in Hawai'i with the Māhele 'Āina, also known as the Great Māhele of 1848. Crown and *ali'i* lands were awarded in 1848 and *kuleana* titles were awarded to the general populace in 1850 (Chinen 1958). Awarded lands in this process are referred to as Land Commission Awards (LCAs). Over time, government lands were sold off to pay government expenses. The purchasers of these lands were awarded Grants or Royal Patent Grants (Chinen 1958). LCAs offer the native and foreign testimonies recorded during the claiming process, which shed light on what the land use of the area was in the early historic period. This information can be used to predict the types of resources may still be present in the project areas.

Research conducted on the LCAs indicates no LCAs were awarded within the current project area and only four LCAs wee claimed in the vicinity of the current project area. One claim (1861 by Kaea was not awarded) while the three remaining claims were filled and granted Royal Patent Numbers. Unfortunately, none of the testimonies contain specific information pertaining to the land use within these areas. The results are presented below in Table 1.

Table 1. Land Court Awards within Project Area

LCA No.	Claimant	Awarded	Royal Patent No.	Testimony	Claim
1861	Kaea	No	-		
7755	Kaluaokamano	Yes	6824	Native Register Vol. 7, pg 223 Native Testimony Vol. 10 pg. 360	½ of the *ahupua'a* of Kahananui [sic; this spelling is from the testimony in the Native Register]
11095	Kalino	Yes	6257	Native Register Vol. 7, pg. 327	An *'ili* called Mahana in Kalamaula, Cultivated the land for 8 years (ca. 10.00 acres)
11216:12	M. Kekauonohi	Yes	8132	Native Testimony Vol. 10 pg. 398	The *ahupua'a* of Naiwa

Two of the claims are large with Kaluaokamano being awarded ½ of the *ahupua'a* of Kahanui and M. Kekauonohi (the Great granddaughter of Kekaulike) being awarded the *ahupua'a* of Naiwa.

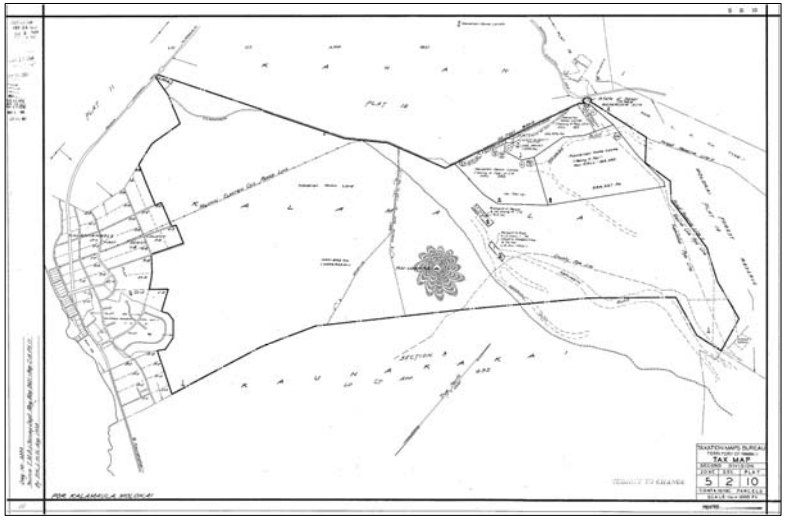


Figure 4. LCAs within Kalamaʻula Ahupuaʻa depicted on TMK Map

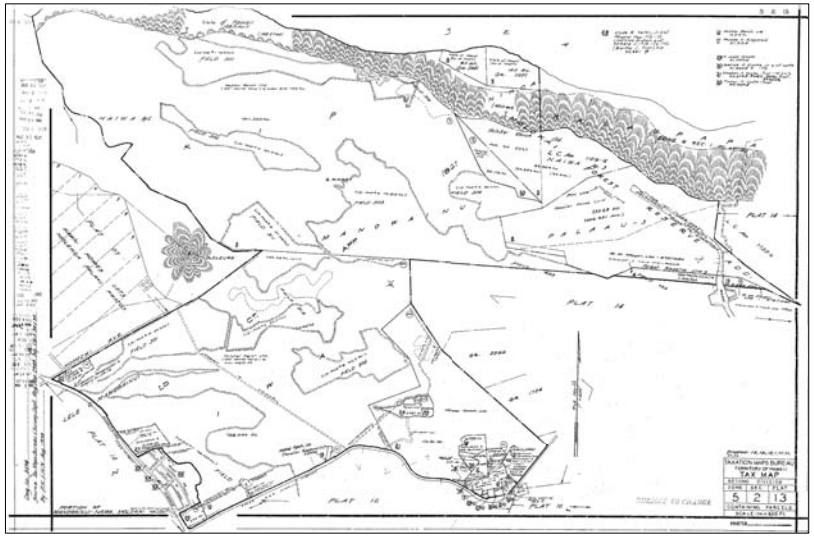


Figure 5. LCAs within the Nāʻiwa and Kahanui Ahupuaʻa depicted on TMK Map.

3.0 PREVIOUS ARCHAEOLOGY

The archaeological record for the central region of Molokaʻi is somewhat unbalanced. There are few records of any archaeological work completed within the northeast corner of Hoʻolehua, while there have been several archaeological surveys to the north, south, and east (Pfenning et al. 2011). The operation of pineapple plantations in Hoʻolehua and Pālāʻau transformed much of the land, and probably impacted or destroyed a great deal of the archaeological features that may have survived ranching (Major and Dixon 1995:43). Ethnographic sources have suggested that surface artifacts such as adzes, slingstones, ʻ*ulu maika,* and other recognizable artifacts have likely been removed over the years by ranch personnel, thus depleting the surface archaeological record (Major and Dixon 1995:51).

The majority of archaeological, historical and environmental information for these areas is provided by Summers (1971), and also from an inventory survey report from the USAF Receiver Station in Pālāʻau, which was created by the Anthropology Department of the Bishop Museum (Major and Dixon 1995) for the National Park Service. This report examines not only the specific project area, but provides a good synthesis of historical and archaeological data, often pointing out the lack of data, for the entire central region of Molokaʻi (i.e., the *ahupuaʻa* of Pālāʻau, ʻIloli, Hoʻolehua, Nāʻiwa, and Kahanui). Major and Dixon (1995:53) mention the recordation of over 15 sites in 1988 by Pantaleo (n.d.) in Pālāʻau 1 that appear to be associated with Pālāʻau Village, now abandoned. Unfortunately, no details were given about the sites, save for their rough locations, several of which are in Pālāʻau 1 (Pantaleo n.d. as cited in Major and Dixon 1995: 53, Figure 18).

Summers (1971) describe six sites throughout Pālāʻau 2 and four sites for Hoʻolehua 2. Two *heiau* are mentioned as being in Pālāʻau 2. The first *heiau* (Site -14) is located east of the Hoʻolehua Cemetery at an elevation of 800 feet. The structure was first reported by Cartwright in 1922, but was in ruins by 1957 when only traces of paving and the remains of a wall with an upright stone were could be seen. The second *heiau* (Site -16) was also first recorded by Cartwright in 1922 and is located on the west side of the mouth of Anahaki Gulch at an elevation of about 50 feet. The structure was a partially paved enclosure with a house site or shelter on the crest of the hill to the south. A *kahua maika* (Site -13) is mentioned as an "old *kahua maika,*" located on a rise at a place called Akani. Two *koʻa* are noted. One is at Naʻaukahihi (Site -18) at the northern extremity of Naʻaukahihi Point. The shrine is a small oval enclosure where numerous fish bones were observed upon it first being discovered. The other is on top of the hill at Puʻu Kapele (Site -15). This *koʻa* has probably been destroyed according to Major and Dixon (1995:48). During their 1994 survey, three mounds were located atop Puʻu Kapele, but they appear to be clearing mounds associated with antenna tower construction. Also, several house sites (Site -17) were seen at the coastal area of Kahinaokalani. Two *heiau* are listed for Hoʻolehua 2; one located on the east side of the crest of ʻEleuweuwe (Site -10) and one named Lepekaheo Heiau (Site -12), located on the boundary of Hoʻolehua 2 and Pālāʻau 2, west of Kaluapeʻelua Gulch. Neither *heiau* are described in any detail nor is their current condition known. The "Catepillar Stones" (Site -11A) are on top of the hill Puʻu Kapeʻelua, as is the "Stone at Puʻu Kapeʻelua," which is just south of the Caterpillar Stones. The face of the stone

has a hollowed out basin with several grooves cut into it, likely used for sharpening adzes or for collecting water.

Table 2. Previous Archaeological Investigations in the Pālāʻau-Hoʻolehua-Nāʻiwa Region

Reference	Location	Description and results
Phelps 1937	Island-wide	Included in the sites documented is a *koʻa* atop the hill Puʻukapele (recorded as Site 20 in Phelps 1937, and Site 15 in Summers 1971), and five features he referred to as agricultural shrines just north of the *koʻa*.
Summers 1971	Island-wide	A compilation of ethnographic, historic, archaeological and legendary material relating to Molokaʻi.
AECOS, Inc. 1980	Airport Area, Hoʻolehua	Found a complex of World War II bunkers, horseshoe-shaped revetments, earth covered Quonset huts, wood-lined causeways, roadways, and an alternate runway. Found a historic hunting site with seven structural features with one possible prehistoric wall.
Neller 1982	Northern coast of central Molokaʻi, including a portion of Pālāʻau 1	A brief aerial reconnaissance spanning several *ahupuaʻa* was conducted. Several "house sites" between Naʻaukāhihi and Kahinaokalani were observed. *Koʻa* were noted at Naʻaukāhihi and a photo was taken of the *heiau* at Anahaki (Summers Site 16).
Weisler 1987a	Kīpū	550 acres located immediately east of the easternmost portion of Subsistence & Supplemental Agriculture DHHL lands; three sites were relocated and rerecorded, Sites 109A, 109B, and 111.
Weisler 1987b	Kīpū	Inadvertently discovered cache of adze pre-forms from an area located 2 km northeast of Kualapuʻu were analyzed.
Weisler 1989	Kīpū	Found new Site 885, a buried Traditional habitation layer, was revealed in several backhoe test trenches from 1.4 to 1.65 mbs. Cultural deposit included an oven feature, midden, charcoal, and one bifacially flaked core.
Griffin 1993	North central coast, near Anahaki	Site 995 was documented during a field visit. Features included a C-shape and a modified outcrop. One boulder with a pecked rectangular basin and several boulders with natural basins were interpreted as water catchments.
Major and Dixon 1995	Hoʻolehua	Found two sites - one pre-Contact and one historic; Features include three enclosures, one dump, and one isolate artifact; performed archival research on Pālāʻau and found an unpublished study by J. Pantaleo (n.d.) on Pālāʻau – site locations mapped with no additional info.
Hartzell 2000	North central coast Hoʻolehua	Same area as Major and Dixon (1995); recorded in detail known sites and found and recorded one new site on the property; one site is adjacent DHHL project area, Sites 843, -1623, and -1624; sites mostly pre-Contact with some historic.

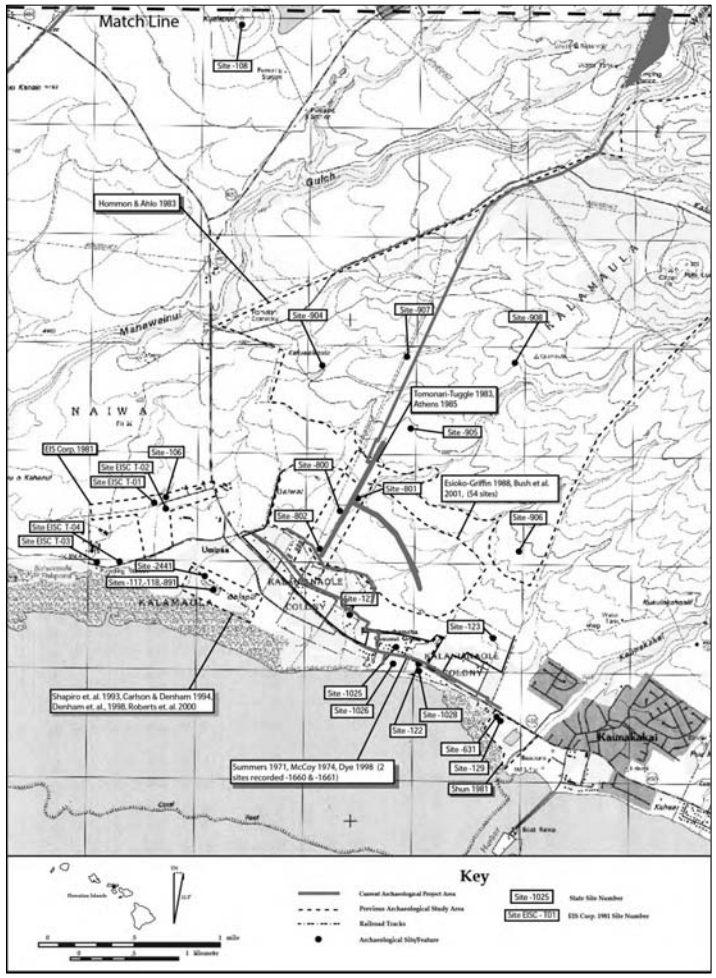


Figure 6. Previous archaeology and recorded sites in the southern portion of the study area (adapted from USGS Kaunakakai Quadrangle Map).

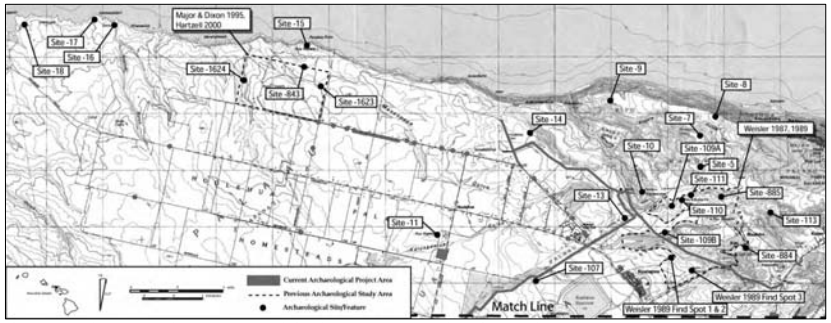


Figure 7. Previous archaeology and recorded sites in the northern portion of the study area (adapted from USGS Molokai Airport and Kaunakakai Quadrangle Maps).

Archaeological survey has shown that settlement of the north coast of central Molokaʻi was more concentrated between Kapalauoʻa and Kahinaakalani, than further east along the Pālāʻau shoreline. However, none of the previous investigations derived their data from systematic, intensive survey and are therefore unconvincing (Hommon and Ahlo 1995:51-55):

Summers (1971:77-78) mentions only two sites for Pālāʻau 1, the first being the Pohoʻele or Pālāʻau Pond (Site -99). This was the largest of the Molokaʻi fishponds with a size of somewhere between 200 and 500 acres. The pond is now filled with mud but its walls were still visible in 1922 along with traces of an old-fashioned sluice gate. It is believed to have been built for Kamehameha I by Hoʻolepanui after he retired to Molokaʻi from Hawaiʻi. About 800 m to the west of Pohoʻele Pond (Site -99), is Hoʻolehua Fishpond (Site -98), which was a *loko ʻumeiki* (shore fishing pond) that extended to the western wall of Pohoʻele Pond. This site had six lanes leading to the sea (Summers 1971:77) during its pre-Contact era use. However, in historic times, the pond was used by people of Pālāʻau Village for growing taro and for raising cattle (Summers 1971:77). In 1988, Pantaleo surveyed this same area and found at least 21 sites that were included in Pālāʻau 1 a map provided by Major and Dixon (1995:53, Figure 18), but no additional data was given (Figure 37).

In the Nāʻiwa Ahupuaʻa are two sites (No. -107 and -108) located by Summers (1971) (Figure 37). The *holua* slide (Site -107) appears to be near or on the eastern boundary of the project area. This site is described as a slide on the south-southwest side of Kualapuʻu hill and was slightly visible in 1966 (Summers 1971:80). About 800 m to the southeast of Site -107 is the Kalakupale Heiau, also known as Palakupale Heiau (Site -108). This site was described as a small *heiau*.

Site -100 is a boundary stone which marks the point where the *ahupuaʻa* of Pālāʻau 1, Kaluakoʻi, Hoʻolehua 2, and Nāʻiwa meet. The stone was relocated in 1923 (Summers 1971). Four *heiau* are listed by Stokes (n.d.) that were "reported by natives but not seen," which were described as:

> Kahimakau, southern portion of Pālāʻau Manai, near Kalamaʻula
> Puʻunana
> Panuhu; for rain purposes; a female deity (as cited in Summers 1971: 78)

The *loʻi* built by Hoʻolepanui, the Big Island chief, in the late 1700s were never been mapped, and have likely suffered erosion and siltation among other destructive development (Major and Dixon 1995:53).

Weisler (1987a) surveyed 550 acres in the Hoʻolehua-Pālāʻau Ahupuaʻa. Within this survey area, three sites were relocated and rerecorded, Sites 50-60-03-109A, -109B, and 111. Summers (1971) wrote that sites -109A and B were reported by Cartwright fifty years prior (n.d. *d*) as *heiau* but did not relocated them and believed that they were both destroyed. Site -109A was a large terrace found somewhat intact, but may have contained additional structures or features destroyed by bulldozing activities; what remained of it was mapped. Site -109B had more severe damage from pineapple cultivation activities. No structures remained, but artifacts and midden were collected in and around the supposed area that it once stood. Site -111, Na Imu Kalua Ua Heiau, was first recorded by W.T. Brigham in the late 19th century (Stokes 1909:27)

and further described by stokes in the early 20th century (Stokes 1909). The site was revisited in the early 1920s and again in the late 1930s.

In 1987, Weisler examined an adze cache that came from an area located 2 km northeast of Kualapuʻu (Site 50-60-03-884). The site is situated on a small hill adjacent to an unnamed gulch, at the 400 m contour overlooking the saddle area and south coast of Molokaʻi. The cache of 11 adze preforms was purported to be buried approximately 1 m below surface and inadvertently discovered by the property owner while excavating a utility trench (Weisler 1987b). Several years later, Weisler (1989) returns to the area that the adze cache was inadvertently discovered for testing. He records another site, 50-60-03-885, which consisted of a buried traditional habitation layer, which was found in several backhoe test trenches from 1.4 to 1.65 mbs. Found in this cultural deposit was an oven feature, midden, charcoal, and one bifacially flaked core (Weisler 1989).

The most recent study performed in Hoʻolehua was Hartzell (2000), where she records in detail a total of three sites were identified in the property that continued into adjacent properties (to the north of the TMK). Two of the sites, -1623 and -1624, were first recorded in 1994 by Major and Dixon (1995). Site -1623 is comprised of two enclosures and a historic artifact scatter. This site is situated on the western boundary of TMK slated for Supplemental Agriculture. Site -1624 consists of two features, including an enclosure and an isolated basalt flake. Site -843, the Puʻuka Pele complex, is composed of 37 individual features, including: 26 stacked and faced walls, five alignments, four enclosures, a depression, and a "prominent, massive natural boulder. This site is comprised of agricultural, habitation, erosion control, water diversion, and religious type features.

4.0 PREVIOUS ETHNOGRAPHIC INTERVIEWS

A total of four Cultural Impact Assessments (CIA) have been conducted in the vicinity of the DHHL Water System Improvements Project (Bush et al. 2001; McGerty and Spear 2005; McGregor 2012; and Notman and Notman 2012).

4.1.1 Pālāʻau

Notman and Notman (2012) conducted a CIA in association with the development of a private hanger at the Molokaʻi Airport in the *ahupuaʻa* of Pālāʻau. The authors consulted with the State Historic Preservation Division, the Office of Hawaiian Affairs and the Department of Hawaiian Home Lands on Molokaʻi. In additional, they reached out to 12 community members that resulted in interviews with three individuals. Their research indicated that the area was traditionally important as a source for basalt used in the manufacture of stone adzes. Fishing and shell fish collecting were also important traditional activities. Cultigens traditionally grown included sweet potatoes and yams. While most of the organizations and individuals contacted did not think that traditional activities would be impacted by the project, may expressed concern that the potential expansion of ht airport may result in more visitors to the island , which might negatively impact the Hawaiian way of life on Molokaʻi

4.1.2 Nāʻiwa

In 2005, Scientific Consultant Services, Inc. (SCS) conducted a Cultural Impact Assessment for two parcels in the *ahupuaʻa* of Nāʻiwa (McGerty and Spear 2005). Their project area focuses on two parcels on the *makai* end of Nāʻiwa that was proposed for quarry operations near Puʻu Kahanui. McGerty and Spear (2005) interviewed five individuals with knowledge of their project area or in the vicinity of the project area. The current DHHL project area extends through the upper portion of the *ahupuaʻa* of Nāʻiwa, thus a summary of their interviews is presented here with the text of the interviews attached in Appendix E.

Halona Kaupuiki is a born and raised on the island of Molokaʻi. At the time of the interview he was 49 years of age and is a member of the Native Hawaiian Historic Preservation Council. Mr. Kaupuiki was raised by his grandparents; his grandfather was a farmer and fisherman (McGerty and Spear 2005:13). They fished at Palaʻau near the fishponds and springs. He says "His grandfather witnessed run-off slowly silting in the fishponds as the soils eroded down the slope where cattle grazed" (McGerty and Spear 2005:13).

His family worked for Molokai Ranch for four generations. They would hunt deer in Mahana area of Nāʻiwa when he was growing up. This was a subsistence lifestyle, not for fun. Regarding the landscape:

> Halona knows that a number of the *puʻu* of the area (Hoʻolehua, Kahanui, Kaʻana) are inter-connected and associated with the very beginnings of the hula. As Molokaʻi warriors sailed away, they would chant to Puʻu Kaʻana, their voices would be lifted by the winds and they would be heard at the *puʻu*.

Mr. Kaupuiki also mentions a large rock in Palaʻau that was located near a fishpond. The rock, which served as a "bell stone" to alert the fisherman, was destroyed during development of the area.

Walter Ritte, a resident of Molokaʻi and at the time of the interview, was the Director of the Hawaiian Learning Center. Mr. Ritte comments specific to the SCS project area. He spoke of "Cumulative Ownership."

> By [Cumulative Ownership] this he means, that certain natural resources on the land belong to, and is the responsibility of all Hawaiians on Molokaʻi, not just for this generation, but also for those to come, and as such, is not a mere commodity to be bought and sold (McGerty and Spear 2005:15).

Steve Eminger is a Molokaʻi resident. At the time of the interview he was age 42 and a "Fire Captain in Kaunakakai and a student of archaeology having taken classes from Wendy McElroy presently working on her Ph.D. at the University of Hawaiʻi" (McGerty and Spear 2005:15). Mr. Eminger's comments were specific to the SCS project area. He spoke of archaeological sites he observed and photographed in the area after a fire. His research uncovered an 1896 Monsarrat map of Molokaʻi that shows habitation in this area [Parcel 27].

Ms. Louise Bush, at the time of the interview, was the Office Coordinator for Kamehameha Schools Resource Center on Molokaʻi. She had specific information regarding the CSH project area and the soil run-off from a previous project entering the fishing grounds downslope.

> She said the run-off from Palaʻau was especially bad during the rainy season as there was no grass to prevent erosion. This was her main concern, as she noted many families [sic] fish and hunt crabs along the coast. An eatable seaweed, ʻeleʻele, has begun to grow back, but would be destroyed if there was more run-off from upslope development (McGerty and Spear 2005: 17).

Ms. Bush also recommended that Mr. John Kaʻimikaua be interview because of his knowledge of Molokaʻi.

Mr. John Kaimikaua is a *kumu hula* and scholar of Molokaʻi history and chants who lives on Oʻahu. Mr. Kaimikaua had information regarding the SCS project area and specific to Puʻu Kahanui.

> The name "Kahanui" refers to lines used in measurement by the *Kahuna Kuhikuhipuʻuone,* those experts in architecture. On this hill the most famous of Molokai's architects, Paepae Koʻa, established a school for *Kuhikuhipuʻuone* in the 10th century. Tradition tells us that PaePae Koʻa built the first fishpond, not only on Molokaʻi, but in all of Hawaiʻi, at Pū Koʻo (an innovation that is unique within Polynesia to these islands; Kirch 1985). John elaborates on the importance of Paepae Koʻa in a film called *Amau Amau*. In the past, there were four *moku* (districts) on the island of Molokaʻi: Kalua Koʻi, Kawela, Koʻolau and Palaʻau where the project is located. From the top of Puʻu Kahanui, the boundaries of all the *ahupuaʻa* in Palaʻau could be seen, as well as other important hills. Within the *ahupuaʻa* of Naʻiwa, are the hills of Puʻu AnoAno for the *Kahuna Kilokilo* (stargazing, navigation), Puʻu Peʻelua for *Kahuna Hoʻohanau* (giving birth), and Puʻu Kahanui, for *Kahuna Kuhikuhipuʻuone* (architects) (McGerty and Spear 2005:16).

4.1.3 Kalamaʻula

As part of their archaeological investigations, Cultural Surveys Hawaiʻi (Bush et al. 2001), conducted a series of oral interviews with knowledgeable *kupuna* with ties to the Kalamaʻula area. The interviews focused on former habitation within the DHHL Kalamaʻula Residence, Unit I, and other information *(i.e.,* burials, livestock and agricultural practices, etc.) (Bush et al. 2001:14). Their project area is located immediately south of the current project area in Kalamaʻula. Those interviewed included George Kualaʻau Chong, Robert Pauʻole, Mary Tengan, Liko Tancayo, Michael Tancayo, Lehua Mokuʻilima, and Zachary Helm. A summary of the interviews are presented here, the text of the original interviews are presented in Appendix F.

Mr. George Kualaʻau Chong (Chinese and Hawaiian ancestry) was born on September 4, 1914 on Molokaʻi. At the time Mr. Chong was interviewed in 2001, he was 85 years old). He lived in the Coconut Grove area (Kapuaiwa grove planted in honor of Kamehameha V- directly *makai* of the current project area). Mr. Chong says that the coconut trees in the grove were small and that the water in the area was from a spring that the families would use before the homestead was created (1920s) and a well was dug. He says prior to the homestead development, the area *mauka* of the coconut grove contained nothing except "*kiawe* and cow" (Bush et al. 2001:16), and no one lived in that area.

Mr. Robert Pauʻole: (part-Hawaiian ancestry) was born in 1918 in Honolulu and moved to Kalamaʻula in 1923. At the time of the interview, Mr. Pauʻole was 80 years old (Bush et al. 2001:17). Mr. Pauʻole's family was one of the first homesteaders at Kalamaʻula. He said there were a number of springs in the Coconut Grove area that they would get water from. Molokai Ranch used the water from the springs for their crops via a flume that existed at the back of the homestead. Mr. Pauʻole also mentioned that there was a homestead lot that contained the several graves nut had no recollection of other burials in the Kalamaʻula area.

Ms. Mary Tengan: (part-Hawaiian ancestry) was born around 1910 and was approximately 89 years old at the time of the interview. She remembers her family moving from Honolulu to Kalamaʻula in 1922 when she was about 12 or 13 (Bush et al 2001:20). Her family was one of the original homesteaders at Kalamaʻula. Present during the interview were Michael Tancayo and his daughter Liko Tancayo (who helps care for Ms. Tengan). Ms. Tengan says there was nothing but *kiawe* in Kalamaʻula. She says at night you could hear noises in the *kiawe*, like people talking and walking (there is some intimation that this was the night marchers).

Liko Tancayo says the trail ran through her house and at times the backdoor and jalousies would just open and slam shut with no wind. Auntie Harriet Ne told her mother a trail ran through the house and that an old well behind the house needed to be covered because too many things were coming out. After they covered the well she didn't hear as much noise. She also says that Kalamaʻula has terraces and that the area was known for its sweet potato. There is also a small platform on the hill (Pōmaikaʻi, behind the church) with a small platform area where Agnes Ne used to live there. Michael Tancayo says people buried there family in the area.

Ms. Lehua Moku ʻIlima (part-Hawaiian ancestry) was born on November 1, 1920 in Honolulu. She was *hanai* (adopted) by Charles and Mary Manu. She remembers moving to Molokai around 1925 or 1926 and lived at Kalamaʻula until 1947 (Bush et al. 2001:23). They were one of the 22 original homesteaders who were awarded Hawaiian homestead lots at Kalamaʻula. At the time of the interview she was 78 years old. She is admired and well-respected in the community and also serves as a *hope kahu* (associate pastor) of *Ierusalema Pomaika ʻi Ho ʻomana o ke Akua Ola* (Blessed Jerusalem and Worshipers of the Living God). She says she knows of no *heiau* in the area but saw at least one burial (from the Ne family) removed from behind of her church (Pōmaikai?) and taken to Homelani Cemetery. She said some of the sites people think are *heiau* were actually used/constructed for pigs.

4.1.4 KAUNAKAKAI – KALUAKOʻI

In 2012, Dr. Davianna McGregor conducted a CIA as part of the EIS for the Molokaʻi Irrigation System to transport water from Well 17 to the West end of Molokaʻi (McGregor 2012). Her study was supported in by an archaeological assessment conducted by Keala Pono (Peters and McElroy 2011). The transport system extended across seven *ahupuaʻa* – Kaunakakai, Kalamaʻula, Kahananui, Nāʻiwa, Hoʻolehua, Pālāʻau, and Kaluakoʻi.

Traditional pre-Contact and early post-Contact period activities taking place in this region included farming sweet potatoes and taro. Fishing and shell fish collecting were also important , as was aquacultural practices of raising fish in constructed fishponds.

McGregor states that fresh water is the area's most important resource. She adamantly argues that the availability and supply of fresh water is crucial for all cultural activities taking place in this area. Contemporary cultural practices taking place in this region include fishing, ocean gathering, forest and stream gathering, gardening, raising animals, and hunting.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The purpose of ethnographic interviews is to acquire information from *kūpuna* and local knowledgeable individuals about the background cultural use, if any, of the subject property that could be adversely affected by the proposed DHHL Water System Improvements Project.

Concerted attempts were made to identify and locate persons knowledgeable about traditional practices that took place in the past, or are currently taking place in the project area, that could be potentially impacted by the project. The Office of Hawaiian Affairs (OHA) was consulted for a listing of potential cultural practitioners and interviewees. Various Neighborhood Boards and civic clubs were also contacted to obtain cultural informants. Appendix B provides a listing of potential cultural informants and their detailed contact history. Contact information was obtained for 10 individuals, all of which were solicited for participation. Two responses were received, providing additional contact information for seven more individuals. Finally, our archaeological field supervisor also approached another individual on his interest in being interviewed. None of the individuals contact expressed an interest in being interviewed As a result no interviews were undertaken. However, it is fortunate that four previously conducted CIAs in the general area were available (this concentration of CIAs in such a restricted area may be a reason that no one was interested in being interviewed).

The results of archival research, as well as the previously conducted CIAs indicate that the *ahupuaʻa* of Pālāʻau, Hoʻolehua, Nāʻiwa, Kahanui, and Kalamaʻula have a long and rich cultural and legendary past. However, little is mentioned of the specific properties which the DHHL Water System Improvements Project will affect. The archaeological background suggests that certain areas were heavily disturbed during the plantation era for sugar cane and pineapple cultivation, which significantly decreases the likelihood of the presence of cultural resources such as intact archaeological subsurface deposits and *iwi kūpuna*.

Based upon previously completed ethnographic interviews (McGerty and Spear 2005, McGregor 2012), some traditional Hawaiian practices were found to be practiced in the vicinity of the project areas, including fishing, gathering of ocean resources, hunting, raising animals, gardening, and forest and stream gathering (McGregor 2012:48).

In general, traditional and mythological accounts from pre-European contact Hawaiʻi represent a belief system explaining all aspects of the physical universe and spirit realm, the origin and nature of mankind, and the history of the community, as well as collectively remembering the heroic adventures, exceptional feats, and cautionary tales of their ancestors. These traditional accounts are contained in the hearts and minds of cultural practitioners and customarily passed on through oration. Throughout the passage of time, figures transcend earthly legends into the cosmic, divine, and fearsome realm of the gods that is only separated from the mundane world by a thin veil and has the power to interact with and cast influence on the mundane. To this day, a sense of respect, reverence, and fear is still held on to by cultural practitioners and those indoctrinated in these traditions, as it is believed that the very landscape is imbued with the *mana* (life force or supernatural energy) of the divine.

Since the Project is to improve an already existing system, it is unlikely that the proposed development of the DHHL Water System Improvements Project will negatively impact any ongoing cultural practices. However, as espoused by various *moʻolelo*, the area in general has a mystical past and retains some supernatural qualities. To respect the spiritual connections that people have with the *ʻāina*, it is recommended that any major event or construction related activity be preceded with a traditional Hawaiian blessing ceremony performed by a *kahuna* (priest or priestess) or *kahu pule* (minister/preacher).

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APPENDIX A

Guidelines For Assessing Cultural Impacts
Obtained From
Office of Environmental Quality Control Website

Guidelines for Assessing Cultural Impacts

Adopted by the Environmental Council, State of Hawaii
November 19, 1997

1. INTRODUCTION

It is the policy of the State of Hawaii under Chapter 343, HRS, to alert decision makers, through the environmental assessment process, about significant environmental effects which may result from the implementation of certain actions. An environmental assessment of cultural impacts gathers information about cultural practices and cultural features that may be affected by actions subject to Chapter 343, and promotes responsible decision making.

Articles IX and XII of the State Constitution, other state laws, and the courts of the state require government agencies to promote and preserve cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups. Chapter 343 also requires environmental assessment of cultural resources, in determining the significance of a proposed project.

The Environmental Council encourages preparers of environmental assessments and environmental impact statements to analyze the impact of a proposed action on cultural practices and features associated with the project area. The Council provides the following methodology and content protocol as guidance for any assessment of a project that may significantly affect cultural resources.

Background

Prior to the arrival of westerners and the ideas of private land ownership, Hawaiians freely accessed and gathered resources of the land and seas to fulfill their community responsibilities. During the Mahele of 1848, large tracts of land were divided and control was given to private individuals. When King Kamehameha the III was forced to set up this new system of land ownership, he reserved the right of access to privately owned lands for Native Hawaiian ahupua'a tenants. However, with the later emergence of the western concept of land ownership, many Hawaiians were denied access to previously available traditional resources.

In 1978, the Hawaii constitution was amended to protect and preserve traditional and customary rights of Native Hawaiians. Then in 1995 the Hawaii Supreme Court confirmed that Native Hawaiians have rights to access undeveloped and under-developed private lands. Recently, state lawmakers clarified that government agencies and private developers must assess the impacts of their development on the traditional practices of Native Hawaiians as well as the cultural resources of all people of Hawaii. These Hawaii laws, and the National Historic Preservation Act, clearly mandate federal agencies in Hawaii, including the military, to evaluate the impacts of their actions on traditional practices and cultural resources.

If you own or control undeveloped or under-developed lands in Hawaii, here are some hints as to whether traditional practices are occurring or may have occurred on your lands. If there is a trail on your property, that may be an indication of traditional practices or customary usage. Other clues include streams, caves and native plants. Another important point to remember is that, although traditional practices may have been interrupted for many years, these customary practices cannot be denied in the future.

These traditional practices of Native Hawaiians were primarily for subsistence, medicinal, religious, and cultural purposes. Examples of traditional subsistence practices include fishing, picking opihi and collecting limu or seaweed. The collection of herbs to cure the sick is an example of a traditional medicinal practice. The underlying purpose for conducting these traditional practices is to fulfill one's community responsibilities, such as feeding people or healing the sick.

As it is the responsibility of Native Hawaiians to conduct these traditional practices, government agencies and private developers also have a responsibility to follow the law and assess the impacts of their actions on traditional and cultural resources.

The State Environmental Council has prepared guidelines for assessing cultural resources and has compiled a directory of cultural consultants who can conduct such studies. The State Historic Preservation Division has drafted guidelines on how to conduct ethnographic inventory surveys. And the Office of Planning has recently completed a case study on traditional gathering rights on Kaua'i.

The most important element of preparing Cultural Impact Assessments is consulting with community groups, especially with expert and responsible cultural records and review of transcripts of previous ethnographic interviews. Once all the information has been collected, and verified by the community experts, the assessment can then be used to protect and preserve these valuable traditional practices.

Native Hawaiians performed these traditional and customary practices out of a sense of responsibility: to feed their families, cure the sick, nurture the land, and honor their ancestors. As stewards of this sacred land, we too have a responsibility to preserve, protect and restore these cultural resources for future generations.

TEXT OF ACT 50, SLH 2000

A BILL FOR AN ACT RELATING TO ENVIRONMENTAL IMPACT STATEMENTS

UNOFFICIAL VERSION

HOUSE OF REPRESENTATIVES H.B. NO, 2895 H.D.1
TWENTIETH LEGISLATURE, 2000
STATE OF HAWAII

A BILL FOR AN ACT

RELATING TO ENVIRONMENTAL IMPACT STATEMENTS.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:

SECTION 1. The legislature finds that there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawai‘i’s culture, and traditional and customary rights.

The legislature also finds that native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the "aloha spirit' in Hawaii. Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups.

Moreover, the past failure to require native Hawaiian cultural impact assessments has resulted in the loss and destruction of many important cultural resources and has interfered with the exercise of native Hawaiian culture. The legislature further finds that due consideration of the effects of human activities on native Hawaiian culture and the exercise thereof is necessary to ensure the continued existence, development, and exercise of native Hawaiian culture.

The purpose of this Act is to: (1) Require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and (2) Amend the definition of "significant effect" to include adverse effects on cultural practices.

SECTION 2. Section 343-2, Hawai‘i Revised Statutes, is amended by amending the definitions of "environmental impact statement' or "statement" and "significant effect", to read as follows:

"'Environmental impact statement" or "statement" means an informational document prepared in compliance with the rules adopted under section 343-6 and which discloses the environmental effects of a proposed action, effects of a proposed action on the economic [and] welfare, social welfare, and cultural practices of the community and State, effects of the economic activities arising out of the proposed action, measures proposed to minimize adverse effects, and alternatives to the action and their environmental effects.

The initial statement filed for public review shall be referred to as the draft statement and shall be distinguished from the final statement which is the document that has incorporated the public's comments and the responses to those comments. The final statement is the document that shall be evaluated for acceptability by the respective accepting authority.

"Significant effect" means the sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of the environment, are contrary to the State's environmental policies or long-term environmental goals as established by law, or adversely affect the economic [or] welfare, social welfare[.], or cultural practices of the community and State."

SECTION 3. Statutory material to be repealed is bracketed. New statutory material is underscored.

SECTION 4. This Act shall take effect upon its approval.

Approved by the Governor as Act 50 on April 26, 2000

2. CULTURAL IMPACT ASSESSMENT METHODOLOGY

Cultural impacts differ from other types of impacts assessed in environmental assessments or environmental impact statements. A cultural impact assessment includes information relating to the practices and beliefs of a particular cultural or ethnic group or groups.

Such information may be obtained through scoping, community meetings, ethnographic interviews and oral histories. Information provided by knowledgeable informants, including traditional cultural practitioners, can be applied to the analysis of cultural impacts in conjunction with information concerning cultural practices and features obtained through consultation and from documentary research.

In scoping the cultural portion of an environmental assessment, the geographical extent of the inquiry should, in most instances, be greater than the area over which the proposed action will take place. This is to ensure that cultural practices which may not occur within the boundaries of the project area, but which may nonetheless be affected, are included in the assessment. Thus, for example, a proposed action that may not physically alter gathering practices, but may affect access to gathering areas would be included in the assessment. An ahupua‘a is usually the appropriate geographical unit to begin an assessment of cultural impacts of a proposed action, particularly if it includes all of the types of cultural practices associated with the project area. In some cases, cultural practices are likely to extend beyond the ahupua'a and the geographical extent of the study area should take into account those cultural practices.

The historical period studied in a cultural impact assessment should commence with the initial presence in the area of the particular group whose cultural practices and features are being assessed. The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs.

The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man-made and natural, including submerged cultural resources, which support such cultural practices and beliefs.

The Environmental Council recommends that preparers of assessments analyzing cultural impacts adopt the following protocol:

1. identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or ahupuaʻa;
2. identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;
3. receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;
4. conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;
5. identify and describe the cultural resources, practices and beliefs located within the potentially affected area; and
6. assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices and beliefs identified.

Interviews and oral histories with knowledgeable individuals may be recorded, if consent is given, and field visits by preparers accompanied by informants are encouraged. Persons interviewed should be afforded an opportunity to review the record of the interview, and consent to publish the record should be obtained whenever possible. For example, the Primary source materials reviewed and analyzed may include, as appropriate: Mahele, land court, census and tax records, including testimonies; vital statistics records; family histories and genealogies; previously published or recorded ethnographic interviews and oral histories; community studies, old maps and photographs; and other archival documents, including correspondence, newspaper or almanac articles, and visitor journals. Secondary source materials such as historical, sociological, and anthropological texts, manuscripts, and similar materials, published and unpublished, should also be consulted. Other materials which should be examined include prior land use proposals, decisions, and rulings which pertain to the study area.

3. CULTURAL IMPACT ASSESSMENT CONTENTS

In addition to the content requirements for environmental assessments and environmental impact statements, which are set out in HAR §§ 11-200-10 and 16 through 18, the portion of the assessment concerning cultural impacts should address, but not necessarily be limited to, the following matters:

1. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.
2. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.
3. Ethnographic and oral history interview procedures, including the institutions and repositories searched, and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.
4. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.

5. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project.
6. An explanation of confidential information that has been withheld from public disclosure in the assessment.
7. A discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs.
8. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.
9. A bibliography of references, and attached records of interviews which were allowed to be disclosed.

The inclusion of this information will help make environmental assessments and environmental impact statements complete and meet the requirements of Chapter 343, HRS. If you have any questions, please call 586-4185.

APPENDIX B

Pacific Legacy Communication Log
- Organizations and Individuals Contacted

MOLOKAʻI DHHL WATER SYSTEM IMPROVEMENTS CIA - CULTURAL INFORMANTS

Name	Affiliation/Association	Contact Log
	Office of Hawaiian Affairs	• letter sent 9/8/15 • no response
Akutagawa, Billy	Molokaiʻ Land Trust	• email sent 9/9/15 • second email sent 10/28/15 • no response
Albino, ʻOpulani (likely same person as ʻOpuʻulani Albino)	referral from OHA	• letters sent: 9/8/15; 10/28/15 • no response
Albino, ʻOpuʻulani (likely same person as ʻOpulani Albino)	referral from H. Ayau	• initial phone call 9/18/15; left message with details • follow-up phone call 9/25/15; left message with details • follow-up phone call 10/5/15; left message • follow-up phone call 10/28/15; left message • no response
Ayau, Halealoha	DHHL	• email sent on 9/15/15 • 9/24/15 - email response with the name of four potential informants • 11/13/15 - C. Fechner (PL field crew) discussed CIA with H. Ayau; asked if he'd be interested or knew of anyone who would be interested. He graciously declined.
Cacoulidis, Edwina H.	Native Hawaiian Historic Preservation Council (Molokaʻi); Hoʻolehua Hawaiian Civic Club	• letters sent: 9/8/15; 10/28/15 • no response
Crabbe, Kamanaopono	Office of Hawaiian Affairs	• letter sent 9/8/15 • letter response received 9/29/15
Hasse, Butch	Molokaiʻ Land Trust	• letters sent: 9/8/15; 10/28/15 • no response
Jennings, Michael	Molokaʻi Planning Commission	• letters sent: 9/8/15; 10/28/15 • no response
Martin, Penny	referral from OHA	• letters sent: 9/8/15; 10/28/15 • no response
Misaki, Ed	referral from OHA	• letters sent: 9/8/15; 10/28/15 • no response
Negrillo, Kupuna Kanani	referral from H. Ayau	• initial phone call 9/18/15; left message with details • follow-up phone call 9/25/15; left message with details • follow-up phone call 10/5/15; left message • follow-up phone call 10/28/15; left message • no response
Ritte, Walter	Hui O Kuapa	• letters sent: 9/8/15; 10/28/15 • no response
Yokomizo, Kyle	Born and raised on Molokaʻi; hunter	• 9/8/15 informal phone conversation to see if he would be interested in talking with me; he graciously declined but agreed to sharing the info with some people he believed would be better qualified • email sent 9/9/15 • 9/10/15 called to verify receipt of email • 9/25/15 called to see if he'd had any luck; no interest so far • 11/18/15 called, still no takers
Pescaia, Mikiʻala	referral from OHA	• initial phone call 9/18/15; left message with details • follow-up phone call 9/25/15; left message with details • follow-up phone call 10/5/15; left message • follow-up phone call 10/28/15; left message • no response
Reyes, Kupuna Kauila	referral from OHA	• initial phone call 9/18/15; left message with details • follow-up phone call 9/25/15; left message with details • follow-up phone call 10/5/15; left message • follow-up phone call 10/28/15; left message • no response
Ocampo, John	DHHL	• 11/9/15 - C. Fechner (PL field crew) discussed CIA with J. Ocampo; asked if he'd be interested or knew of anyone who would be interested. He graciously declined.

APPENDIX C

Correspondence From OHA

PHONE (808) 594-1888 FAX (808) 594-1938

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
560 N. NIMITZ HWY., SUITE 200
HONOLULU, HAWAI'I 96817

HRD15/7621

September 29, 2015

Elizabeth L. Kahahane
Pacific Legacy, Inc.
30 Alulike St., Suite 301
Kailua, HI 96734

Re: Request for Pre-Consultation for the Cultural Impact Assessment for the Moloka'i Department of Hawaiian Home Lands Waterline Improvement Project
Kalama'ula, Kahanui, Nā'iwa, and Ho'olehua-Pālā'au Ahupua'a, Kona Moku, Moloka'i Mokupuni
Tax map key (2) 5-2 various

Aloha Ms. Kahahane:

The Office of Hawaiian Affairs (OHA) is in receipt of your September 8, 2015 letter requesting information on cultural, historic, and archaeological sites within the area of potential effect. Pacific Legacy, Inc. is acting as a consultant to PBR Hawai'i and the Department of Hawaiian Home Lands, who intends to propose various waterline improvements.

OHA would like to suggest that the following entities and individuals be contacted:

- The Nature Conservancy – Moloka'i
  - Ed Misaki, Director
  - Penny Martin
  - Opulani Albino
- Billy Akutagawa (work: 808-560-3653)

Elizabeth L. Kahahane, Pacific Legacy, Inc.
September 29, 2015
Page 2

In addition, OHA recommends consultation with the petitioners of In re Waiʻola O Molokaʻi, Inc.[1] and In re Water Use Permit Application ("Kukui Molokaʻi Inc.),[2] as both cases were instrumental in setting parameters for the protection of the Molokaʻi aquifer system, as well as Native Hawaiian traditional and cultural practices on Molokaʻi.

Mahalo for the opportunity to consult. Should you have any questions, please contact Jeannin Jeremiah at 594-1790 or by email at jeanninj@oha.org.

ʻO wau iho nō me ka ʻoia ʻiʻo,

Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer

KC:jj

C: Gayla Haliniak-Lloyd – OHA Community Outreach Coordinator, Molokaʻi Island

**Please address replies and similar, future correspondence to our agency:*
Dr. Kamana'opono Crabbe
Attn: OHA Compliance Enforcement
560 N. Nimitz Hwy, Ste. 200
Honolulu, HI 96817

[1] 103 Hawaiʻi 401 (2004).
[2] 116 Hawaiʻi 481 (2007).

APPENDIX D

Post-field Summary of Supplemental Archaeological Subsurface Testing Letter Report (Fechner 2015)

Pacific Legacy
Historic Preservation

Pacific Basin — O'ahu
30 Aulike Street, Suite 301
Kailua, HI 96734

Phone: 808.263.4800
Fax: 808.263.4300
www.pacificlegacy.com

20 November 2015

Ms. Malia Cox
PBR Hawai'i
1001 Bishop Street, Suite 650
Honolulu, HI 96813

sent via email
mcox@pbrhawaii.com

RE: Post-field Summary of Supplemental Archaeological SubsurfaceTesting for the Ho'olehua Water System PWS 230 Improvements, Department of Hawaiian Home Lands Water System in Ho'olehua, Kauluwai and Kalama'ula *ahupua'a*.

Dear Ms. Cox:

At the request of PBR Hawai'i, Pacific Legacy, Inc., conducted supplemental archaeological subsurface testing between 9-13 November 2015. A total of three test units were excavated by hand at two of the newly identified sites.

Two test units were excavated at Site T-001, which is located within the proposed Project Site 1 area situated in Kalama'ula. A 1 meter by 1 meter test unit was excavated in the Site T-001, Feature A, terrace. A variety of traditional cultural material was recovered from this test unit including basalt flakes, marine shell midden, as well as datable material. This evidence suggests that the terrace functioned as a traditional pre-Contact or early post-Contact habitation feature.

In addition, a 1 meter by 0.5 meter test unit was also excavated in the Site T-001, Feature C, terrace. No cultural material was recovered from this excavation. The Feature C, terrace, is believed to have functioned as a traditional pre-Contact or early post-Contact agricultural terrace.

During the course of the archaeological testing, a previously unrecorded site was identified. This newly identified site was recorded as Site T-008, a traditional artifact scatter. Site T-008 is located just northeast of Site T-001, within the proposed Project Site 1 area in Kalama'ula. The site was documented and recorded in detail.

As part of the archaeological subsurface testing, a 0.5 meter by 0.5 meter test unit was excavated in the newly identified Site T-008, artifact scatter. A variety of traditional cultural material was recovered from this test unit including volcanic glass flakes and basalt flakes, as well as datable material. This evidence indicates that not only is Site T-008 a traditional surface artifact scatter, but that the cultural deposit extends below the surface as well.

During the week of archaeological testing, I was also able to discuss the Cultural Impact Assessment (CIA) that Pacific Legacy is in the process of producing with two DHHL employees. On 9 November 2015, I brought up the CIA with John Ocampo (DHHL) to see if he would be interested, or if he knew

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anyone that would be interested, in being interviewed for the report. John graciously declined. On 13 November 2015, I also brought up the CIA with Halealoha Ayau (DHHL) to ask him if he would be interested, or if he knew anyone that would be interested, in being interviewed for the report. Halealoha also graciously declined, but suggested that Pacific Legacy send him an email to follow up with several names he had previously provided regarding possible testimonials for the CIA.

We are currently in the process of analyzing the data collected during the most recent subsurface testing and supplemental survey into a single Archaeological Inventory Survey (AIS) report in support of the proposed water system project.

Please contact Paul L. Cleghorn or myself (808-263-4800) if you have any questions regarding our inventory survey.

Sincerely,

Caleb C. Fechner, B.A.
Archaeologist

APPENDIX E

Excerpt from McGerty and Spear 2005 CIA Report: Interviews

HALONA KAUPUIKI

Interview with Halona Kaupuiki, Native Hawaiian Historic Preservation Council, on Moloka'i, July 6, 2005. Present are Leann McGerty (LM), Senior Archaeologist with SCS, and Halona Kaopuiki. We are meeting at Halona's office in Kaunakakai.

LM: We're on Moloka'i, and we're talking to Halona Kaopiki, and your position is…? State it for me, you're the …?

HK: Native Hawaiian Historic Preservation Council.

LM: Native Hawaiian Preservation Council, which is connected with OHA. On Moloka'i.

HK: Yes.

LM: So, Halona, of course is native of this Island, and May I ask how old you are?

HK Forty-nine.

LM: Forty-nine, and he was just telling me about his auntie…would you tell me again? Who used to live in the area of Nā'iwa Ahupua'a.

HK: We called that, on the big flats, actually that's my nephew's grandmother. Her last name is Naho'opi'i, and she was telling us the story while she was alive. And, she was nine years old when they first started to throw the cattle in there. And when they throw the cattle in there…[brief interruption] put up fence line. And the story was, not only this auntie, it's one nother auntie Way Lee's grandmother. And her name was Alice Lee, I think. And she said that..she asked them, "What you guys doing?" And they said they putting up a fence for keep the cattle out.

LM: To protect their crops, yeah?

HK: For protect the cattle. For the cattle goin' come into the village. That was out last Hawaiian Village, McGerty. And we call 'um…today our generation, we call that place Black Pipe Road, cause of where they put all the pipes, all the big black pipes. That's one base yard, but the village was there. And the people, when they saw the cattle, they say for keep the cattle out from their place [the village], right? Actually, it was to keep the people out. When they saw the cattle, the man saw the cattle, they thought it was a gift from God, because that was food! So, when they did the inventory of the cattle, they saw all the carcasses in the village, and they, you know, arrested all the men. I guess you've heard this story?

LM: No.

HK: Well, they arrested all the men. And the guy who was the…you know, I get respect for the family cause we have descendents today that we highly respect that is family to us [indistinguishable]. That *Luna* did inventory, found a…

LM: The *Luna* on the ranch?

2

HK: On the ranch. Found carcasses of the cattle, arrested all the men, throw 'um on the boat, took them to Honolulu. They had to build their own prison in Honolulu, the *kānes*. Now,...

LM: In Iwilei?

HK: Yeah, that first prison, my people build 'um. Now, the *kānes* gone, now they don't...the *wahines*...because they was the providers, the men, so the *wahines* ended up had to go with the families when to support the husbands! Then we lost the property, that was out last, our last Hawaiian village.

LM: Where was the village located?

HK: The village was on the flats of , we call Waihewahewa in Mahana. My father told me Waihewahewa was a [indistinguishable] till this time. And I was the...Waiheawhewa on the flats of Mahana. You know when you was landing your airplane? This way, the flats where there's nothing but big pasture land. The get one fence line inside there. In the old days had one big springs and in the late 70s when I came back home, my father and my uncle, his oldest brother, went to go look to the springs to show us, but when we went to that place, its all covered yeah now, because the water run out. That was the spring where the villagers used to take the water.

LM: So the springs gone?

HK: It's all gone.

LM: So, when this happened to your auntie, you say she was nine years old, when was this? What time period was this about?

HK: I don't know, I really don't know because I really wasn't too much paying attention, because I was kinda like....

LM: Yeah, yeah. You said she was in her 80s when she died?

HK: She was in her 80s or early 90s. And my nephew would get more [information], my nephew, cause that's his grandma. And that's where he's staying, now. They was raised, they moved to Hālawa, in Hālawa Valley on Moloka'i. And my nephew, that's his *kuleana* now, he take care of the places up there. And the grandma raised him. So, I was there for pick up my nephew-them. You know, and they was of my age, my nephew. I was there to pick him up and take him or take the workmen there. So, while she was telling us the story, she was more, [indistinguishable].

LM: Yeah. So, when did she die?

HK: Oh, she died in the 80s, I think. Yeah, in the 80s.

LM: O.k. Alright, I can get, you know, kinda an idea...

HK: 1900 maybe? Early. Or maybe 1800s.

LM: That's really interesting, I didn't realize there had been an actually village up on the flats. What I'm supposed to be doing is identifying any sort of cultural resources at all, that might be impacted by any kind of development. Or, any kid of activities within those Parcels, 27 and 29, I think it is. And cultural resources can be places, they can be values, they can be behaviors, they can be rights, they can be *mo'olelo*, they can be stories. Anything like that would fall under cultural resources. So, you have told me, you had mentioned something, your association with that area, in Parcel 27, when you were growing up. Can you tell me more about that, what you used to do in that area?

HK: We used to go hunt, that's why in that area. We used to hunt the deers. And not only had deers during my time, had wild pigs, it was domesticated pigs, but it was open range [indistinguishable] So that's the kinda of stories and memories that I have that I....

LM: And the ranch [Moloka'i Ranch]didn't bother [you for hunting]?

HK: No, at that time, the ranch, no. During our time, no. I go back four generations on the ranch

LM: But you weren't taking cattle, you were taking, you know, deer and stuff like that, so that doesn't...

HK: Yeah. And I knew...see they call it "outlaw", Yeah? But we never knew what was outlaw before, because my father was a ranch, at that time he was working on the ranch, and his father. When my father used to come home after work, and we got to go get our dogs and go outlawing because that's the place we goin'. And the reason why he went go outlaw, for get our food, get the kill, because he went ask to have hunting pass for one nother area, and bosses never give him. So, he came home, he was mad and we go get out dogs, so we knew where we was going to, [indistinguishable] So we knew we was going...So we used to park on the main highway, you know, the road you came down? We park right on the main highway, cause never had roads to go inside. And the walk was pretty far! We walked! But that's why he kept the dog. The dog chase'um for us, good dogs, my father had.

LM: They'd chase the deer and the pigs?

HK: Yeah, and we can come home earlier, because they're the ones going find the deer, we don't have to track'um! They would track'um.

LM: Right.

HK: And he used to leave his truck on the side of the road no matter what and we'd carry the deer. And in the old days, we carried the whole deer. We gut them an' everything, but we don't de-bone, we bring home everything. I always could remember, because that was one dying thing, cause coming home time was so tired! Dark, getting dark...

LM: This was part of your food, this wasn't recreation, this was for feed the family?

HK: Yes. And that's why to me, the deers, for me is very, very big plus for me. We need the deers. Even though nowadays everybody claiming its not native, but for us, for my family, we goin' to survive on that. We made everything out deer. We made hamburger deer, *laulau* out of deer, the hides of the deer, the skins, we'd make belts…

LM: It's really a shame, because, of course if they're up in the forest, they're destroying it, but they're really a good thing to have for food, for instance. There's got to be some balance, or something that can be done, maybe, yeah? Are they working on that?

HK: Yeah. On Maui what they do, they put up fences, yeah. For keep out the pigs, keep out the deer.

LM: Like up in Waikolu and up in that area, they have the fences, yeah? The pigs are probably even worse than the deer, I don't know.

HK: The pigs, they claim the pigs [indistinguishable]. The pigs are the ones, yeah? They dig, yeah? The pigs dig…You know, my definition of that is because, we need the pigs. The pigs is one make…the animals, McGerty, that's the one makes the trails. Cause, no more ancestors who used to take care of the trails. And we no more time now, because society todays is completely different from our lifetime before. Before, my ancestors, they could take care of the trail. Nowadays, we no can take care of the trails, because we have jobs.

LM: We have to work, yeah.

HK: And, only time you spend up there is weekends. And weekends is…majority, not every weekend, yeah? So, if we leave the pigs, the animal was up there, you know, just my belief, they the ones that taking care the trails for our ancestors. So with the fence, you know, it's good, because it…I saw it on some films, of what they doing when they [indistinguishable]. It's all good, it's really good. But the thing take away the trails, the old trails, when we used to go behind the island. For my father-them. Thank god for my dad, because that was his a…because I was one traditional baby, I was raised by my grandparents, took away. I was by my grandparents.

LM: Where were they?

HK: They was a…my grandparents, my grandfather was fisherman. He was a fisherman and then one taro farmer. That's why, this is all his, this is his [referring to beautifully made *poi* board and other artifacts in office]. This is made out of *'iliahi*, this *poi* board. Yeah made out of sandalwood. I don't know who else get sandalwood…we had three. I know one of them stay Nu'uanu Valley in my other uncle's house. They all passed away already. That was my grandfather's younger brother, my uncle Lolakou [indistinguishable].

LM: That's a big tree, I wonder how they missed it! [laughs]

HK: Big tree, but it was a stump. And it was on top out property in Hālawa Valley, we get on top Mo'ula falls, we have about 260 acres, the Kaopuiki family and a, this was one of them! My dad, my grandpa I call daddy and then, we had one more, my uncle Laua get'um, and then we

had one nother one, that I don't know where it stay. Probably…my grandma, my grandma was giving them all away.

LM: did your auntie talk about when she was living in the village, what life was like?

HK: Ah, there life was farming [indistinguishable]. And surviving, try to survive, cause it already was c0oming to that turn of the century, you know. Everything was turning around…the train was going through, they had all train tracks all the way from La'au point to the old harbor in Kaunakakai. So it was really changing times for them.

LM: Where did she go, where did they go fishing?

HK: At that time, they was fishing all inside Pala'au, we call the place Pala'au. And I, probably they…, that village was taking care of the fish ponds, too.

LM: Probably.

HK: And at the same time they saw the destruction of the fish ponds. All the run-off was coming. And a lot of water, [indistinguishable] no more, but my father always used to tell us it's the opposite. When you say no more water. And you just watch the trees. When you see the trees, and the thing big, man, underneath you get water. So my dad was awesome, and my grandfather, he used to tell us, my grandpa used to say, like uh, "When you was born, you was born to environment". For people who not to, you know, smart in the highcobolical-kine words, you have to know what it was in the environment. What is the environment? It's all this! With no more this, without the plants and animals, the rain, the clouds, the sun, you goin' die. And today, *kupunas* tell you [indistinguishable], "Boy, you gotta watch the plants!" The way the plants grow, that's the way the human race not goin' survive. When the plants start dying, we goin' die next, we goin' be next. My grandfather always used to say that a, we was created last. And we never was to own lands. The lands was for us to *mālama*. We're the steward of the lands. And I believe that. Even though we have lands, I losing lands left and right now. Beachfronts, we losing to the max, because of land tax grow. Only our mountain [indistinguishable] we still get, our mountains, cause nobody will live on the mountains yet. Because there goin' come, there goin' take care.

LM: That's right. What stories have you…, have you heard of any stories associated with, with features within that Parcel 27.

HK: Well, all I know, small kine, was the, in the *oils*, the chant, when you go up Ka'ana, when you stay on top that place, and then, the hill we talk about…

LM: This is Pu'u Kahanui, or a different *pu'u*?

HK: This one nother, this the kine Ka'ana, is a big flats on top. It's way on top where the kine, Ka'imikaua get his *'ili*, where he do his thing. Where the hula was done. And there we have these *pu'us*, so these *pu'us* all connected, McGerty. The Pu'u Huli Ho'olehua, and then get Pu'u Kahanui…

LM: I'm sorry, what was the first one?

HK: Pu`u Ho`olehua.

LM: O.K., alright.

HK: And then we get the Kahanui…

LM: And this is associated with Lanikaula, you said?

HK: Not Lanikaula. Kaimikau, where the hula started. So all these *pu`u* is connected to Ka'ana, to the hula. Because the chants go, when the warriors used to come, you know, today's a beautiful day, like you say. But most times, Moloka'i, we [indistinguishable] to the trade winds, the trades. Warriors used to stay down there when they sail out, they used to chant, *kahea* to, Pu`u Ka`ana. And you could hear'um! So all these pu`us connected, to Ka`ana! And Ka`imikaua, you know, in this life, he did that. He took his boys down there, he stay on top there [Pu`u Ka`ana] and they started to *kahea* to him. With the trade winds, you could hear'um.

LM: And he could hear'um?

HK: They could hear'um!

LM: And where was he? He was at Pu`u…

HK: Pu`u Ka'ana! Way on top there. And the boys was way down! And Ka'imikaua, he can vouch for it.

LM: Now, tell me about Ka`imikaua, he's a *Kumu hula*…

HK: A *Kumu hula* and he's a historic and all that *mana* he get, is from the chants. That's why he knows lot of stories of Moloka'i from the chants. Because of this *kupuna*, Luahine, I think her name was, and, she the one when…I might be wrong with the last name. But, this *kupuna* went teach him the chants on Moloka'i. That's why, his *mana'o* is only Moloka'i. And he [indistinguishable] from Moloka'i, he's just like *`ohana* to me. And, he the one tell all the stories.

LM: Yes, I've been trying to get in touch with him, unfortunately he leaves for the mainland for two week.

HK: that's o.k. You should have catch'um when the kine', when they had the *Kapiko Hula* over here. That would have been awesome.

LM: Oh, yeah, that would have been the time…I've called and called and called and, you know, he is so busy. He's very nice, I mean he will talk to me, if we can find the time!

HK: He's a very in demand [indistinguishable] over there. Yeah.

LM: So, tell me, do you recall anything that Ka`imikaua told you about the chant that mentions, for instance, Pu'u Kahanui?

HK: Pu`u Kahanui….go ahead, I like hear, cause I kinda like forget.

LM: He said to me, maybe this will help your memory. He said to me that , he said, "Do you know what Kahanui means?" and I said, "Well, *kaha* means to cut, and, you know, *nui*, big." He said, "Well, it actually refers to cutting of the *piko*."

HK: The umbilical cord. Wow!

LM: And then he, at that point, I said, "Well is it possible for us to get together?" He said "Yes", and blah, blah blah, we just haven't done it. But does that bring anything back to you, having it to do with the, actually having to do with the cutting…

HL: The umbilical cord, the *piko*? All I remember was, every time when we get up that Pala'au Road, at the bottom towards the fishponds, the main road going in Pala`au where the back, it's the back part of the Moloka`i Electric and Maui Electric Company. Before they had that, before it was only lands. My father used to stop by the side of the road by this fishpond, had this big stone *mauka* side of the fishpond and we used to pound'um, it was one [indistinguishable] stone

End of Tape Side I

Conversation is session

LM: …a very special, as far as that goes. Yeah.

HK: *Kāpueo`o* island, *Kāpuleo`o, kaimomona, kai `āina momona*. The thing feed us…

LM: Fertile, very fertile, yep…

HK: Yeah! And when I was growing up, this place was always raining. During my time. Oh, in October, the rain start coming. December, we take Christmas vacation early sometime, because the rivers start running and the buses no can come pick us up. Starting in October, when you still get thunder, whole house used to shake!

LM: This is when you were living in Hālawa?

HK: When I stay, no, other side town, Olipa. Hālawa, you couldn't go to Hālawa. Hālawa, my grandfather, he had two mules, this place we called Lupehu. This big, what they call sandy beach, well we call'um Lupehu. We had two mules inside there, inside this corral. Every Friday we pick him up, cause he gotta to make his *lo`i*, he gotta go check his *lo`is*, his taro. From Kalaupapa, he'd come up the old trail, we'd pick him up. We had one 1948 sedan Chevrolet, [indistinguishable] door…

LM: Stylin', huh? [laughs]

HK: We were stylin'!…me and my grandma, then we pack all his stuffs then we go up Sandy beach, Lupehu. We sleep over there. Lupehu is one 'nother place….over there was one war in the old days. Thousand warriors died. There all over there inside a small valley, all of them. They all died. They coming out now, the *'iwi* stay popping out…

LM: Oh, yeah, eroding out of the… [soil].

[Discussion about Halona's family land above Mo'ula falls in Hālawa]

LM: You were mentioning, I want to go back to your auntie. What kind of…when I go over in that area, it looks really dry, you know, and I know there's been changes. Did they grow crops up there?

HK: I think it was potato. Potato and probably they had taro.

LM: Dry land taro.

HK: Dry land…yeah.

LM: It would have to be yeah? But there was a spring, you said there was a spring?

HK: Down there get plenty springs. My father was the one had to dig'um out for the ranch, you know, for the first corn company was coming over, we had to look for springs or else [indistinguishable]

LM: Is your dad still alive?

HK: He passed away, right now three or four years. He was a good man and very, very, on the land he was super! Really super. He died when he was like 78 years old. Kidney failure. He was still young though…my grandfather, he died when was 70, but his heart had one *puka*; but his body was V [shaped] blocks, [in terrific shape]…And Pala'au you know Pala'au, that place get so much…we used to go there, that's where the black-tipped sharks migrate down there. They had their babies down there. I took Walter {Ritte] down there, I show'um the sharks, but…I just don't like them delete the sharks from there, you know, at one time eco-tourism guys wanted to come down there, because over there get nice-kind beaches. All the springs, you know, stay all down there and running. You can see'um in the…

LM: Cause they run into the fish ponds? Or run into the water, or…?

HK: Yeah, on the side of the fish ponds…

LM: Fish ponds, are they still…have they been restored?

HK: Slowly, they're restoring'um. Walter-gang, they restoring them, but the fish ponds not like before. It's gonna come back, the fish, but gonna take time because almost hundred years plus and the thing wasn't used. So, the fish will come [indistinguishable]…

LM: And the silt comes down and it needs to be cleaned out…

HK: Yeah, cover up the springs. Just like Kapa'akea, my mom's place, have one inland fishpond over there. They went cover it up. And I told my older brother if he went go check'um out. He said he no like go over there because the springs not working, and that's true. Because on the beach, you can see the spring bubbling and when they went cover up pond…

LM: Who covered it up?

HK: GoodFellow. Brothers. When they was making the MCC, yeah.

LM: Making the what?

HK: The Maui Community College. When he was doing that, he went go across the street, go clear the land and [indistinguishable] he covered up the pond. Then they re-opened'um up again. They had to go re-dig'um, but kinda to late, uh?

LM: Yeah, yeah. How long ago was that?

HK: I don't know, ten years maybe? Almost 10 years. Cover'um out and then had big squawk and then he went re-dig'um and made'um bigger, but it's not the same.

LM: Yeah, it's not the same. Of course not, yeah.

HK: And I don't blame him, because they don't know, uh?

LM: Yeah, oh, yeah, yeah.

HK: Just like what you like do over there. You know, what they like do over there, I can see the stones [indistinguishable] but the connection is there. You know, even though they say the Kahanui, Pu'u Kahanui is one mile away, but when you look at the overlay map, when you look at the map, she running, she running to that place [the slope of the parcel ascends to Pu'u Kahanui]. The thing is connected. All this *pu'u* connected and the resources over there is unreal. Not only the resources, for us, you know, for our future, our future the stories that we gotta tell. But how we gonna' say'um [indistinguishable]? How we gonna' tell our future what had? Because I was grown up on hands, you know, on hands work [indistinguishable]. My school was like this [motions he learned through watching and doing]. That was my school.

LM: That's the best way to learn.

HK: That's how I went learned. So, I getting' hard time with development. Because, what I goin' tell my future, when I tell the story, "Over here had this, uncle went park his two canoes over here, you *'ohana* of there, he catch one big 400 lb. turtle, we went go *kalua* the bugga right there." "Where?" [indistinguishable] "Where?

LM: Yeah, under the hotel!

HK: Right. I don't know how they gonna' react to that.

LM: I appreciated the time you've given me, your concerns…do you have specific conerns that you want to be mentioned in the….for instance, Walter talked about the, an archaeological study should be done.

HK: Yeah, we have archaeological sites over there, McGerty. You know I saw…

LM: You are aware of these, you've seen sites, I have too.

HK: Even though the other Lianne said, can be from a tractor, no. Like I told here, the secrets of archaeology, my secrets is when you build one house today modernization, when they build, your foundation gotta be super strong. So in the old days, we never had wood for build foundations. So the stones have to be the foundation of our house and, that's how I read'um right there. When I told her that, she went kinda' like, I was surprised when she said "No, it's from the tractors". And I told'um "No". She was questioning my job, and my job was a…my secret, the secret is how to set the stones. Completely how tractors goin' make'um, and how modern day masons goin' do'um. Our ancients was completely different. But over there, we have connections. Probably …you know, my Tūtū-them so said that this island is alive and all the lava tubes is the artery of this islands surviving. And what runs through that lava tube, the arteries, is not *koko*, it's water. An aquifer, they call aquifer, is the heart. As long as she still beating and producing, the arteries goin' be o.k. And once they goin' to [indistinguishable] arteries, she going die. And because we stay in the salt water, we goin' be history.

LM: Not only the archaeology, but you're obviously concerned about the landscape. The traditional landscape staying the same, so that you can point to your grandchildren and say, "That *pu'u* and that *pu'u* are connected", not, you know, "There used to be a *pu'u* there." You know, that sort of thing.

HK: That's my culture!

LM: So, your concerned also to preserve as much as possible?

HK: For our future, McGerty!. Had one *pu'u*, I don't know the *pu'u*'s name. When you're coming down from the airport, you're coming Kaunakakai, when you pass that big bridge. Get a quarry, yeah, over there. Sista, when you coming down, the quarry over here, right before the quarry, right where the beginning of gulch, used to get one *pu'u* over there. I don't the name of the *pu'u*, I was young boy that's why, but had the *pu'u*. Because I was going Kaunakai School, every morning my grandma had to drive me to the school. So, every morning, from across that gulch, I used to watch the deers running. And used to come and we call this place Yochida's farm. And Yochida Farm used to be on the *mauka* side of the gulch and the deers coming and then, the farm was on…had piggery, had…we go get chicken eggs, we buy it, oh, plenty eggs! But again, come cross the gulch, climb up this *pu'u*, before we used to quarry. I came home in '78, the *pu'u* was gone! And I told my friends, "What happened to that *pu'u*?" They go, "Wow, Halona, you remember had one *pu'u*!" I go, "How can I forget that *pu'u*! Every morning I used watch the deers run!" The *pu'u* stay for the reef run-way for the kine, the shuttle.

LM: This is right past the bridge, the long bridge?

HK: Yeah. Yeah, the long bridge. That's why got one flat area at bottom, the flat area was *pu'u*. The *pu'u* was right there. Then I went kinda like think, "Oh, wow!". In '78,I kinda realized what's happening man. They went take away the *pu'u* for make the reef runway.

LM: Oh!

HK: In Honolulu, you know, all that front part of the airport by the water? The big boulders…

LM: Right. For fill, for fill.

HK: Yeah, the big boulders, the wall, that's my *pu'u*. Yeah that was my *pu'u*. I don't know the name, I can go look up that name bye-im-bye. I gotta look for one old map. I looking for the 70s map or 60s.
LM: Yeah, that's a good example of the changes that can happen to the landscape and how, in fact, it can be missed, it can be, yeah…

HK: Not only the bell stone, the one that's below [by the fishpond]…

LM: That one's gone too.

HK: It's all gone. An I know where it went, probably went into a crusher! When they was building H-3, there was up Kamaloa They went quarry up there. The was takin' the stones from the a river, crush'um up for make cement for the H-3. When they was making the walls up there at the tunnel…we call'um the kine black sand, the rocks from Kamaloa when they was crushing them for make the cement. The walls was cracking, so the thing couldn't hold. What they wanted was our white sands. The one from Pokahaku.

[Halona tells of seeing barges on Maui take sand near Pihana Heiau for H-3]

LOUISE BUSH
Interview with Louise Bush (LB) at Molokai's Pizza place on Wed. July 6, 2005. Concerning Parcels to be developed in Nā'iwa Ahupua'a. Present are Louise Bush and Leann McGerty, Senior Archaeologist, SCS.

LM: Louise Bush is here. Now, could you tell me what you're…you're with Kamehamaha Schools?

LB: Actually, right. I am the Office Coordinator at Kamehameha Schools here on Moloka'i with the Regional Resource Center.

LM: O.k., all right. Yeah. So, you're the perfect person to come to about this particular area. I know, I was told by Halona that a, for instance, Pu'u Kahanui has significance and is mentioned in chants. Do you know more about that?

LB: O.k. I went through the chants that I have. I have to be honest, I haven't found anything in reference to that direct location. And I'm not sure exactly that whole impact in the area, but I do know that there's a book called *The Wind Gourds of…"*

LM: Yes!

LB: And in there, Paka'a, that… I know that there was a travel and it included the area in the Pala'au. And I'm not sure exactly where. And I know that, I believe that Halona also told you to try and contact John Ka'imikaua.

LM: Yes. I have been and I've been working on that very conscientiously, but he is a very busy man!

LB: And actually, I do know, I'm not sure if he's back yet, but he was in the hospital.

LM: Yeah, he's out from the hospital. I can tell you exactly his whole schedule [laughs], He's out of the hospital, he went to the big Island, he's back from the Big Island and he's about to leave for the mainland for two weeks, so…When you talk about the Pala'au region? What is, what exactly is the Pala'au region? [Leann gets out map]

LB: O. k. Because, it's actually in this whole area, you know, the whole coastal area, we call the Pala'au. And it comes up into the...going west…

LM: So Pala'au would include at least a portion of Nā'iwa.

LB: A portion of Nā'iwa. Which would be the *makai* side.

LM: Right, alright, yeah. O.k. and that's in *Wind Gourds of Lono'i*...Is it Lonoikamakahiki?

LB: *Wind Gourds of La'a*.... La'a… Oh, gosh I know I have the book in home.

LM: I have it at home.

LB: I do know there's reference in there, but I'm not really sure as far as the actual locations.

LM: Well, maybe I can look that up and see what's in there.

LB: But I did go through the chants that I have and I did not find Pu'u Kahanui. But, a…the chants that we have on Moloka'i, actually [indistinguishable]. And, um, I'm looking in here, and I would say that, fishermen. If I hear the fishermen, then I know the fisherman know these grounds and they would it [chants], you know it, actually Halona would probably, too, cause of their ability to fish and the affect that it would have on their fishing grounds. I know that there was a lot of affect on it when there was some grading that took place up above. And part of the homestead association which I'm also sitting on the Board for Ho'olehua, that we went into a suit and it was because of a lot of run-off that took place during grading.

LM: Now, where was that, where was that grading? Was it in the base yard?

LB: Actually, it wasn't so much…see, I'm trying…and I'm thinking, cause their base yard is, I'm looking at Homelani and I know it's slightly west of Homelani on the main highway. So, the grading actually took place further west, *mauka*, as well as *makai* side.

LM: And it still ran down and affected the a….

LB: Yeah. It affected the coastal lines of Pala'au. There was a lot of run-off. Especially the rainy season, and basically it was because there was no growing of grass or any kind of growth to maintain the dirt and hold it back.

LM: O.k. No precautions to alleviate…prevent…

LB: I would have a concern about that.

LM: Concern about the run-off affecting the…

LB: Affecting the fishing grounds.

LM: O.k., yeah, definitely. Do you know, when you looked through the chants, do you know of any stories or anything or any particular beliefs about that area, or behaviors, like is there anything gathered there of any importance that you know of?

LB: I'm tryn' think off-hand and not off-hand, I can't think of anything. I know kept tryn' a…I know there was something, but it was in reference up *mauka* side.

LM: I know there is supposed to be a petroglyph site in one of these, in the parcel [27] but that's been said that it will not be, you know, they're aware of that and it will not be….You can see, it's a pretty big parcel [shows Louise TMK map] It's a big area, definitely. So, your concern would be for precautions for the run-off for the fishing grounds.

LB: Fishing grounds, cause I know that um, I know that with the run-off and with the fishing and everything there's a lot of other…not so much ocean life, but coastal life that goes on down

there. And I know for a lot families, there's a lot of crabbing and stuff in that direct area, not so much, but along that and it might fill the pools.

LM: Right. It might affect those a…

LB: And right now, honestly, I know that there's *ʻeleʻele* coming back right in this area, which is towards the east of the location, the site. I would not like that to be [indistinguishable] I want them to come back!!

LM: Cause they're coming back, it's coming back. *ʻEleʻele* is a seaweed?

LB: Yeah, it's starting to come back. A seaweed, yeah. When I first moved home here, about 27 years ago, the only place I found it was on the east side. So I'm happy to see it coming back!

LM: Oh, really? Oh, that's terrific, that really is, yeah. That is really neat.

LB: And I know a lot of it has to do with the fresh water that comes down, and so I know the fresh water needed, but with the run-off, I don't know how that [indistinguishable. I'm tryn'…you know, I'm really sorry, but I don't anything…

LM: O.k., No, that's fine, that's fine. It's just that we want to make sure that we can, if there is anything, that we can identify it, yeah. That's fine, that's not a problem at all. Any other concerns?

LB: You know, cause….and I am really, cause I may be way off, but I know that in that book, in the story of Paka'a, oh, *Wind Gourds of Laʻamaomao*, I think it was, and in there there's reference to, I think some kind of a path that made with shells, and the path was made along the coastal lines of Pala'au. And I'm not sure if it came down into this area but if it did.

LM: Right, right. Alright, I'll look that up and see if I can find anything. You're concern would be that this would not be affected?

LB: Yeah, that it wouldn't be affected. Cause I'm quite sure that it's probably over grown and stuff, but it did appear, that they would protect it in what ever form [indistinguishable].

LM: Yeah. Yeah. I don't think their property goes down that far, but, as you say, the run-off would be something that we would definitely want to make sure that [didn't happen].

LB: Yeah, that it doesn't affect.

LM: Well, that's great, that's great. If you can, you know, along the way, if you can end up thinking of anything else, you can always give me a call.

LB: I know. Oh, but I'm really glad that their doing this.{Cultural Impact Assessment]

LM: Exactly, it's almost really foolish for developers not to do it. Because they're just asking for trouble [from the community, you know, and, it used to be before, yeah they would just go and do whatever. And even though it's been a part of our laws for years, it hasn't been, you

know, it hasn't been respected. But now because of communities that are not allowing it to get by, they're doing more and more [CIA] and I think it's really important, really important.

[Discussion of landmarks that have disappeared and affects of development]

End of Interview

APPENDIX F

Excerpt from Bush et al. 2001 AIS Report: Oral Interviews

Shapiro 1993	Maunaloa Borrow, and Ohi'apilo Pond	**Inventory Survey**: Identified a possible religious complex with multiple features. Core samples did not indicate any cultural deposits or datable material.

Due to increased visibility following a brush fire in 1988, 21 sites were documented within theDHHL Kalamaula subdivision, including walls, L-shapes, C-shapes, enclosures, and a platform (possible burial)(Estioko-Griffin 1988). An inventory survey was recommended to further map and describe these sites.

An archaeological inventory survey of a 12-acre lot for Kaunakakai School at Kalama'ula was completed by International Archaeological Research Institute, Inc. (Dye 1998). Two sites were encountered during the survey. State site 50-60-06-1660 consisted of a petroglyph gallery and limestone quarry and their associated cultural deposits, providing a continuous archaeological record from traditional Hawaiian times (late 1700's) through to the present. State site -1661 is the old Kaunakakai School, first built in the early 1920's.

Finally, International Archaeological Research Institute, Inc. conducted an archaeological inventory survey of the entire parcel of the DHHL land to be used for the current homestead subdivision project. It was determined that occupation of this area was primarily low intensity agriculture, short-term, sporadic, and/or low intensity occupation, primarily along the coast by the fishponds, and short term, sporadic military encampments which may have used the pre-existing structures and/or built new structures as needed (Tomonari-Tuggle 1990).

Of the 54 site found to be contained within the overall subdivision parcel boundaries, 16 sites were within the Phase I development boundaries (*ibid.*). Recommendations were made for the mitigation of adverse effect on 14 of the 16 sites; the other two sites required no further investigation. Data recovery was recommended for State sites 50-60-03-1740, -1741, -1743, -1745 to -1748, and -1751 to -1753 on the basis of DLNR-SHPD rules and regulations of the Historic Sites Section (May 1989) Criterion D, "site has yielded, or may be likely to yield, information on pre-history or history". In addition, two other historic sites were recommended for preservation, including State site 50-60-03-1731 (a historic irrigation ditch) and -1742 (a possible *heiau*).

E. Oral Interviews

A series of interviews with local residents was conducted by CSH (Ka'ohulani Mc Guire), concerning former habitation within the current project area, and any other pertinent information (*i.e.* burials, livestock and agricultural practices, *etc.*). Those interviewed included George Kuala'au Chong, Robert Pau'ole, Mary Tengan, Liko Tancayo, Michael Tancayo, Lehua Moku'ilima, and Zachary Helm. A synopsis of each interview is given here, while the entire transcript of each interview can be found within Appendix D of this report.

1. George Kuala'au Chong is of Chinese and Hawaiian ancestry. He was born on September 4, 1914 on the island of Molokai. Mr. Chong is the son of Chong Lung (k) and Wong Yee Oe (w). He traces his Molokai roots to his Chinese grandfather, Chong Ayau, from China and his Hawaiian grandmother, Kamamalu Kanaka'ole, from Kalama'ula. Mr. Chong spent his early childhood years living at the area commonly known as Coconut Grove, today. This is the famed Kapuāiwa grove, that was planted in honor of Kamehameha V in the 1860's. At the time of the interview, Mr. Chong was 85 years old. He resides at Ranch Camp, on Molokai, where the Chong family still continues to run the *poi* shop his

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grandfather started many years ago.

CSH: Can you tell me about where your parents lived at Coconut Grove?

KC: Oh, well, when I was living Coconut Grove, there was two brothers there: my father and my uncle — his brother. They lived down there and had children down there. My side had about four, I think. My uncle side had four children born down there, born Coconut Grove. But, after that we all move away, eh.

CSH: What part of Coconut Grove was that?

KC: It's next to, right opposite — used to be Seventh-Day Adventist Church. Right across ...

CSH: So, when you grew up there had plenty coconut trees over there [at Coconut Grove]?

KC: All the coconut trees small. I gotta go get stick, we go poke the coconut down. I go poke 'em down. Small. No can talk how many years ago, they so tall now. It was short, small. Small, the coconut trees.

CSH: And what about the springs?

KC: The spring was mainly for water, for us drink water. That's all.

CSH: Had different springs for different uses?

KC: Uh, no. That spring, that's the one we drink water, we cook with that. There was no more pipe water. No more pipe water until the homestead came. Then they had their own well and pipe water. My time as a kid down there, my mother raise pig. Two family raise pig. My father them and my uncle them raise pig. Down where the homestead area. You know the homestead?

CSH: On the beach side?

KC: Down there? You know that area there? Down there, that area where all the homes are?

CSH: Yeah.

KC: That's where the pig pen was next to the pond ...

CSH: So before the homestead, what had on top the land?

KC: Nothing [emphasized]! Before the homestead ever come over there, nothing but *kiawe* and cow. No, there's nothing down there. Of course, the ranch has something here and there, but I don't know. I was small kid, I not allowed roam all over the place bum-by you get lost. Us kids small, we all stay around Coconut Grove, right over there. Our playmate was our cousins, and then bum-by the Duke [Maliu] family come. I would go down there, but I don't know about the girls. They no like go down there. Anyway, that's the only people was down there, Coconut Grove. All the other areas, no more nothing, until they build all these homes up.

CSH: They didn't have people up *mauka* side?

KC: No more nothing! No more one — only cow. No more nothing! Only cow and grass growing and *kiawe* tree, and what not. No more one building over there. Until the homestead came in.

The homestead came in, then they dig one big well. Stay 'Olo'olo Street, they build one big [emphasized] well. As a kid, afterwards I go school up here until the 2nd grade I stay up here go school. Third grade I go down there, they build one school up Lili'uokalani Trust, on top. That's where our first school was when I went to that — not down here. I stay over there no more one year. I think, half a year, ah, we move to Honolulu. When the homestead was in already, since 1920, eh. In for couple of years already all the buildings all around the place all the homestead homes all built up already because there are plenty carpenters around to build. How many homesteads down there? More than 10 homesteads down there...

CSH: So when you were a small boy, the Chinese people were already here? Or they came after you were born?

KC: Yeah, they were fishing already down Coconut Grove. The Chinese people was fishing already.

CSH: And they lived over there, you said?

KC: Yeah, they lived there. That's where they *kau kau*, everything, they lived down there. They stay near the beach. So, when they go, they right there, they go out. They no go too far, they no more motor, only make stick. They only catch right around Kalama'ula side...

CSH: Do you remember if any of them moved across the highway from Coconut Grove? You know where Church Row is?

KC: Yeah.

CSH: Did any of them move *mauka* side?

KC: Nothing [emphasized]! No. That's why I told you, there was nothing down there [emphasized]! Nothing down there. Only our family. That's all, the two Chong family, my father and his brother house and their wives and children. That's the only building was in that area. No more nothing. Only *kiawe* trees. No more, until the homesteaders came in 1920, ah, get plenty house.

2. Robert Pau'ole: Robert (Bobby) Pau'ole is the son of Richard and Gertrude Harvey Pau'ole. He is of part-Hawaiian ancestry and was born in 1918, making him 80 years old at the time of the interview. Uncle Bobby's father was from Anahola, Kaua'i and his mother was from Honolulu. Uncle Bobby was born at Hale'iwa, O'ahu. One of the original homesteader families, they moved to Kalama'ula in 1923. Uncle Bobby was interviewed at the suggestion of Gregory Helm, the Director of the Department of Hawaiian Home Lands, who is also his son-in-law.

[section omitted]

CSH: And when did you move to Molokai?

BP: 1923, at Kalama'ula. That's when we moved to Molokai. I remember my dad had the horse wagon and he farmed at Ho'olehua, Molokai. That was in 1925, I think. But we were staying at Kalama'ula all the time.

CSH: So, your dad was one of the first homesteaders that came to Kalama'ula?

BP: Yes.

CSH: And that's why you folks moved here?

BP: Yeah. That's why we moved out here.

CSH: What was it like when you first came? What do you remember?

BP: Oh, it was country. It was just like, well, it was prehistoric. The road was not improved. It took us about one hour to get to Ho'olehua...

BP: ...we were able to raise chickens and chicks.

CSH: What other animals did you raise?

BP: Chickens and ducks, because my mother used to like to make feather *leis* with the ducks. Had the white — no color in those days. But she was able to make feather *leis*. So, it was pretty good.

CSH: Did you guys raise pigs too?

BP: Oh, a couple of years back we raised pigs. No cows. We raised cows, horses, mules. Because mules pull our wagon train ...

CSH: Did you get water from any of the springs?

BP: No.

CSH: In Coconut Grove area?

BP: Oh, Coconut Grove area. Yes, used to have a springs, lotta springs.

CSH: Did you go there for water?

BP: Oh, yes. When we go down Kalama'ula we used to fetch water.

CSH: Were there different springs for different uses?

BP: Yes. Molokai Ranch was using the water in the spring very much because that was for irrigation purposes, yeah. And then there was a flume in the back of the homestead area, Kalama'ula. And they were providing irrigation for their crops. And then they planted fruit trees and mangoes and the kine. So they was pretty much provided with crops, and cabbage, and home farming, and so forth.

CSH: Now, the Chinese man that lived with you folks, do you know where he came from, or when he came to Molokai? Do you know his background?

BP: Oh, my father picked him up from around the place, I think. He went like to farm. And he told "*Pākē* Charlie" that he was moving to Molokai — and he wanted to go Molokai and farm — and then he agreed.

CSH: Oh, so he came with you from Honolulu?

BP: Yeah, yeah. He came with us from Honolulu.

CSH: When you were growing up, were there other Chinese people living in Kalama'ula?

BP: Oh, there was quite a few Chinese people living in Kalama'ula, but they were scattered, eh. They would use the farm, that I know of.

CSH: And what part of Kalama'ula did they live? Did they live kind of together in a community, or village, or they all live separate?

BP: No, separately. They were hired by the families, eh.

CSH: Oh, so the families would hire them to help them farm?

BP: Yeah, farm. Irrigate the farm and do everything.

CSH: Do you remember if there were any Chinese people that lived down by Coconut Grove, or down by the beach?

BP: Yeah, I remember having Chinese people living in Kalama'ula, but scattered and living with families...

CSH: You folks raised pigs?

BP: Oh, yeah. We had pigs when we moved to Ho'olehua, eh.

CSH: Oh, but not down Kalama'ula?

BP: No. Oh, yeah. Kalama'ula used to raise a lot of pigs.

CSH: How did they keep them?

BP: By feeding them, oh, soil. Used to be no commercial kind feed, yeah. Used to be soils and all kind of left-overs...

CSH: Do you remember if had Chinese people living behind there in Kalama'ula, in that area behind the church?

BP: No.

CSH: You don't remember?

BP: No. I remember Kalama'ula people used to hire Chinese people to live with them and then they work on the farm. But small amount of people.

BP: In my endeavor, Hawaiian Homes, I say "Oh, I just got through burying one family." Because these new homesteaders that own the lot seen these two children parading through the bush, holding the flowers. So these families saw them and the mother came out — the owner of the lot came out — and said, "Oh, where you two girls going?" "Oh, to my great-great-grandma's grave." "Oh, that's why you're taking the flowers?" "Yeah." So, these people was flabbergasted because they wanted to see where they was going. Then they said, "Oh, they going to their grandma's and grandpa's grave, and great-grandma." "Oh." They owned the lot, and it was Mr. and Mrs. Pu'a lot. So, Hawaiians Homes was called in Honolulu, by this family that owned the lot and told them, "Better check on our lot cause get graves on our lot." So, Hawaiian Homes was so surprised, in Honolulu, that they looked to Board of Health records and saw that Mr. and Mrs. Pu'a's great-grandpa and grandma was buried over there on their lot. So they checked the

records and sure enough they found out that the records showed that they were buried over there. So, they hired their grandsons, or whatever, family to dig up the graves.

CSH: What about when you were young? When you were growing up as a young child or teenager. Do you remember hearing anything about burials in Kalama'ula area?

BP: No. Kalama'ula, no. That's the only one.

3. Mary Tengan is of part-Hawaiian ancestry. At the time of the interview, she said she was 89 years old. If this is correct, she would have been born in 1910. This seems to bear true, as she remembers that her family moved from Honolulu to Kalama'ula in 1922 and she was about 12 or 13 at the time. Her father was David Kealaikahiki Kupihea, one of the original homesteaders to move to the Kalama'ula homestead lots. Mary Tengan still resides in Kalama'ula.

The interview was conducted at the Michael Tancayo home in Kalama'ula. Aunty Mary has no surviving immediate family and the Tancayos look after her welfare. Also present at the interview were Michael Tancayo and his daughter Liko Tancayo.

CSH: When did you come here to the homestead?

MT: In 1922 we came here. We came Molokai 'cause homestead opened. So, my father was one of the first homesteaders, and I know the date, 1922. How many years is that now?

LT: Over 70 years ...

CSH: Do you remember hearing any stories, stories about Kalama'ula or stories on your lot? Hawaiian kine?

LT: The story, the *mo'olelo* about Kalama'ula. Have you heard anything, people telling you stories when you were growing up about Kalama'ula, like the trail?

MT: I heard what?

LT: Stories. Like the marching warriors, the trails, Kalama'ula, the Kalama'ula stone? You heard any stories when you were growing up you hear any stories about Kalama'ula?

MT: Oh, yeah we hear stories. You know there was nothing but *kiawe*, yeah? If you walking on the road go up, you can hear noise in the *kiawe*, like people talking in there — only at night time. And so when we go there is just like somebody walking. That's our road. By Hanakahi's place, all *kiawe*, and over here. All nothing but *kiawe*. And we live in the tent. Maybe some party going on or something. Just like somebody walking inside. Olden days they say, yeah, they walk. I don't know. And we hear [imitates noise] and we take off! Run home!

CSH: So was dark time?

MT: In the olden days, they say that they going on their way, on their trail. Where they going, I don't know. And that is right. When we walk, sometimes we say, "Eh, somebody walking!" [Imitates sound.]

CSH: You know where it is?

LT: Actually the trail comes through here. In the back, but it comes through our lot. Sometimes our door opens. All we do is just tell them, "Whoever is the last one, please close the door." And they do. They're friendly spirits, so we just talk to them. And that's it. Sometimes I can feel them. 'Cause I remember when I was in the 7th grade I used to come down here and clean the house, 'cause we were living with my grandfather. And, boy, I used to hear people talking in the backroom, I swear. I'd walk in the backroom and I'm like, "Anybody in this house?"

CSH: *Ma ka 'ōlelo Hawai'i?*

LT: Well, I just can hear voices, but I cannot understand. I cannot make out what it was. And then I come back in here, 'cause I *pau* clean the back rooms. I come back in here and I get the stereo going. And then the door — no more wind — and the door slamming or the jalousies closing, da kine "pac" kine. And I'm like "Oh my God, hurry up, get out of this house!" I hurry up, everything, I go outside, turn on the water. I go, "Okay, come on Dad, Hurry up! Hurry up! Come pick me up!" For one whole week was like that. I used to tell my mom, "You know, Mom, I think get somebody inside our house." Then she told me, "Get people come inside the house." And plus, too, we get one well on the other side of the house. Auntie Harriet Ne told my mom, "You folks need to cover that well. Get too much things coming out of there." But she said, "There is a trail that comes through your house." But after that I was fine. I said, "But mom, if you had told me I could talk story with them instead of be afraid of what was going on." But after that, no way! I not going down there clean that house. If you like clean that house, you clean 'em up yourself. But it was interesting to know that I wasn't hearing things. It was actually happening.

CSH: So, did you folks cover the well?

LT: Yeah, we covered the well. We covered the well and then after that I didn't hear as much — like the slamming of the door. To me, I think they were arguing in the back. But there was no slamming of the door, but once in awhile I would hear people talking story. I no bother. And one night I stay sleeping over here, the door is locked and it opened. I just tell them, "Okay, whoever is last, could you please *kokua*, close the door after you *pau*?" And the door close. Just like somebody went over there and close the door — "pak". But I could feel something, like "chicken skin", you know. My father was saying that when they built the house, they asked what position the house should be. And they went to ask Auntie Harriet Ne and she said, "Build the house this way. Don't build it this and this way. Build it so they can come."

CSH: So the path starts, where?

LT: Well, the path starts in the back, at Homelani, in the back there. Because had the old road before — they had construction on the Manawainui Bridge* and they had to close it. When the construction was going on they had to use the old road and I remember somebody telling me that Mrs. Joe Ka'ahanui* was going home one night and there's a dip, and in that dip she got stalled. She kept trying and trying and trying. And then she said all she saw was these eyes — she already knew it was the night marchers — and the person just said, "Wait." He went like that [puts up her hand to show "wait" signal. She was kind of scared, she said. And they went and then, whoever was the last person of the night marchers left and her car started up. I think was her son that told me that story. It starts up from Homelani, somewhere up there and comes down this way.

CSH It goes to *makai*.

LT: Yeah.

CSH: Do you know where it ends up *makai*?

LT: I have no idea at all. But, Auntie Harriet Ne's daughter, Anna Lou, has a lot of stories. From what I heard, the Kalama'ula stone, I think it's the Kalama'ula stone, Auntie Harriet Ne's *'ohana* was involved in that back in the old days.

CSH: I was talking to Zachary [Helm] yesterday and he showed me a photo of the Kalama'ula stone.

LT: Yeah, it's over there by — and my cousin folks, when they clean yard, they go over there and clean the grass around it 'cause they put bars around it to protect it. So, they clean over there. They *mālama* [take care of] that stone.

CSH: So, do you know any stories about that stone that you remember hearing?

LT: I only remember them saying that the chief's daughter was in love with this commoner, and the commoner was sent away by the chief, and they would meet at night and her lady-in-waiting would tell her not to go, to listen her father and she said, "No, I no like." And before he left, or something, they were supposed to have met that night. And he never came and she fell asleep, and the sun was coming up. Something like that. Something to do with the sun and she was waiting for her lover and her lover never came.

MiT: The sad part about that Kalama'ula rock story is that a lot of people came to interview Auntie Harriet Ne. But when they write about it, they fantasize in their own world, [and] it never comes up the way it was told. If you read books about Molokai and the Kalama'ula rock, you take two different books, the story is not the same.

CSH: You talking about Auntie Harriet Ne's book, and —

MiT: Auntie Harriet Ne's book is alright, but the other people that wrote about the Kalam'ula rock, the version is different. And yet, that's the same lady they went interview. Like you talk about Coconut Grove, if there was people living in there. My father-in-law grew up over there. A lot of people come and interview the *kupuna*, but when they write the story, to me, they fantasizing on their own and they give it a generalistic view or color it up. Like, the *haole* lady that wrote the book that was here for awhile. She wrote a book on Molokai.

CSH: A long time ago?

MiT: Yeah.

CSH: It's about sites of Molokai? Summers?

MiT: Yeah.

LT: We also heard that Kalama'ula has terraces, yeah. And that this place just flourished back in the old days with sweet potatoes. Kalama'ula was known for the best sweet potato in the islands. And when they were clearing, "Oh, look there's terraces." Can you imagine back in the old days, all this sweet potato growing, just flourishing, this *'āina*, this land? Oh, look now — all dry...

CSH: You know where they're building the new homestead lots? You know where the green church is? The old green one?

MiT: Yeah, yeah.

LT: Kalaiakamanahou?

CSH: No.

MiT: Oh, Pōmaika'i, on the hill.

CSH: Yeah, Pomaika'i, that one on the hill. Kind of just behind that, and to the west, there's like a platform area.

LT: Yeah. It's house. Agnes Ne used to live up there. Uncle Kaukula folks.

MiT: Yeah, there's a homestead — people that lived there.

LT: People used to live there, and then they moved down here. Yeah, 'cause I remember going up there.

CSH: Well, there's a platform up there and that's where they found two burials. But we think its historic, early 1920's.

MiT: Yeah, you see like Uncle Kaukula's place, the Nes. Get people that buried their family in the back yard. See, that was part of their graveyard too — their cemetery, or whatever. Those days you gotta mark the corpse with *pōhaku*...

4. Lehua Moku'ilima: Her birth name is Charlotte Lehua Solomon and she was born on November 1, 1920 in Honolulu. She was *hānai* (adopted) by Charles and Mary Manu of Honolulu and, thus, she carries the last name of Manu rather than Solomon. Aunty Lehua remembers that the Manu family moved to Molokai around 1925 or 1926 and lived at Kalama'ula until 1947, when her *hānai* parents passed away. The Manu family was one of the 22 original homesteaders who were awarded Hawaiian homestead lots at Kalama'ula.

Aunty Lehua is of part-Hawaiian* ancestry. At the time of the interview, Aunty Lehua was 78 years old. She is admired and well-respected in the community and also serves as a *hope kahu* (associate pastor) of *Ierusalema Pōmaika'i Ho'omana o ke Akua Ola* (Blessed Jerusalem and Worshipers of the Living God).

LM: My full name is Lehua Charlotte, actually its Solomon, but I was *hānai* [adopted] by the Manus, by Manu, so it's Charlotte Lehua Manu. That's what I was going by. My parents were Mary and Charles Manu, one of the original homesteaders, the first homesteaders on the island. We lived in Kalama'ula until they both passed on. And I believe we came in [19]25, [19]26 around that time.

CSH: To Kalama'ula?

LM: To Kalama'ula. And our lot number, I remember, was lot 8 in Kalama'ula, now the Helms, it's under the Helms...

CSH: Do you know anything about the name of Kalama'ula? What it means?

LM: I understand it's from a rock. It's a red, jasper rock, they call that. And one lady showed me that. She told me it was a rock, but I don't know. I don't know if it is, but it's in Kalama'ula.

It's by one of the residence over there. And they say that's that red stone, that it's jasper stone. And it was also known as "Humu'ula.

CSH: Humu'ula?

LM: Uh huh. It's a red jasper stone used for adze. That's what I have heard about that. And that rock, if they wasn't pulling my leg, this lady told me that's the rock that still remains in Kalama'ula, by somebody's residence. And I don't know if it's still there. I haven't been in the back there in a long time. So that's all I know of that stone there.

CSH: And what is your *mana'o* Humu'ula?

LM: It's the same meaning as for Kalama'ula. And that Kapuāiwa Grove.

CSH: Can you tell me about the Grove?

LM: The information that I had gotten is that it was named for Kamehameha V. And it means "mysterious tabu". Taboo — *kapu*, āiwa — mysterious. So put it together, you get Kapuāiwa. Some people pronounce it "Kapua'iwa". I've heard it pronounced that way. But, I cannot get myself to pronounce it that way. So, one day when I went to look in my dictionary, I have a dictionary, and I saw that long, *mēkona* above the "a", to me it sounds like "ai", you know "āiwa". So I thought I wasn't wrong, then. I used to pronounce it that way "Kapuāiwa". I cannot get myself to pronounce it the way other people are pronouncing it. They say "Kapua'iwa". I tell them the truth, I cannot pronounce it like that. I am used to saying "Kapuāiwa", for whatever reason. But when I made a research because of this, that's when I finally got in there to research over that name, so that's how I found the long *mēkona* over the "a", so it means that way, you know "*āiwa*". Just like "nine", "*'eiwa*" ...

LM: ... We used to walk all the way from my house to school and walk home, and there were seasons when they had this caterpillar all over the road. I used to cry all the way home. I'm so frightened of caterpillar [laughs]. Certain time of the year they all come on the road, and if there's cars passing by you could hear the cracking sound, 'cause they were run 'em over.

CSH: That was in Kalama'ula?

LM: In Kalama'ula, but all over from Ho'olehua. They all on the road. But Kalama'ula where we have to walk home. I crying all the way go home.

CSH: I don't think that happens anymore, huh?

LM: No. Long time now. Not like that. Used to happen every once a year. It was a season for that thing. Well, anyway, there's a legend for that. *Pe'elua*, I think. That's why they call that place Pu'u Pe'elua. That's where the Mormons used to be up Ho'olehua. That place is Pu'u Pe'elua...

CSH: Do you remember seeing any *heiau* or anything like that in your area?

LM: No. Burial, yes. Because I witnessed some. They took out the body to go plant 'em in the regular cemetery. It was right in the back of our church. It was from the Ne family. You know, during the days of old they never had cemetery. So they planted [them] in their own yard. So this happened to be that it's just where they are working now. But this was taken away from there a couple of years ago.

CSH: Does the church have a cemetery?

LM: No. But people used to bury wherever they, you know. That's why, once within my mission somebody ask me, they wanted a virgin place where no more. I said, "You cannot find that nowhere." They said, "How come?" I said, "Because they had war during their own days. They had war, too and where the body going drop, that's where they gonna leave 'em, so you cannot tell me get virgin land where no more dead people stay. I said, "that's what you look at. You don't know where they went fall down and die." I said, "It's foolish you folks ask for virgin land. I don't think there is any. One time or another, there must have been war in every place. And the bodies just drop. You know, the people drop like that, they have no time to go bury. So, for me, I feel that's how we get the bodies all around.

CSH: So, the Ne family burials, do you remember who that was up there?

LM: Yeah, that was Mrs. Ne's mother and father.

CSH: Auntie Harriet's mom and dad?

LM: No, her in-laws. She was married to a Ne. But one of the Ne boys married to this Pua'a girl, Auntie Mona. Well, her mom and dad, that's the Pua'a family. They were buried in the back of our church. So, before this thing was brought up about the homestead, they felt they wanted to take the bodies out. And she was still strong. She was one of them that's still living. If she was still strong, okay, she can sit down and talk story with us.

CSH: Auntie Mona Pua'a?

LM: Yeah, Auntie Mona. Her parents were buried in the back of our church and that's the ones they took off, to take them up to Homelani [Cemetery].

CSH: Do you remember any other burials in the area?

LM: No, no. Maybe there is because there's families living in the back there, too. But, I wouldn't know. Only hers, because she wanted me to go bless when they were taking it out — bless that area.

CSH: When you were growing up in that area, you don't remember anybody being buried in that area, or anyone talking about burials?

LM: No, because by the time we got to our homestead, the house was there and everything. People died, but I know they took them to the cemetery. The only thing that bother me night time, if you don't hear of anybody dying, or died, I mean, and you can hear hammering. They're making a coffin during the night to finish it so they can use it in the day for the body. That's how you know if somebody's dead, I mean, if you don't hear about it. You hear them carpentering night time making coffin. They make their own.

CSH: So, in those days when you were growing up, most everyone was buried in the cemetery?

LM: I think so, because I never seen it around. Maybe before that. Because there have been people living around before we ever came. Because when we came and we used to go down Pālā'au side and play in the bushes, while we picnicking or whatever, and you see formations. Just like it's the bottom of the house — square thing with just like an opening someplace for the door. Look like it was for thatched house, eh. The kind with the grass that they made. 'Cause you can

see the stone, you know, the way they line it up for the bottom part. Had plenty down Pālā'au, and that's why they were saying that some people lived way in the back. What's the name of that place? Pelekunu, and, that place, Wailau. People used to live down here. I guess the people living down there, that's their houses, the form of their houses, and they say that's why they exchanged food. Those from over there would bring their taro, their poi, whatever, and this one from over here to up there is the fish and whatever else, I guess. They exchanged. I used to see that when we used to run around under the *kiawe* trees. They had houses there.

CSH: You don't remember stories about them, or anyone saying, "Oh, this was somebody's house"?

LM: No, I just assumed it was, the way I see it. It was a square thing, just for one corner there's an opening just like a door. Then, I was figuring, well, when I went to school I read about houses being built with grass, yeah. So must be that. For *heiaus*, no. Not until I got into my ministry. Then I got to, how they say, this is *heiau* and over there is *heiau* . But some is not *heiau*, but they assume it is *heiau*. Whoever says that they feel that that is a *heiau*.

CSH: In Kalama'ula? You're talking about Kalama'ula area?

LM: No, around. That's the only time I seen *heiaus* when I got into the ministry. 'Cause when I need to go bless the *heiau*, I tell them, 'cause I do my thing before I go. Then they ask me and I say, "That's not *heiau*". Because some people, they have cattle or animals. I know when we were raising pigs, because like the water always go over the drainage part and go in the pig pen, and our pigs, the babies especially, so my papa pile up all the stones so these pigs go on top of there when the water come up. They go on top there. At least they're kind of safe up there, you know. I don't think only my papa did that. I think the others did that too. So, some other guys come and they think it's *heiau*.

CSH: So how big would the area be that he piled up the stones for the pigs?

LM: Oh, kinda big cause we have plenty pigs. Kinda big. 'Cause he and this man, they do it when it's clear time, so when the time it's gonna rain, or whatever, and the water is gonna start coming, they already have their thing over there.

CSH: About how many pigs did your folks have back then?

LM: Some people would have about 100, or so. But, then some, that's all they have to sell, or whatever . My papa had just a few. Maybe about 20 pigs, not more than that. We just wanted mostly for the household use. Or, we have parties, your family is all away from here and maybe they would want so he go kill 'em and he clean 'em and he put them in the *imu* and when cook he sends it over to where ever they are...

F. Settlement Pattern

The settlement pattern of south central Moloka'i included a coastal habitation zone populated by at least the 13th century (Athens 1993) with upland agricultural activity possibly as early as the 15th century (Weisler 1989, Tomonari-Tuggle 1990). Permanent habitation appears to have been for the most part within the coastal zone or at the foot of ridges as they meet the coastal flats (Hommon and Ahlo 1983, Tomonari-Tuggle 1990). The upland agricultural zone appears primarily to have temporary shelters as occupation sites though a few exceptions indicative of permanent habitation have been noted (Hommon and Ahlo 1983).

Appendix G

NHPA CONSULTATION

2015- Cultural/Natural Resource Correspondence

List of agencies, organizations and individuals receiving a more detailed information packet in 2015. This list included the Department of interior's (DOI) list of Native Hawaiian Organizations (NHOs) as provided on the DOI website in September 2015. All listed here also received written notification of the release of the Draft Environmental Assessment of this Project prepared to meet State of Hawai'i, Chapter 343 requirement via email or letter delivered by U.S. Postal Service in February 2016.

- **Office of Hawaiian Affairs**
- **State Senator Kalani English**
- **State Representative Lynn DeCoite**
- **OHA Trustee Colette Machado**
- **Maui County Council-Molokai, Stacy Helm Crivello**
- **Molokai Burial Council-Central Molokai**
- **Molokai Burial Council-Kalawao**
- **Molokai Burial Council-West Molokai**
- **Molokai Burial Council-East Molokai**
- **ʻAha Kāne**
- **Aha Kukaniloko Koa Mana mea ola kanaka mauli**
- **Aha Moku O Kahikinui**
- **Aha Moku o Maui Inc.**
- **Aha Wahine**
- **ʻAhahui Siwila Hawaiʻi O Kapōlei**
- **Ahupuaʻa o Molokaʻi**
- **Aloha First**
- **Association of Hawaiian Civic Clubs**
- **Association of Hawaiians for Homestead Lands**
- **Au Puni O Hawaii**
- **Brian Kaniela Naeʻole Naauao**
- **Charles Pelenui Mahi Ohana**
- **Council for Native Hawaiian Advancement**
- **Friends of ʻIolani Palace**
- **Friends of Mokuʻula, Inc.**
- **George K. Cypher ʻOhana**
- **God's Country Waimanalo**
- **Hauʻouiwi Homestead Association on Lānaʻi**
- **Hawaiian Civic Club of Hilo**
- **Hawaiian Civic Club of Wahiawa**
- **Hawaiian Community Assets, Inc.**
- **Ho Ohana**
- **Hoʻokano Family Land Trust**
- **Hui Hoʻoniho**
- **Hui Huliau**
- **Hui Kaleleiki Ohana**
- **Hui Mālama Ola Nā ʻŌiwi**
- **Kaha I Ka Panoa Kaleponi Hawaiian Civic Club**
- **Kākoʻo ʻŌiwi**
- **Kalaeloa Heritage and Legacy Foundation**
- **Kalamaʻula Mauka Homestead Association**
- **Kalamaʻula Mauka Homestead Association**
- **Kalihi Palama Hawaiian Civic Club**
- **Kamealoha**
- **Kamehameha Schools - Community Relations and Communications Group, Government Relations**
- **Kamiloloa One Alii Homestead Association**
- **Kanu o ka ʻĀina Learning ʻOhana**
- **Kapolei Community Development Corporation**
- **Kauwahi ʻAnaina Hawaiʻi Hawaiian Civic Club**
- **Kawaihapai Ohana**
- **Kingdom of Hawaiʻi**
- **Koʻolau Foundation**
- **Koʻolaupoko Hawaiian Civic Club**
- **Koa Ike**
- **Laʻi ʻŌpua 2020**
- **Lahui Kakaʻikahi**
- **Maʻa ʻOhana c/o Lani Maʻa Lapilio**
- **Machado-Akana-Aona-Namakaeha Ohana**
- **Mahu Ohana**
- **Mainland Council Association of Hawaiian Civic Clubs**
- **Makaha Hawaiian Civic Club**
- **Makuʻu Farmers Association**
- **Maluʻōhai Residents Association**
- **Marae Haʻa Koa**
- **Meleana Kawaiaea, LLC**
- **Menehune Foundation**
- **Moku o Kaupo**
- **Na Aikane O Maui**
- **Na Koa Ikaika Ka Lahui Hawaii**
- **Na Kuʻauhau ʻo Kahiwakaneikopolei**
- **Nā Kuleana o Kānaka ʻŌiwi**
- **Na Ohana o Puaoi a me Hanawahine**
- **Nanakuli Housing Corporation**
- **Native Hawaiian Church**
- **Native Hawaiian Economic Alliance**
- **Native Hawaiian Education Council**

• **Nekaifes Ohana** • **Order of Kamehameha I** • **Pacific Agricultural Land Management Systems** • **Pacific Justice & Reconciliation Center** • **Papa Ola Lokahi** • **Papakōlea Community Development Corporation** • **Partners in Development Foundation** • **Paukukalo Hawaiian Homes Community Association** • **Peahi Ohana** • **Piihonua Hawaiian Homestead Community Association** • **Royal Hawaiian Academy of Traditional Arts** • **The Friends of Hokuleʻa and Hawaiʻiloa** • **The I Mua Group** • **Waiʻanae Hawaiian Civic Club** • **Waiehu Kou Phase 3 Association** • **Waimānalo Hawaiian Homes Association**	

Subsequent to the release of DHHL's September 16, 2015 letter packet, additional information was obtained regarding historic sites identified within the APE. Information was provided via an electronic mailing on October 29, 2015, to all NHO that responded with the exception of Ms. **Maui County Council-Molokai, Stacy Helm Crivello, and** all those with valid email addresses as listed on the DOI list that did not respond to the September letter. Ms. Cox had a phone discussion with Ms. Crivello. She indicated she looked forward to seeing the complete AIS once release. This was provided to her via CD as part of the Chapter 343 distribution in February 2016. The October 29, 2015 distribution list follows:

Email Address	Organization
umikai@ahakane.org	ʻAha Kāne
tlenchanko1@hawaii.rr.com	Aha Kukaniloko Koa Mana mea ola kanaka mauli
dhelekunihi@yahoo.com	Aha Moku O Kahikinui
keeaumokukapu@yahoo.com	Aha Moku o Maui Inc.
kaleopaik@yahoo.com	Aha Wahine
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acamaral@yahoo.com	Association of Hawaiian Civic Clubs
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apohi21@gmail.com	Au Puni O Hawaii
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info@iolanipalace.org	Friends of ʻIolani Palace
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mallow@hawaii.edu	Hawaiian Civic Club of Hilo
kalimapau@hotmail.com	Hawaiian Civic Club of Wahiawa

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kamanaoc@oha.org	Office of Hawaiian Affairs
kawikab@oha.org	Office of Hawaiian Affairs
kawikar@oha.org	Office of Hawaiian Affairs
hawleyi@oha.org	Office of Hawaiian Affairs
lisawv@oha.org	Office of Hawaiian Affairs
kehaua@oha.org	Office of Hawaiian Affairs
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Soongm001@hawaii.rr.com	The I Mua Group

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ccullison@pbrhawaii.com	PBR HAWAII
mcox@pbrhawaii.com	PBR HAWAII
gnakai@pbrhawaii.com	PBR HAWAII

Aloha e Kakou,

In September 2015, DHHL sent out a packet of information to your organization as part of the Native Hawaiian Organization (NHO) consultation process for a federally funded project. The contact information was obtained from the U.S. Department of Interior's (DOI) NHO list. We are sending the information via email as a follow up if email contact information was provided on the DOI list. A copy of the letter is attached (click here to download attached PDF, 1.1MB: NHO_signed_letter_and_enclosures-_NA.pdf). This email is also being sent to individuals who attended the Oct 1, 2015 meeting, as well as individuals/organizations recommended by NHOs either in writing or verbally for those that we have obtained email contact information.

Subsequent to mailing the consultation letter in September, we received additional information regarding archaeological resources in the vicinity of Site 2 based on archaeological field work conducted after the letter was mailed. A brief post field summary from the archaeologist is included (click here to download attached PDF, 375.3 KB: Postfield_summary.pdf). Additional field testing is being scheduled based on the findings.

Finally, Pacific Legacy is also conducting a Cultural Impact Assessment regarding this same project to meet State of Hawai'i requirements. I encourage you to contact Lisa Kahahane if you would like to participate in that process. She can be reached at kahahane@pacificlegacy.com.

If you have any questions, don't hesitate to contact via email Ms. Malia Cox of PBR HAWAII at mcox@pbrhawaii.com, or Ms. Gigi Cairel of DHHL at gigi.o.cairel@hawaii.gov.

Mahalo,

Malia Cox, LEED® AP BD+C, REM
Project Manager

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www.pbrhawaii.com

The linked documents referenced in this email contain maps and graphics. If you experience difficulties downloading linked documents, please contact Malia Cox by email, and PBR HAWAII staff will send you an electronic copy directly. Mahalo.

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7 October 2015

Ms. Malia Cox
PBR Hawai'i
1001 Bishop Street, Suite 650
Honolulu, HI 96813

sent via email
mcox@pbrhawaii.com

RE: Post-field Summary of Supplemental Archaeological Investigations for the Ho'olehua Water System PWS 230 Improvements, Department of Hawaiian Home Lands Water System in Ho'olehua, Kauluwai and Kalama'ula *ahupua'a*.

Dear Ms. Cox:

At the request of PBR Hawai'i, Pacific Legacy, Inc., conducted supplemental archaeological investigations of various Department of Hawaiian Homes Lands properties, on the Island of Moloka'i. The recent supplemental investigations were conducted 21-30 September 2015 and are in addition to a previously undertaken Archaeological Inventory Survey also conducted by Pacific Legacy between 24-26 October 2011 and 13-16 November 2012. The 2011/2012 archaeological investigations identified six archaeological sites (50-60-03-2516 to 2521) along with three previously known archaeological sites (Site 50-80-06-800 thru 802) as being located within the project boundaries. Test excavations were also conducted at sites 50-60-03-2516 and 2519 with negligible results.

The current archaeological investigations focused on the expansion of the project boundaries in several areas previously investigated as well as examining two new areas previously not part of the 2011/2012 project areas. During the current investigations, a total of seven newly identified sites were documented. These sites are presented in Table 1 below and depicted on Figure 1.

Table 1. Archaeological Sites Identified During the 2015 Survey

Site No.	Site Type	Number of Features	Period
T-001	Complex	3	Early Historic
T-002	Terrace	1	Historic/Agriculture
T-003	Modified Outcrop	1	Traditional
T-004	Alignment	1	Traditional
T-005	Complex	5	Historic/Military
T-006	Concrete Slab	1	Historic/Ranching
T-007	Concrete foundations	2	Historic/Ranching

As per our proposal, no archaeological testing was to be conducted until the results of the survey were known. Thus, none of the recently identified archaeological sites identified were tested. We believe two of the recently identified sites need to be tested as part of the current investigations. Site T-001, a complex of terraces should be excavated to aid in the determination of its function; and Site T-003 should be excavated to aid in its determination of its function. My understanding is that this testing will be covered in an amendment to our current contract, and Paul Cleghorn will be providing that amendment separately.

Upon completion of the testing, the information from both investigations will be analyzed and data associated with the water system improvements will be summarized and synthesized into a single Archaeological Inventory Survey report in support of the proposed project.

Please contact Paul L. Cleghorn or me (808-263-4800) if you have any questions regarding our inventory survey.

Sincerely,

James McIntosh, B.A.
Supervisory Archaeologist

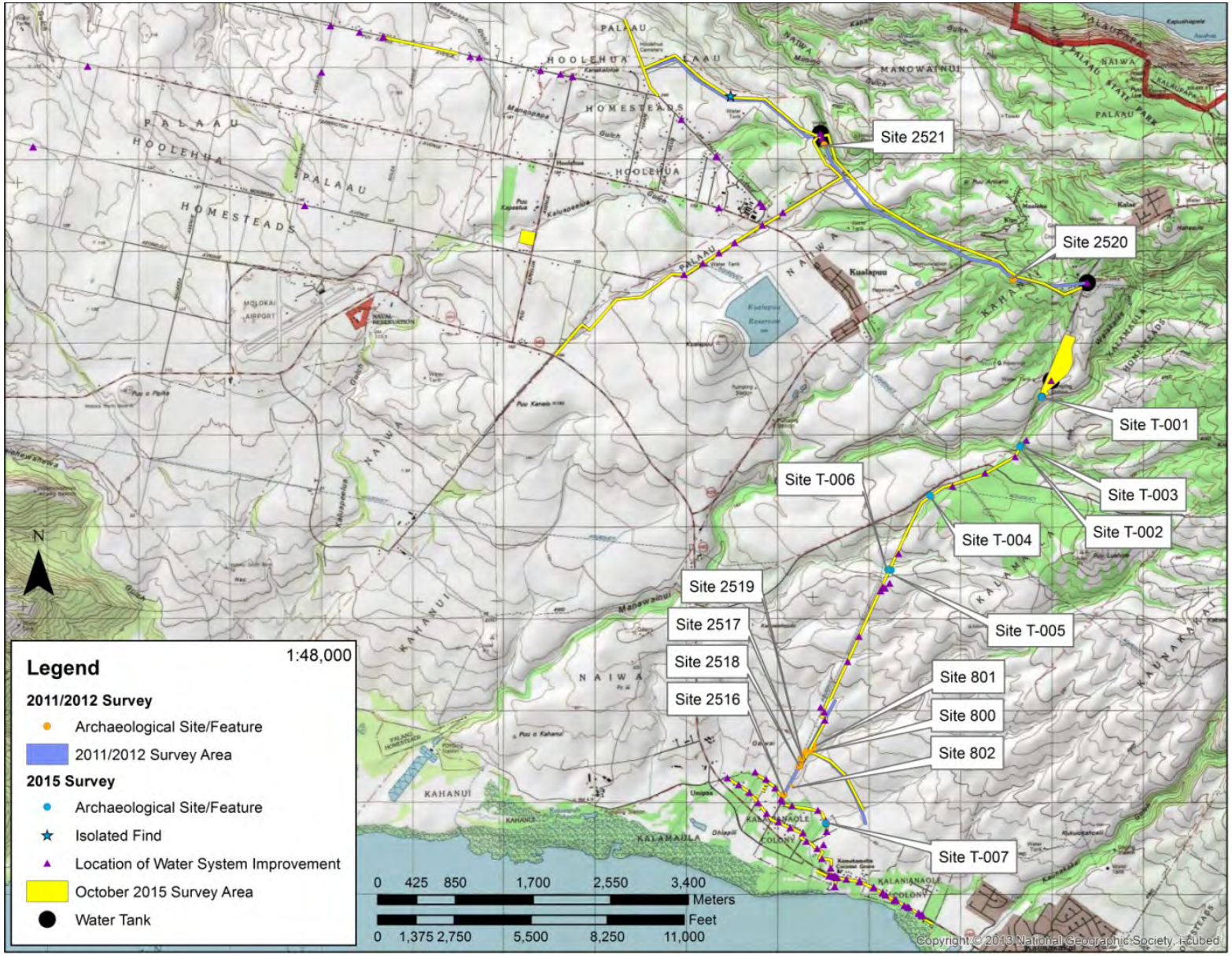


Figure 1. Archaeological sites identified during the 20011/2012 and 2015 archaeological investigations.

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

September 16, 2015

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I

Aloha mai

The Department of Hawaiian Home Lands (DHHL) is submitting applications for funding from two Federal agencies. DHHL is requesting funds from U.S. Department of Agriculture-Rural Development division Water and Waste Disposal Loan and Grant (USDA-RD) program; and U.S. Department of Housing and Urban Development, Native American Housing Assistance and Self-Determination Act, Native Hawaiian Housing Block Grant (HUD) program to improve DHHL's, Ho'olehua Water System, PWS No. 230 on Moloka'i. We are initiating consultation with your agency/organization to satisfy the requirements of the National Environmental Policy Act (NEPA) and related laws and authorities including, Section 106 of the National Historic Preservation Act, and Section 7 of the Endangered Species Act. This project is located on State lands, therefore consultation with your agency/organization is also being conducted to meet Hawai'i Environmental Policy Act (HEPA), Chapter 343 Hawai'i Revised Statutes (HRS), Chapter 11-200 Hawai'i Administrative Rules (HAR) as well as the USDA-RD and HUD requirements.

Consultation Activities
During our Regional Planning Process that began in 2007, the community identified several issues with the potable water system. The Department of Health also identified several issues that while not eminent hazards would improve the safety, security, and reliability of the water system. DHHL, in consultation with USDA-RD, developed a list of improvements (see Preliminary Project List and Consultation attached) to be included in an application requesting federal funds. Consultation with agencies, Native Hawaiian Organizations (NHO), and

individuals began in 2011 based on the preliminary project list[1]. Meetings were held with the Ahupua'a o Molokai[2] and select Kalama'ula homesteaders in December 2011. The objective of these meetings was to discuss the proposed potable water projects, and adjust the proposed task as needed based on local knowledge. Subsequent to these meetings, the project was revised and additional actions including fire protection, and transmission repairs were incorporated into the project. DHHL identified additional improvements that if incorporated into the project would improve fire protection, reliability, security, health, and sanitation and decrease long-term energy costs. These projects have been incorporated into the proposed improvements to the DHHL Ho'olehua Water System, PWS No. 230, Moloka'i, Hawai'i. Agencies, organizations, and individuals previously consulted are being re-engaged for consultation based on the expanded scope of the project.

Project Overview
The proposed improvements to the disinfection, storage and distribution system will be integrated into DHHL's existing potable water system, "Ho'olehua Water System, PWS No. 230" (PWS 230). These project actions will improve reliability and functionality while decreasing operational energy cost of the system. In addition, deficiencies that affect health, sanitation and security of the potable water system identified by the DOH and DHHL are anticipated to be corrected as a result of this project.

Project Location
The water system includes source, storage and conveyance equipment throughout central Moloka'i. Tasks associated with actions designed to improve the water system will occur at seven dis-contiguous areas located in central Moloka'i. Please see enclosed map.

Proposed Tasks and Activities
A brief description of the tasks and activities proposed for each of the seven locations is described below.

Site #1 Well Site Improvements

1-A 200,000 Gallon Storage Tank: This task includes the installation of 200,000-gallon storage tank and ancillary equipment to connect to the existing system, excavation, and disposal of overburden/construction debris. The new tank will be located adjacent to the

[1] *Consultation with DHHL's Moloka'i beneficiaries regarding the water systems (including Ho'olehua Water System, PWS No. 230) has been an on-going part of the Regional Planning Process beginning in 2007. The Regional Plan was originally released in 2007 and was updated in 2010.*
[2] The Ahupua'a o Molokai is composed of leadership from all the Molokai Homestead organizations except Kalamaula. The Ahupua'a invited Kalama'ula representatives to attend their monthly meeting, providing DHHL and the project team an opportunity to engage in an open discussion with the leadership of all the Molokai homestead associations connected to the DHHL water system.

existing 100,000-gallon tank on a hillside at the well site. The proposed storage tank is necessary to ensure uninterrupted supply of water to Kalama'ula residents. This tank will augment, not replace existing storage facilities.

1-B Chlorination and Storage Facility: Disinfection of water is an important process to ensure the delivery of safe drinking water. Improvements are necessary to make the facility safer for workers and the general public. This task includes the construction of a new structure that includes safety facilities (such as an eye wash/safety shower) in a decontamination room, a clean room and a storage room, excavation, and disposal of overburden/construction debris. The storage room will be designed to ensure safe storage of disinfection product containers that meet Occupational Safety and Health Administration (OSHA) standards. In addition, critical /equipment necessary for emergency maintenance, safety and operations of the water system will be stocked/housed at this facility. At a minimum, the equipment identified will include a forklift, front-end loader and replacement pumps.

1-C Above-Ground Fuel Storage Tank (fuel AST): Currently, the water system has an emergency generator to supply electricity for pump operation when grid supplied energy is not available. The generator has fuel storage capacity to operate the generator for a maximum of 24-hours. A fuel AST would augment the existing capacity, increasing operational time of the generator during emergencies. Tasks associated with this action include the installation of a fuel AST at the well site, fuel lines connecting the tank to existing generator system, automation equipment, security fencing, excavation, and disposal of overburden/construction debris.

1-D Well Site Compound Modifications: The existing well site compound does not have adequate space to accommodate a new 200,000 gallon storage tank, chlorination facility, a fuel AST, and ancillary equipment associated with the solar energy system. Activities associated with this task include the redesign and construction of a minimum 8-foot high deer deterrent fencing and roadway system for security and access, excavation, disposal of overburden/construction debris.

1-E Booster Pump Replacement: The existing booster pumps have reached their estimated useful life. Pump failure is a concern. This task requires the replacement of the existing booster pumps and ancillary equipment. It is anticipated that activities associated with the task will include grading, excavation, disposal of construction debris, demolition debris and overburden, as well as installation of a concrete pad, connection to the supervisory control and data acquisition (SCADA) and electrical systems as well as the existing water system. Reuse of existing site preparations such as a pre-existing concrete pad will be implemented if possible.

1-F Energy System Modifications: A one-megawatt solar system will be built on approximately seven acres within a 25-acre area at the well site identified for solar production by DHHL. This system would be comprised of approximately 3,500 to 4,000 fixed ground-mounted solar panels (depending on panel efficiency). An inverter bank will convert the DC output of the solar panels into AC that can be used to drive the existing pumps. The system will be connected to the Maui Electric Company grid for redundancy as well as to the existing diesel backup generators located at the well site. It is anticipated that the system will not export electricity to the Maui Electric Company grid. The existing electrical panels are nearing the end of their expected useful life. They will be replaced to meet existing requirements and modified as necessary to accommodate additional solar requirements.

Site #2- Kalama'ula Improvements

2-A All-Weather Roadway to Kalama'ula Tank: The access road to the existing 200,000 gallon tank in Kalama'ula is unpaved and severely eroded, hampering access for maintenance and operations. This task will modify the existing dirt roadway with the installation of a 3,000 linear feet (LF) of all-weather roadway from Hā'ena Street to the reservoir. The new roadway will follow the existing road corridor. Tasks included in this action will include roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

2-B Kalama'ula Transmission Main and Lateral Replacements: The conveyance system in Kalama'ula is not a looping system, occasionally resulting in lower pressure, and water sitting in pipes for a longer than optimal period of time. Additionally, portions of the existing galvanized transmission lines are over 30 years old and have reached the end of their useable life. This task will include the installation of new larger capacity mains and 15 laterals along approximately 5,600 LF in Kalama'ula. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

2-C Valves Replacement: One Pressure Relief Valve (PRV), 20 Gate Valves (GV), 9 Air Relief Valves ARV) and associated ancillary equipment in Kalama'ula have reached the end of their useful life due in part to the harsh environmental conditions. This task will include replacing PRV, GV, and ARV valves and realigning manholes as necessary. This project will also require limited excavation at each valve site and debris disposal.

2-D Deer Deterrent Fencing: Existing fencing does not restrict deer access to the area surrounding the tank. Health and sanitation of water stored at the tank may be compromised by the presence of deer feces. This task will include the removal of the

existing fences, excavation, installation of minimum 8 foot tall deer deterrent fencing, and disposal of overburden/construction debris.

2-E Fire Hydrants: Harsh environmental conditions have reduced the life expectancy of most fire hydrants in the coastal are of Kalama'ula. Replacement of the deteriorated hydrants will improve fire protection capabilities in the areas. This task will include the replacement of approximately 30 fire hydrants.

Site #3- Kauluwai Tank and Transmission Improvements

3-A Kauluwai Tank Transmission Main: A section of the 6-inch main transmission line at the existing 1.0 MG Kauluwai tank is approximately 12 feet above the lowest portion of the tank. As a result, the water stored at the base of the tank cannot be utilized. This task would redesign and replace the lower main increasing the useable storage capacity to the tank design capacity. Some excavation and associated disposal of debris is also anticipated. It is anticipated that completion of this tank will reduce water stagnation in the bottom of the tank.

3-B Kauluwai to Ho'olehua Transmission Main: The existing main was constructed utilizing a 6-inch transite (asbestos) pipe. Integrity of the existing pipe is a concern. This task requires the replacement of 11,000 LF of piping. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

3-D Deer Deterrent Fencing: Existing fencing does not restrict deer access to the area surrounding the tank. Health and sanitation of water stored at the tank may be compromised by the presence of deer feces. This task will include the removal of the existing fences, excavation, installation of minimum 8 foot tall deer deterrent fencing, and disposal of overburden/construction debris.

Site #4- Ho'olehua Tank Site Improvements

4-A Ho'olehua Tank Improvements: The tanks should be modified to improve safety and automation. This task, 4-A has been subdivided into four subtasks as described below. In addition to the subtasks described, this task will include site preparation, installation of ancillary equipment and disposal of construction debris/overburden.

4-A-1 Automation of Level and Flow Control Valves: Water flow from 1.0 MG reservoir to the two 3.5 MG tanks located in Ho'olehua requires manual operation of a gate valve. Changes in demand require manual adjustments. This subtask would connect these tanks to the SCADA system and allow for automated adjustments providing more

consistent water delivery. The sub-task will include construction of a new control valve vault, installation and connection of control equipment to existing system and ancillary equipment.

4-A-2 Replacement of Exposed Vertical Piping and Valves: Some of the exposed pipes and valves are corroded. This sub-task would assess and replace corroded ancillary equipment.

4-A-3 Exterior Ladder: The exterior ladder is unsafe. This sub-task would replace or repair the existing ladder and safety railing system to meet OSHA safety requirements.

4-A-4 Tank Repair: There are two 3.5 MG tanks located at Site #4 that were placed in operation approximately 80 years ago. While the tanks are still operational, the concrete is showing signs of wear and is crumbling in some areas. Rebar supports show substantial rusting. This sub-task would repair the tanks.

4-B All-Weather Roadway to 3.5 MG tanks: The existing access road to the 3.5MG tanks in Ho'olehua is unpaved and located on non-DHHL lands owned by Kualapu'u Ranch and subject to their authorization. This task will develop a new road within DHHL landholdings. The new roadway will extend from Pālā'au Road approximately 5,280 LF to the 3.5 MG tanks. Tasks included in this action will include grubbing, grading, roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

4-C Deer Deterrent Fencing: Existing fencing does not restrict deer access to the area surrounding the tanks. Health and sanitation of water stored at the tank may be compromised by the presence of deer feces. This task will include the removal of the existing fences, excavation, installation of minimum 8 foot tall deer deterrent fencing, and disposal of overburden/construction debris.

Site #5- Ho'olehua Transmission and Fire Protection Improvements

5-A Ho'olehua to Veterans' Cemetery to Lihi Pali Avenue Transmission Main: The existing water main is comprised of a mix of one to three inch pipes of various materials. It does not extend to the Veterans' Cemetery, nor does it provide service to several homesteads along the northern extent of Lihi Pali Avenue. This task would include the replacement of the existing main and extend service to Veterans' cemetery and then on to Lihi Pali Avenue with approximately 11,000 LF of 8-inch main. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

5-B Fire Protection: The Veterans' Cemetery as well as the homesteads in this section of Ho'olehua do not have fire protection. This task would improve brush fire protection as well as provide fire protection for existing homes in the vicinity through the installation of 17 fire hydrants and a new access roadway from Ho'olehua to the Veterans' Cemetery. Tasks included in this action will include roadway excavation, disposal of overburden/construction debris in addition to construction of a gravel packed roadway.

5-C Pu'ukapele Transmission Main: The existing 1.25 inch galvanized transmission line is over 30 years old and has reached its useable life. Main breaks interrupt service to the areas. This task includes the replacement of approximately 3,350 LF of transmission main and laterals, and the installation of two new fire hydrants. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals not being replaced.

Site #6- Ho'olehua Pressure Breaker Tank Facility Improvements

6-A All-Weather Roadway to the Pressure Breaker Tank: The existing access road to the 19,500 gallon pressure reducer tank in Ho'olehua is unpaved and inaccessible during heavy rains. This task will modify an existing dirt roadway. Approximately 7,920 linear feet (LF) of all-weather roadway will be installed from the intersection of Kūle'a and Mo'omomi Avenue to the tank. The new roadway will follow an existing, overgrown road corridor. Tasks included in this action will include grubbing, grading, roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

6-B Ancillary Equipment Improvements: Several of the equipment located at the Pressure Breaker Tank Facility such as the butterfly valves have reached the end of their useful life. This task will replace equipment in kind. This project may include limited excavation, disposal of demolition/construction debris and replacement of equipment.

6-C Deer Deterrent Fencing: Existing fencing does not restrict deer access to the area surrounding the tank. Health and sanitation of water stored at the tank may be compromised by the presence of deer feces. This task will include the removal of the existing fences, limited excavation, installation of minimum 8 foot tall deer deterrent fencing, and disposal of overburden/construction debris.

Site #7- Ho'olehua Maintenance Yard Improvements, and Scattered Valve and Hydrant Replacements

7-A Valve and Hydrant Replacement: Seven Pressure Relief Valve (PRV), seven Gate Valves (GV), five In-line Valves (IV)11 Air Relief Valves (ARV), up to five fire hydrants

and associated ancillary equipment in Ho'olehua have reached the end of their useful life. This task will include replacing hydrants, PRV, GV, IV, ARV valves and realigning manholes as necessary. This project will also require limited excavation at each valve site and debris disposal.

7-B **Maintenance Yard Improvements:** The Maintenance Building, built in 1969 is not large enough to house necessary equipment and materials needed to maintain the water system. Based on an evaluation of the existing structure, the deterioration of support structures dictated building replacement rather than expansion of the existing. This task will include the demolition of the existing structure, re-use of the existing concrete pad and expanding it to accommodate a 4,800 square foot warehouse type facility. A fire hydrant and water meter will be installed to provide fire protection for the building and surrounding DHHL lands. An additional concrete pad, up to 2,400 square feet, will be constructed to accommodate outside storage, loading, unloading, and parking. Tasks included in this action will include grubbing, grading, excavation, disposal of demolition, overburden, and construction debris as well as the installation of fire hydrant and ancillary equipment and construction of the building and concrete pad.

While improvements to the water system are important, we want to ensure that cultural and natural resources are also considered. Evaluations including a Literature Review of Previous Archaeological work within all DHHL's landholdings on Molokai have been conducted. An archaeological inventory and natural resources survey of the initial project area were also conducted. The areas not included in the initial evaluation will be surveyed for both cultural and natural resources during September 2015.

Historic sites were identified within the vicinity of Sites 2, 3 and 4, but not within the proposed construction areas. Three archaeological sites were found within project Site 2 are likely pre-contact structures, State Historic Preservation Division consultation on the project is on-going to ensure any negative effects on historic properties are appropriately mitigated. The areas not included initial evaluation will be surveyed during September 2015.

In addition, based on the initial findings, the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) was detected in the vicinity of the project site. Project design and construction will be planned to avoid areas with this endangered mammal. In particular, during construction phases of the project, the clearing of trees taller than 15 feet will be avoided between June 1st and September 15th.

Thank you for taking the time to review the information provided. If you have any information that you feel is relevant to share or comment on as it applies to this project, cultural resources and the Native Hawaiian people, we humbly ask that you respond within 30 days.

Responses may be emailed, or mailed to our authorized agent for this project, PBR HAWAII

Email:
mcox@pbrhawaii.com

Written Correspondence:
PBR HAWAII
Attn: Ms. Malia Cox
1001 Bishop Street, Suite 650
Honolulu, HI 96813

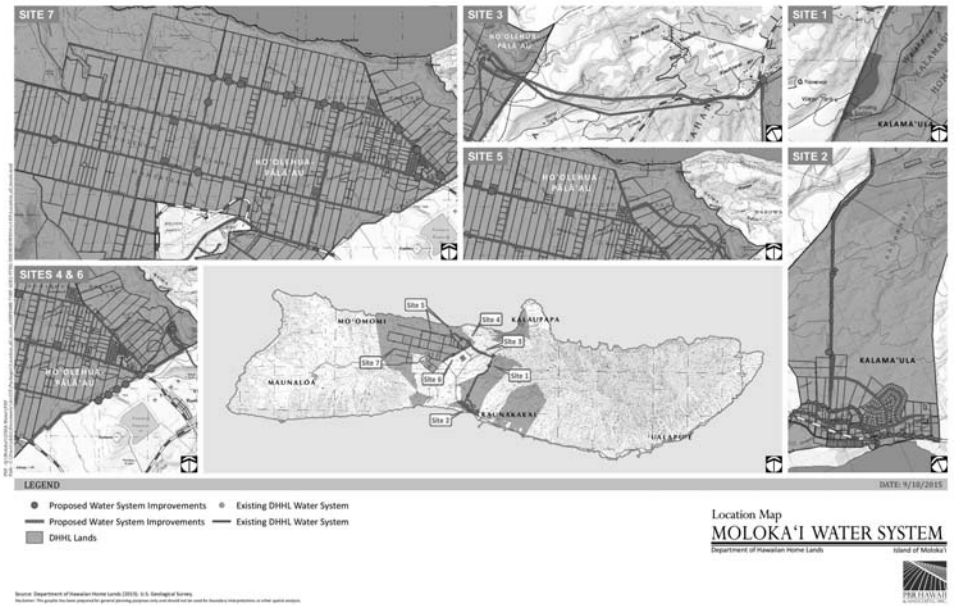
Should you have any questions, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at 620-9484. We will also be on Molokai on October 1 -2, 2015. If you would like to schedule a meeting to discuss cultural resources as they relate to this project, please email Ms. Cox as soon as possible as available time slots are limited.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

Copy: Norman Sakamoto, Administrator-Land Development Division
Gigi Cairel, Planner-Planning Office
Malia Cox, PBR HAWAII, 1001 Bishop Street, Suite 650, Honolulu, HI 96813-3484

Enclosure: Regional Location
Excerpts from Archaeological Inventory Survey for the Proposed Improvements to the Department of Hawaiian Home Lands Water System on Moloka'i Lands In Ho'olehua, Nā'iwa, Kahananui, and Kalama'ula Ahupua'a



Pacific Legacy

Historic Preservation

Excerpts from this document are provided to give some information regarding the physical cultural resources identified during AIS conducted in 2011. Additional field work is scheduled for September 2015 within the expanded project areas.

ARCHAEOLOGICAL INVENTORY SURVEY FOR THE PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS WATER SYSTEM ON MOLOKA'I LANDS IN HO'OLEHUA, NĀ'IWA, KAHANUI, AND KALAMA'ULA AHUPUA'A

[TMK (2) 5-2-007:029-030, 035, 040, 055, 078-080, 082-085; (2) 5-2-008:051-052, 079, 084, 086-089, 091, 114; (2) 5-2-010:001-003; (2) 5-2-012:999; (2) 5-2-013:010, 017, 028-032; and (2) 5-2-033:001-003]

Pacific Legacy: Exploring the past, informing the present, enriching the future.

Cultural Resources Consultants

Hawai'i Offices
Kailua, O'ahu
Hilo, Hawai'i

California Offices
Business Office
Bay Area
Inland Empire
Sierra/Central Valley
Southern California

ABSTRACT

Pacific Legacy, Inc., under contract to PBR Hawai'i, conducted an archaeological inventory survey of various Department of Hawaiian Homes Lands properties, on the Island of Moloka'i. This archaeological inventory survey is meant to identify areas or potential areas of concern for the DHHL for the proposed Water System Improvements, which will include actions to improve reliability and functionality of water delivery to the 1,900 users connected to the Ho'olehua Water System – PWS No. 230 on Moloka'i Island.

The survey was conducted between 24-26 October 2011 and between 113-16 November 2012. The survey team was assisted in the field by DHHL personnel who helped to orient and coordinate field activities. The survey determined that pineapple cultivation had impacted large areas of land making it unlikely that archaeological resources would be identified.

A total of six new sites (50-60-03-2516 to 2521) were identified and three previously documented sites (Site 50-60-03-800 to 802) were identified as being located within the project boundaries.

Details regarding the sites are presented herein and no further archaeological work is recommended (Section 8.0).

7.0 SIGNIFICANCE

The National Historic Preservation Act of 1966 (as amended) authorizes the Secretary of Interior to expand and maintain a National Register of Historic Places (NRHP) that contains a listing of districts, sites, buildings, structures and objects significant in American history, architecture, archaeology, engineering and culture. A property may be listed in the NRHP if it meets criteria for evaluation defined at 36 CFR §60.4:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and
>
> (a) That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b) That are associated with the lives of persons significant in our past; or
>
> (c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d) That have yielded, or may be likely to yield, information important in prehistory or history.

The State of Hawai'i recognize the above criteria under HRS §13-275-6, and has also added a fifth significance criterion to the evaluation process:

> (e) That have an important value to the Native Hawaiian people or to another ethnic group of the State due to associations with cultural practices once carried out or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts – these associations being important to the group's history and cultural identity.

Based upon the above stated criteria, the newly identified sites are assessed as follows: Site 2516 appears to be significant based upon criteria d and e and its use as a residential structure; Site 2517 appears to be not significant based upon its style of construction; Sites 2518 and 2519 appears to be significant based upon criterion d; Site 2520 is significant based upon criterion d and its association with ranching; and Site 2521 appears to be significant based upon criteria c and d and its association and importance with water resources on Moloka'i.

The above recommendations and recommended treatments of the sites are also present below in Table 6.

Table 6. Site significance and recommended treatments.

Site No.	Site Type	Significance	Recommended Treatment
2516	Platform	d, e	No Further Work/Preservation
2517	Modified outcrop/enclosure	not significant	No Further Work
2518	Mound	d	No Further Work/Preservation
2519	Mounds (n=3)	d	No Further Work/ Preservation
2520	Concrete water trough	d	No Further Work
2521	Concrete tank stands	c, d	No Further Work/ Preservation

8.0 SUMMARY AND DISCUSSION

At the request of PBR Hawai'i, Pacific Legacy, Inc., conducted an archaeological inventory survey on various DHHL properties on the Island of Moloka'i for proposed Water System Improvements which will include actions to improve reliability and functionality of water delivery to the 1,900 users connected to the Ho'olehua Water System-PWS No 230. Proposed actions to the water system will occur at five discontinuous project areas located in central Moloka'i, specifically the Ho'olehua and Kalamaula Ahupua'a and consisted of a myriad of improvements from replacing a tank ladder to the installation of new subsurface water lines.

Archaeological investigations were conducted between 24-26 October 2011 and 13-16 November 2012. The survey team was assisted in the field by DHHL personnel who helped to orient and coordinate field activities. During the survey, the space between the archaeologists varied between 30-35 m wide depending on vegetation and terrain. The survey determined that pineapple cultivation had impacted large areas of land, making it unlikely that archaeological resources would be identified. Nonetheless, a total of six new archaeological sites (2516 - 2521) were identified and three previously documented sites (Site 50-80-06-800 – 802) were identified as being located within the project boundaries.

Two survey areas (Project Area 1 and Project Area 5) contained no identified archaeological sites. Any future work conducted in these areas will have a very low likelihood of any archaeological resources. However, a corrugated metal shed was located on the edge of the parcel. The shed will not be impacted during the proposed improvements. The date of construction of the structure has not been determined. Should future work in this area occur, DHHL may have to evaluate the shed for potential significance. No further work is recommended for these areas.

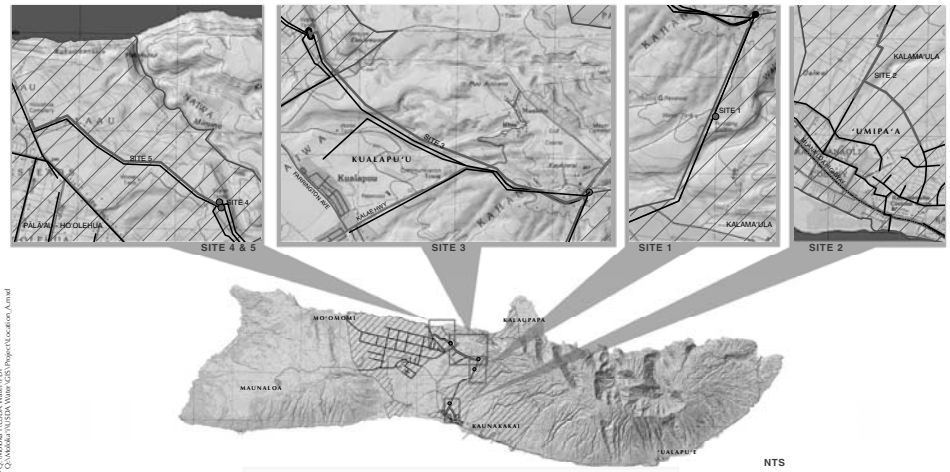
A total of four new sites were identified in Project Area 2 (2516 to 2519) along with three previously recorded sites (800-802). All of the sites were located off of the *mauka/makai* road corridor. Site 2516, 2518 and 2519 are probable pre-Contact structures given their appearance and construction methods. All of these sites appear to be significant under criteria d and are recommended for preservation. Site 2517 is a modern structure that has been determined to not be significant. All of these sites appear to be far off the roadway and would not be impacted by the proposed project with the exception of Site 2518. This site is adjacent to the existing roadway and may be impacted. It is recommended that this site be avoided during construction if possible. However, if this site cannot be avoided, it has undergone documentation and recording and its destruction would have a negligible effect on the archaeological record of Moloka'i. No further work is recommended at any of these sites. Of the three previously identified sites, two (800 and 801) are pre-Contact (complex and mounds) and one (802) is historic (cattle wall). None of these should not be impacted by the proposed project.

Project Area 3 contained two historic era sites (2520 and 2521). Site 2520 is a historic concrete water trough and 2521 is associated with water tanks that formerly operated in the Ho'olehua area. Both of these sites can easily be avoided during the construction activities associated with the new pipeline. No further work is recommended at these sites.

Although Site 2519 contained no archaeological sites, two active 3.5MG tanks comprising the Ho'olehua tank farm (reportedly constructed in the 1930s) are present. It is unknown whether these tanks have been formally documented but it is recommended that they undergo formal recordation. To the archaeologist they are impressive in size and are possibly significant for their architectural style and construction methods.

As previously stated, none of the archaeological sites identified are in danger of being affected by the proposed construction activities. In the areas where pipeline instillation is proposed, the lines could easily avoid the resources present.

The proposed improvements to the DHHL water system presented herein will have no significant impact to the documented archaeological sites. No further work is recommended for this project. However, if any potentially significant resources (e.g., human remains) are discovered during the course of construction, work should halt and the State Historic Preservation Division should be contacted (808) 692-8015).



PDF - Q:\Molokai\GIS\ESA Maps\.PDF
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NOTE: This graphic shows the locations covered by the 2012 Archaeological Survey. It DOES NOT show the full extent of the proposed water system improvements. Please refer to the map dated 9/10/2015, for current project area.

LEGEND

- Site of Improved Water Facility
- Site of Improved DHHL Water Line
- Water Facility not in Site Scope
- DHHL Water Line not in Site Scope
- DHHL Lands

DATE: 6/14/2012

EXHIBIT B
Location Map
MOLOKA'I WATER SYSTEM

Department of Hawaiian Home Lands
State of Hawai'i

Linear Scale (feet)
0 1,000 2,000 4,000

PBR HAWAII & ASSOCIATES, INC.

Source: City and County of HonoluluCounty of Maui (2010). Hillshade GRIDs created by ESRI Honolulu staff using USGS 10 meter DEMs (2008).
Moloka'i Quadrangle Map, 1:24,000-scale Digital Raster Graphic, U.S. Geological Survey.
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

COUNTY COUNCIL
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793
www.MauiCounty.us

September 30, 2015

PBR HAWAII
Attn. Ms Malia Fox
1001 Bishop Street, Suite 650
Honolulu, HI 96813

Dear Ms. Cox:

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAIʻI REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIʻIAN HOME LANDS HOʻOLEHUA WATER SYSTEM, PWS NO. 230, MOLOKAʻI, HAWAIʻI

With reference to the request for comment from the Maui County Council to satisfy the requirements of the National Environmental Policy Act (NEPA) and related laws and authorities including, Section 106 of the National Historic Preservation Act, and Section 7 of the Endangered Species Act and being that this project is located on State lands, it further is required to meet Hawai'i Environmental Policy Act (HEPA) Chapter 343 Hawai'i Revised Statutes (HRS), Chapter 112-200 Hawai'i Administrative Rules (HAR) as well as the USDA-RD and HUD requirements, this correspondence serves to document my comments, as the Molokai representative to the Maui County Council, regarding the above-mentioned subject matter.

I applaud the Department of Hawaiian Home Lands' (DHHL) efforts to improve its existing water system on Moloka'i. DHHL, in consultation with USDA-RD, is requesting federal funds to improve the safety, security and reliability of their water system. The request incorporates proposed improvements to the DHHL Ho`olehua Water System, PWS No. 230, Moloka'i, Hawai'i. Furthering DHHL's efforts are the agencies, organizations and individuals previously consulted who

have been re-engaged for consultation based on the expanded scope of the project.

As the Molokai Council Member, I support the DHHL Project and its "Proposed Tasks and Activities" because it proposes to improve the following:

- Protection of Water Sources
- Support Management of DHHL's Water System
- Support infrastructure so that Homestead Water will always be usable and accessible
- Provides adequate amounts of Water
- The improvements will meet efficiency measures. Upgrading maintenance of the water system will reduce costs. Operational costs are extremely high for a system with a customer base of 587 customers. Electrical costs are one of the driving factors of the operational costs. To address this costly component, improvements and modifications to the energy system will be addressed.

DHHL, through this project, encompasses its *Kuleana (rights and responsibilities).* The department is being responsible by seeking means to develop a comprehensive effort of protecting its water assets inventory, DHHL owned water infrastructure, current and future water demand and potential water sources.

Respectfully,

STACY HELM CRIVELLO
Councilmember – Molokai

SSC:aas

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. ARLA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

County of Maui
County Council
200 S. High Street
Wailuku, Maui, 96793

Attn: Councilmember Stacy Helm Crivello

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Ms. Helm Crivello;

Thank you for your letter dated September 30, 2015. We appreciate your review and support of this project. The Department of Hawaiian Home Lands (DHHL) takes its kuleana regarding both protection and management of its water assets and infrastructure seriously. It is our belief that these improvements will reduce the operational costs of the system while improving security, health/safety, and reliability.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL Administrator-Land Development Division
Gigi Cairel, Planner, DHHL Planning Office
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Mr. Thomas Joseph Lenchanko
tlenchanko1@hawaii.rr.com

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I

Aloha mai Mr. Lenchanko;

Thank you for your email dated October 1, 2015. We appreciate you taking the time to review the information provided and offer the following response to your comments.

DHHL is a state agency that administers the Hawaiian Homes Commission Act of 1920, as amended, and has jurisdiction over Hawaiian home lands.

We thank you for your participation in this consultation process. The Draft EA is now available for public review and comment. You can access the electronic version of the Draft EA by clicking on the document title within the table of contents of the *Environmental Notice.* A link to the current issue of the *Environmental Notice* follows. http://oeqc.doh.hawaii.gov/Shared%20Documents/Environmental_Notice/current_issue.pdf. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL- Administrator-Land Development Division
Gigi Cairel, Planner, DHHL- Planning Office
Niniau Simmons, DHHL- Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure: Regional Location

PHONE (808) 594-1888

FAX (808) 594-1938

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
560 N. NIMITZ HWY., SUITE 200
HONOLULU, HAWAI'I 96817

HRD15/7621B

October 5, 2015

Malia Cox
PBR Hawaii
1001 Bishop St., Suite 650
Honolulu, HI 96813

Re: Request for Consultation Under the National Environmental Policy Act and Hawai'i Chapter 343 for Proposed Improvements to the Department of Hawaiian Home Lands Ho'olehua Water System, PWS No. 230
Kalama'ula, Kahanui, Nā'iwa, and Ho'olehua-Pālā'au Ahupua'a, Kona Moku, Moloka'i Mokupuni
Tax map key (2) 5-2-007:029, 030, 035, 040, 055, 078, 079, 080, 082-085; (2) 5-2-008:051, 052, 079, 084, 086-089, 091, 114: (2) 5-2-010:001, 002, 003: (2) 5-2-012:999; (2) 5-2-013:010, 017, 028-032; and (2) 5-2-033:001, 002, 003

Aloha Ms. Cox:

The Office of Hawaiian Affairs (OHA) is in receipt of your September 16, 2015 letter requesting consultation on cultural, historic, and archaeological sites within the area of potential effect. PBR Hawai'i is acting as consultant to the Department of Hawaiian Home Lands (DHHL), who intends to propose improvements to the Ho'olehua Water System, PWS No. 230.

The DHHL is requesting federal funds for the waterline improvements from the U.S. Department of Agriculture-Rural Development division of Water and Waste Disposal Loan and Grant program, and the U.S. Department of Housing and Urban Development, Native American Housing Assistance and Self-Determination Act, Native Hawaiian Housing Block Grant program, triggering consultation under the National Environmental Policy Act and the Hawai'i Environmental Policy Act.

The proposed improvements are to address issues with the potable water system that services the homesteads, which were identified by the State of Hawai'i Department of Health. Improvements include among others new storage tanks, chlorination facilities, booster pump and pipe replacements.

OHA would like to suggest that the following entities and individuals be contacted:

- The Nature Conservancy – Moloka'i
  - Ed Misaki, Director
  - Penny Martin
  - Opulani Albino
- Billy Akutagawa (work: 808-560-3653)

In addition, OHA recommends consultation with the petitioners of In re Wai'ola O Moloka'i, Inc.[1] and In re Water Use Permit Application ("Kukui Moloka'i Inc.),[2] as both cases were instrumental in setting parameters for the protection of the Moloka'i aquifer system, as well as Native Hawaiian traditional and cultural practices on Moloka'i.

Mahalo for the opportunity to consult. Should you have any questions, please contact Jeannin Jeremiah at 594-1790 or by email at jeanninj@oha.org.

'O wau iho nō me ka 'oia 'i'o,

Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer

KC:jj

C: Gayla Haliniak-Lloyd – OHA Community Outreach Coordinator, Moloka'i Island

**Please address replies and similar, future correspondence to our agency:*
Dr. Kamana'opono Crabbe
Attn: OHA Compliance Enforcement
560 N. Nimitz Hwy, Ste. 200
Honolulu, HI 96817

[1] 103 Hawai'i 401 (2004).
[2] 116 Hawai'i 481 (2007).

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 22, 2016

Dr. Kamana'opono Crabbe
Attn: OHA Compliance Enforcement
560 N. Nimitz Hwy, Suite 200
Honolulu, HI 96817

Attn: Ms. Jeannin Jeremiah

SUBJECT: RESPONSE TO NATIONAL ENVIRONMENTAL POLICY ACT AND CHAPTER 343, HAWAI'I REVISED STATUTES CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWA'I

Aloha mai Dr. Crabbe;

Thank you for your letter dated October 5, 2015 (Reference Number HRD15/7621B). We appreciate you taking the time to review the information provided and offer the following responses to your comments.

The Nature Conservancy and Billy Akutagawa were contacted at your request. We have attempted to contact the petitioners in the Wai'ola O Moloka'i and Water Use Permit Application (Kukui Moloka'i Inc.) cases, but have not received any responses to date.

Thank you again for your participation in this consultation process. An electronic copy of the Draft EA has been included for your review. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL- Administrator-Land Development Division
Gigi Cairel, Planner, DHHL- Planning Office
Niniau Simmons, DHHL- Office of the Chairman
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

Enclosure: Regional Location

O:\JOB16\1684.29 Molokai USDA water\Correspondence + Consultation\Correspondence\2015 update Correspondence\2015 Correspondence Comments\RESPONSES\HI - OHA response.doc

Malia Cox

From: Malia Cox
Sent: Wednesday, October 28, 2015 11:12 AM
To: 'russellr005@hawaii.rr.com'
Cc: Catie Cullison (ccullison@pbrhawaii.com); Greg Nakai; 'Cairel, Gigi O'; 'halealohahapai64@gmail.com'; Paul Cleghorn (cleghorn@pacificlegacy.com)
Subject: FW: Updates for Hui Hooniho and Hui Malama I Na Kupuna O Hawai'i Nei
Attachments: NHO signed letter and enclosures.pdf; Postfield summary.pdf

Aloha e Mr. Russell,

We submitted some information to Mr. Ayau to begin the consultation process with Hui Ho'oniho regarding the Department of Hawaiian Home Lands proposed water system improvements on Molokai to meet Section 106 requirements for federally funded projects. He informed us that you are now the contact for Hui Ho'oniho. In the event that the consultation packet didn't get forwarded to you, I've attached a copy of the information sent out to all Native Hawaiian Organizations (NHO) listed on the U.S. Department of Interior's NHO list. You'll note that this letter is not addressed to Hui Ho'oniho. Only one copy of the letter was kept as an example of the information sent out to the NHO distribution list. With the exception of the addressee, all the other information in the attached letter (NHO_signed_letter_and_enclosures.pdf) is identical to what was previously sent to Mr. Ayau.

We've also received some additional information regarding archaeological resources in the vicinity of Site 2 based on archaeological field work conducted after the letter was mailed out in September. A brief summary from the archaeologist is included. Additional field testing is being scheduled based on the findings.

If you are interested in additional information, an environmental assessment is being prepared. Please let me know if you would like updates regarding its release.

Finally, Pacific Legacy is also conducting a Cultural Impact Assessment regarding this same project. I would encourage you to contact Paul Cleghorn as well if you would like to participate in that process. He can be reached at cleghorn@pacificlegacy.com.

If you have any questions, don't hesitate to contact me via email.

Mahalo,

Malia Cox, LEED® AP BD+C, REM
Project Manager

PBR HAWAII
Land Planning | Landscape Architecture
Environmental Planning | Land Use Entitlements
1001 Kamokila Blvd, Suite 313
Kapolei, HI 96707

Mailing Address:
1001 Bishop Street Suite 650
Honolulu, HI 96813
Phone: 808-521-5631
Fax: 808-523-1402

Email: mcox@pbrhawaii.com
www.pbrhawaii.com

From: Edward Ayau [mailto:halealohahapai64@gmail.com]
Sent: Saturday, October 17, 2015 12:06 PM
To: Malia Cox
Subject: Updates for Hui Hooniho and Hui Malama I Na Kupuna O Hawai'i Nei

Aloha no e Malia,

This is inform PBR that I am no longer the contact person for Hui Ho'oniho. The new Executive Director is Robert Russell, his email address is russellr005@hawaii.rr.com and his mailing address is P O Box 298 Holualoa, HI 96725.

Second, Hui Malama I Na Kupuna O Hawaii Nei formally dissolved as a not for profit corporation in January 2015. We have terminated all activities for this organization. Please remove us from your contact list for Native Hawaiian organizations, mahalo.

If there are any questions, you can reach me at this email address or by calling 808.646.9015.

Ke aloha no,

Edward H Ayau

List of organizations receiving general information and cultural/natural resource supplement.

- State of Hawai‘i, Office of Hawaiian Affairs,
- State of Hawai‘i, Department of Land and Natural Resources
- Representative Carroll
- Senator English
- Mayor Arakawa
- Councilmember Mateo
- Councilmember Pontanilla
- County of Maui, Department of Environmental Management
- Maui/Lāna‘i Islands Burial Council
- Ahupua‘a o Moloka‘i
- Kalama‘ula Hawaiian Homestead Association

NEIL ABERCROMBIE
GOVERNOR
STATE OF HAWAI'I

ALBERT "ALAPAKI" NAHALE-A
CHAIRMAN
HAWAIIAN HOMES COMMISSION

MICHELLE K. KAUHANE
DEPUTY TO THE CHAIRMAN

STATE OF HAWAI'I
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAI'I 96805

March 30, 2012

Example letter

Mr. William J. Aila, Jr., Chairperson
State of Hawai'i
Department of Land and Natural Resources
Kalanimoku Building
1151 Punchbowl Street
Honolulu, HI 96813

SUBJECT: CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HOOLEHUA WATER SYSTEM, PWS NO. 230, MOLOKAI, HAWAII

Aloha Mr. Aila:

The Hawaiian Home Lands Trust, Department of Hawaiian Home Lands (Trust) is submitting an application for funding to the U.S. Department of Agriculture-Rural Development division (USDA-RD) to improve the Trust's, Hoolehua Water System, PWS No. 230 on Molokai. I am writing to advise you and your staff of the proposed conceptual plans and consult with you regarding the proposed project.

Entities Involved in the Project

During our Regional Planning Process, the community identified several issues with the potable water system. The Department of Health also identified several issues that while not eminent hazards at the present moment, would improve the safety, security, and reliability of the water system. The Trust, in consultation with USDA-RD, developed a preliminary list of projects to be included in an application requesting federal funds. Informational meetings were held with the Ahupuaa o Molokai[1] and select Kalamaula homesteaders on December 1, 2011, and December 9, 2011, respectively. The objective of these meetings was to discuss with attendees the proposed potable water projects, and adjust them based on local knowledge.

Project Overview

The proposed improvements to the disinfection, storage and distribution system will be integrated into the Trust's existing potable water system, "Hoolehua Water System, PWS No. 230." These project actions will improve

[1] The Ahupuaa o Molokai is composed of leadership from all the Molokai Homestead organizations except Kalamaula. The Ahupuaa invited Kalamaula representatives to attend their monthly meeting, providing the Trust and its consultants an opportunity to engage in an open discussion with all the Molokai homestead associations connected to the Trust's water system.

reliability and functionality of the system. In addition, deficiencies that affect health, sanitation and security of the potable water system identified by the DOH and the Trust are anticipated to be corrected as a result of this project.

Project Location

The water system includes source, storage and conveyance equipment throughout central Molokai. Tasks associated with actions designed to improve the water system will occur at five dis-contiguous sites located in central Molokai.

Proposed Tasks and Activities

A brief description of the tasks and activities proposed for each of the five locations is described below[2].

1-A 200,000 Gallon Storage Tank: This task includes the installation of 200,000 gallon storage tank and ancillary equipment to connect to the existing system, excavation, and disposal of overburden/construction debris. The new tank will be located adjacent to the existing 100,000 gallon tank on a hillside at the well site. The proposed storage tank is necessary to ensure uninterrupted supply of water to Kalamaula residents. This tank will augment, not replace existing storage facilities.

1-B Chlorination and Storage Facility: Disinfection of water is an important process to ensure the delivery of safe drinking water. Improvements are necessary to make the facility safer for workers and the general public. This task includes the construction of a new structure that includes safety facilities (such as an eye wash/safety shower) in a decontamination room, a clean room and a storage room, excavation, and disposal of overburden/construction debris. The storage room will be designed to ensure safe storage of disinfection product cylinders that meet Occupational Safety and Health Administration (OSHA) standards. In addition, critical components necessary for emergency maintenance of the water system will be stocked at this facility.

1-C Above-Ground Fuel Storage Tank (fuel AST): Currently, the water system has an emergency generator to supply electricity for pump operation when grid supplied energy is not available. The generator has fuel storage capacity to operate the generator for a maximum of 24-hours. A fuel AST would augment the existing capacity, increasing operational time of the generator during emergencies. Tasks associated with this action include the installation of a fuel AST at the well site, fuel lines connecting tank to existing generator system, automation equipment, security fencing, excavation, and disposal of overburden/construction debris.

[2] Several other project actions such as wind energy for the pumping and disinfection operation were discussed, but ultimately, not included. While the excluded actions are extremely important, their incorporation into this application would have caused significant delays in submission and therefore will be considered for inclusion in a subsequent application.

1-D Well Site Compound Modifications: The existing well site compound does not have adequate space to accommodate a new 200,000 gallon storage tank, chlorination facility, and a fuel AST. Activities associated with this task include the redesign and construction of fencing and roadway system for security and access, excavation, disposal of overburden/construction debris.

Site #2- Kalamaula Improvements

2-A All-Weather Roadway: The access road to the existing 200,000 gallon tank in Kalamaula is unpaved and severely eroded hampering access. This task will modify the existing dirt roadway with the installation of a 3,000 linear feet (LF) of all-weather roadway from Haena Street to the reservoir. The new roadway will follow the existing road corridor. Tasks included in this action will include roadway excavation, disposal of overburden/construction debris in addition to construction of the asphalt concrete roadway.

2-B Kalamaula Water Main Loop: The conveyance system in Kalamaula is not a looping system, occasionally resulting in lower pressure, and water sitting in pipes for a longer period of time. This task will include the installation of a new 12-inch main along approximately 3,000 LF in Kalamaula. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

Site #3- Kauluwai Tank and Transmission Improvements

3-A Kauluwai Tank Transmission Main: A section of the 6-inch main transmission line at the existing 1.0 MG Kauluwai tank is approximately 12 feet above the lowest portion of the tank. As a result, the water stored at the base of the tank cannot be utilized. This task would redesign and replace the lower main increasing the useable storage capacity to the tank design capacity. Some excavation and associated disposal of debris is also anticipated. It is anticipated that completion of this tank will reduce water stagnation in the bottom of the tank.

3-B Kauluwai to Hoolehua Transmission Main: The existing main was constructed utilizing a 6-inch transite (asbestos) pipe. Integrity of the existing pipe is a concern. This task requires the replacement of 11,000 LF of piping. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

Site #4- Hoolehua Tank Site Improvements

4-A Hoolehua Tank Improvements: The tanks could be improved with regard to safety and automation. This task, 4-A has been subdivided into three subtasks as described below. In addition, activities with this task

will include site preparation, and disposal of construction debris/overburden.

4-A-1 Automation of Level and Flow Control Valves: Water flow from 1.0 MG reservoir to the two 3.5 MG tanks located in Hoolehua requires manual operation of a gate valve. Changes in demand require manual adjustments. This subtask would connect these tanks to the SCADA system and allow for automated adjustments providing more consistent water delivery. The sub-task will include construction of a new control valve vault, installation and connection of control equipment to existing system and ancillary equipment.

4-A-2 Replacement of Exposed Vertical Piping and Valves: Based on a site visit, some of the exposed pipes and valves are corroded. This sub-task would assess and replace corroded ancillary equipment.

4-A-3 Exterior Ladder: The exterior ladder is unsafe. This sub-task would replace or repair the existing ladder and safety railing system to meet OSHA safety requirements.

Site #5- Hoolehua/Veterans' Cemetery Transmission and Fire Protection Improvements

5-A Hoolehua to Veterans' Cemetery Transmission Main: The existing water main is comprised of a mix of one to three inch pipes of various materials. It does not extend to the Veterans' Cemetery. This task would include the replacement of the existing main with approximately 8,000 LF of 8-inch main that extends to the Veterans' Cemetery. Activities associated with this task will also include trench excavation, disposal of construction debris and overburden, as well as connection to the existing water mains and laterals.

5-B Fire Protection: The Veterans' Cemetery as well as the homesteads in this section of Hoolehua do not have fire protection. This task would improve brush fire protection as well as provide fire protection for existing homes in the vicinity through the installation of 16 fire hydrants and a new access roadway. Tasks included in this action will include roadway excavation, disposal of overburden/construction debris in addition to construction of a gravel packed roadway.

Thank you for taking the time to review the information provided. If you have any information that you feel is relevant to share or comment on as it applies to this project, please respond within 30 days. Responses should be mailed to Ms. Malia Cox of PBR HAWAII, the Trust's technical consultant for this project. If you have any questions, do not hesitate to contact the

project point of contact, Ms. Sandy Pfund, Land Development Division Administrator at 620-9271.

Me Ke Aloha,

Albert "Alapaki" Nahale-a
Chairman
Hawaiian Homes Commission

C: Sandy Pfund, Administrator-Land Development Division
Bob Freitas, Planner-Planning Office
Malia Cox, PBR HAWAII, 1001 Bishop Street, Suite 650, Honolulu, HI 96813-3484

Enclosure: Location Map

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

2012 MAY -3 PM 2:10
DEPT OF HAWAIIAN HOME LANDS

May 1, 2012

Department of Hawaiian Home Lands
Attention: Mr. Alapaki Nahale-a, Chairman
91-5420 Kapolei Parkway
Kapolei, Hawaii 96707

Dear Mr. Nahale-a:

SUBJECT: Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System

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

At this time, enclosed are comments from Land Division – Maui District on the subject matter. Should you have any questions, please feel free to call Lydia Morikawa at 587-0410. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

2012 MAY -4 AM 7:47
LAND DEVELOPMENT DIVISION

Enclosure

cc: Central Files

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

2012 APR 12 PM 12:36

April 11, 2012

MEMORANDUM

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

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Consultation on Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System
LOCATION: Island of Molokai
APPLICANT: Department of Hawaiian Home Lands

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by April 26, 2012.

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

Attachments

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

Signed:
Date: 4/12/12

cc: Central Files

NEIL ABERCROMBIE
GOVERNOR
STATE OF HAWAI'I

JOBIE M. K. MASAGATANI
CHAIRMAN DESIGNATE
HAWAIIAN HOMES COMMISSION

MICHELLE K. KAUHANE
DEPUTY TO THE CHAIRMAN

STATE OF HAWAI'I
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAI'I 96805

July 12, 2012

Mr. Russell Y. Tsuji, Land Administrator
State of Hawai'i
Department of Land and Natural Resources
Land Division
PO Box 621
Honolulu, HI 96809

SUBJECT: CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HOOLEHUA WATER SYSTEM, PWS NO. 230, MOLOKAI, HAWAII

Dear Mr. Tsuji:

Thank you for your letter dated May 1, 2012. We appreciate your office making the information we provided available to the various DLNR divisions for their review and comment.

We acknowledge that the Land Division- Maui District responded to your request for review and indicated that they did not have any comments.

Thank you again for your participation. If you have any questions, do not hesitate to contact the project point of contact, Ms. Sandra Pfund, Administrator, Land Development Division at 620-9271.

Aloha,

Jobie M.K. Masagatani
Chairman Designate
Hawaiian Homes Commission

c: Sandra Pfund, Administrator-Land Development Division
Bob Freitas, Planner-Planning Office
Dre Kalili, Policy & Program Analyst-OCH
Malia Cox, PBR HAWAII, 1001 Bishop St., Ste. 650, Honolulu, HI 96813

ALAN M. ARAKAWA
Mayor
KYLE K. GINOZA, P.E.
Director
MICHAEL M. MIYAMOTO
Deputy Director

TRACY TAKAMINE, P.E.
Solid Waste Division
ERIC NAKAGAWA, P.E.
Wastewater Reclamation Division

COUNTY OF MAUI
DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
2200 MAIN STREET, SUITE 100
WAILUKU, MAUI, HAWAII 96793

July 3, 2012

Ms. Malia Cox
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

SUBJECT: **DEPARTMENT OF HAWAIIAN HOME LANDS**
HOOLEHUA WATER SYSTEM
EARLY CONSULTATION

We reviewed the subject application and have the following comments:

1. Solid Waste Division comments:

   a. None.

2. Wastewater Reclamation Division (WWRD) comments:

   a. None.

If you have any questions regarding this memorandum, please contact Michael Miyamoto at 270-8230.

Sincerely,

KYLE K. GINOZA, P.E.
Director of Environmental Management

NEIL ABERCROMBIE
GOVERNOR
STATE OF HAWAI'I

JOBIE M. K. MASAGATANI
CHAIRMAN DESIGNATE
HAWAIIAN HOMES COMMISSION

MICHELLE K. KAUHANE
DEPUTY TO THE CHAIRMAN

STATE OF HAWAI'I
DEPARTMENT OF HAWAIIAN HOME LANDS
P O BOX 1879
HONOLULU, HAWAI'I 96805

July 12, 2012

Mr. Kyle K. Ginoza, P.E., Director
County of Maui
Department of Environmental Management
2200 Main Street, Suite 100
Wailuku, Hawai'i 96793

SUBJECT: CONSULTATION ON PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HOOLEHUA WATER SYSTEM, PWS NO. 230, MOLOKAI, HAWAII

Dear Mr. Ginoza:

Thank you for your letter dated July 3, 2012. We acknowledge that neither the Solid Waste Division, nor the Wastewater Reclamation Division have any comments regarding the proposed project at this time.

Thank you for your participation. If you have any questions, do not hesitate to contact the project point of contact, Ms. Sandra Pfund, Administrator, Land Development Division at 620-9271.

Aloha,

Jobie M.K. Masagatani
Chairman Designate
Hawaiian Homes Commission

c: Sandra Pfund, Administrator-Land Development Division
Bob Freitas, Planner-Planning Office
Dre Kalili, Policy & Program Analyst-OCH
Malia Cox, PBR HAWAII, 1001 Bishop St., Ste. 650, Honolulu, HI 96813

Appendix H

PHOTOVOLTAIC (PV) SYSTEM FUNDING OPTIONS

SPS
ENERGY & FINANCIAL

DHHL has two options for funding this project, through USDA/NAHASDA, or outside financing through a lease to a developer with a Power Purchase Agreement (PPA). DHHL has opted to pursue USDA/NAHASDA. Following is a quick summary of the pros and cons to each

Option	Benefits	Potential Repercussions
Solar funded by USDA / NAHASDA	-No change to present course of action, PER, USDA application - - DHHL can design, install at own pace because tax credits and incentives are not being pursued.	-DHHL staff will need to operate and maintain energy generation/storage system, or contract it out. Existing staffing levels are just adequate to operate the water system during non-upset conditions. No extra man-hours are available for operation of solar component.
Solar as a privately funded developer project with PPA	-Operation/Maintenance would not be DHHL's responsibility. Workers cab focus on water system operation. Developer selected would be able to capitalize on some state tax credit, and accelerated depreciation schedules increasing profitability. -DHHL costs will be reduced by approximately $20k per year per well.	-Scope of project utilizing USDA funds needs to be modified. -PER modifications: The cost could stay in the PER / life cycle analysis, but would need to be modified to identify as being funded through a non-federal funding source. -ES modifications: Impacts resulting from energy system would need to remain in scope of overall project with clarification. federally funded components and costs would need to be separated from developer funded energy components and cost. Financials section may need to be modified to show new revenue stream. -Some Tax credits/incentives are set to decline in scale to sunset in 2019. -DHHL would need to put out RFP for lease option and lease agreement with developer. This may need to be fast-tracked to realize all credits and incentives.

If you have any questions concerning this table please contact me at 415-519-5352 or e-mail at Karl.stahlkopf@SPS-EF.com. Respectfully submitted March 23, 2016.

Dr. Karl Stahlkopf, PhD
Managing Director
SPS Energy & Financial
2548 Pacific Heights Place
Honolulu, Hawaii 96813

Appendix I

DRAFT ENVIRONMENTAL ASSESSMENT

COMMENTS AND RESPONSES

OFFICE OF PLANNING
STATE OF HAWAII

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

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
DIRECTOR
OFFICE OF PLANNING

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

Ref. No. P-15071

March 14, 2016

To: Jobie Masagatani, Chair
Department of Hawaiian Home Lands

From: Leo R. Asuncion, Director

Attention: Jeffrey Fujimoto, Project Manager
Land Development Division

Subject: Improvements to the Department of Hawaiian Home Lands Hoolehua Water System, PWS No. 230, Molokai

Thank you for the opportunity to provide comments on the Draft Environmental Assessment (Draft EA) for the proposed improvements to the Potable Water System No. 230 on the island of Molokai. Draft EA review material was transmitted to our office by letter dated February 17, 2016.

It is our understanding that the Department of Hawaiian Home Lands (DHHL) proposes to improve treatment, storage, and delivery of potable water supplied by the Hoolehua Water System (Public Water Supply No. 230) to 2,400 customers on the island of Molokai. The project will improve the health, sanitation and security of the potable water system while reducing energy costs. The proposed improvements will include the construction of a 1-megawatt photovoltaic energy production farm, the repair and replacement of aging equipment, increase fire protection capability, and increase water storage capacity. It will also improve the maintenance yard facilities and storage as well as site accessibility and security.

This project integrates with the existing DHHL potable Hoolehua Water System that serves the residents of the island of Molokai. The proposed well improvements will occur along seven dis-contiguous well sites in central Molokai. These well site improvements will improve reliability and functionality, while decreasing the operating costs of the system.

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

1. The Draft EA addresses a number of our comments made in a previous pre-consultation letter dated October 12, 2015 (Reference Number P-14919). The Draft EA addresses the project's consistency with the Hawaii State Plan objectives and policies listed in Hawaii Revised Statutes (HRS) Chapter 226; the objectives and policies of the Hawaii Coastal Zone Management Act, listed in HRS § 205A-2; examines coastal erosion/sediment loss issues during and after the construction phase; addresses surface water, wetlands, and underground water concerns for the surrounding area; and acknowledges the potential need for a Federal Consistency Review conducted by OP.

2. Section 5.1.4, pages 65-66 addresses the goals, objectives, and policies of the Hawaii State Plan. However, this is a State agency sponsored project and may be compatible with a DHHL functional plan, strategic program or project. The Final Environmental Assessment should include DHHL functional plans, programs, project objectives, or goals that this project may impact.

3. Section 3.4, page 29 lists mitigation measures for surface water, wetlands, and ground water. Best management practices (BMP) will be used for erosion and drainage control during and after construction and will meet County of Maui Department of Public Works requirements. The project will adhere to BMP's to minimize erosion from the project site during and after construction. Temporary erosion control methods include silt fences, filter socks, or silt barriers. However, according to the Draft EA, the project will result an increase of 4.8-acres of impervious surfaces from the construction of access roads and new water tank infrastructure.

   Please consider reducing the amount of impervious and hardened surfaces as an effective method in mitigating stormwater inundation. During heavy storms, hardened surfaces allow storm runoff to flow into dry gulches, and streams and overwhelm nearby coastal areas with sediment and land-based pollutants.

   Low Impact Development (LID) design concepts and stormwater runoff BMPs embrace decentralized micro-scale controls that infiltrate, filter, store, reuse, evaporate, and detain runoff close to its source. Examples of effective LID stormwater controls that could be used on this project include enhanced landscaping, bio-retention basins, and permeable pavers for the access roads. These, and other methods, are cited in OP's "Low Impact Development, A Practitioners Guide." For more information on this, please examine Section 3.4, pgs. 3-14 to 3-17 of this guide. It can be viewed or downloaded from the OP website at: http://files.hawaii.gov/dbedt/op/czm/initiative/lid/lid_guide_2006.pdf

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

c: Malia Cox, PBR HAWAII

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P. O. BOX 1879
HONOLULU, HAWAII 96805

Mr. Leo Asuncion, Director
State Hawai'i
Office of Planning
P.O. Box 2359
Honolulu, HI 96804

Attn: Mr. Josh Hekekia

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Asuncion;

Thank you for your letter dated March 14, 2016 (Reference Number P-15071). We value your input, and offer the following responses to your comments.

1. We appreciate your acknowledgment of the ways in which the Draft Environmental Assessment (EA) addresses the comments you had made in a previous pre-consultation letter dated October 12, 2015 (Reference Number P-14919), regarding: the proposed project's consistency with the objectives and policies of the Hawai'i State Plan (HRS Chapter 226); the objectives and policies of the Hawaii Coastal Zone Management Act (HRS §205A-2); coastal erosion/sediment loss issues during and after the construction phase; surface water, wetlands, and underground water concerns for the surrounding area; and the need for a Federal Consistency Review conducted by the Office of Planning.

2. The Draft EA included a discussion of the DHHL functional plans, programs, project objectives, or goals that the proposed project may impact. This was included in section 5.1.2.1 through 5.1.2.4.

3. We appreciate your recommendation to reduce the amount of impervious and hardened surfaces as an effective method in mitigating stormwater inundation, and to consider low

impact development (LID) design concepts. DHHL has made every effort to minimize the amount of impervious and hardened surfaces included in the project, and has eliminated approximately 2.2 acres of hardened roadways initially considered as part of Site 5. DHHL will continue to evaluate project components to determine where more pervious building materials can be utilized.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

DAVID Y. IGE
GOVERNOR

DOUGLAS MURDOCK
Comptroller

AUDREY HIDANO
Deputy Comptroller

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

FEB 26 2016

(P)1038.6

Ms. Malia Cox, Project Manager
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, HI 96813

Dear Ms. Cox:

Subject: Improvements to the Department of Hawaiian Home Lands
Hoolehua Water System, PWS No. 230
Molokai, Hawaii

Thank you for the opportunity to comment on the subject project. The proposed project does not impact any of the Department of Accounting and General Services' projects or existing facilities in this area and we have no comments to offer at this time.

If you have any questions, your staff may please contact Ms. Dora Choy of the Planning Branch at 586-0488.

Sincerely,

JAMES K. KURATA
Public Works Administrator

DC:lnn
c: Mr. Jeffrey Fujimoto, DHHL-PM
Mr. Wade Shimabukuro, DAGS-MDO

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

April 1, 2016

Mr. James K. Kurata, Public Works Administrator
State Hawai'i
Department of Accounting and General Services
P.O. Box 119
Honolulu, HI 96810-0119

Attn: Ms. Dora Choy, Planning Branch

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Kurata;

Thank you for your letter dated February 26, 2016 [Reference Number (P)1038.6]. We appreciate you taking the time to review the information provided. We acknowledge that the proposed project does not impact your projects and facilities and that you have no comments at this time.

Thank you again for your participation in this consultation process. Your letter will be included in the Final Environmental Assessment (EA). If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

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DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

LORRIN W. PANG, M.D., M.P.H.
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, HAWAII 96793-3378

March 8, 2016

Ms. Malia Cox
Project Manager
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Ms. Cox:

Subject: Improvements to the Department of Hawaiian Home Lands Hoolehua Water System, PWS No. 230, Molokai, Hawaii

Thank you for the opportunity to review this project. We have the following comments to offer:

1. National Pollutant Discharge Elimination System (NPDES) permit coverage may be required for this project. The Clean Water Branch should be contacted at 808 586-4309.

2. The noise created during the construction phase of the project may exceed the maximum allowable levels as set forth in Hawaii Administrative Rules, Chapter 11-46, "Community Noise Control." A noise permit may be required and should be obtained before the commencement of work. Please call the Indoor & Radiological Health Branch at 808 586-4700.

It is strongly recommended that the Standard Comments found at the Department's website: http://health.hawaii.gov/epo/home/landuse-planning-review-program/ be reviewed, and any comments specifically applicable to this project should be adhered to.

Should you have any questions, please call me at 808 984-8230 or E-mail me at patricia.kitkowski@doh.hawaii.gov.

Sincerely,

Patti Kitkowski

Patti Kitkowski
District Environmental Health Program Chief

c DHHL
EPO

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

Ms. Patti Kitkowski
District Environmental Health Program Chief
State of Hawai'i
Department of Health
Maui District Health Office
54 High Street
Wailuku, HI 96793-3378

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Ms. Kitkowski:

Thank you for your letter dated March 8, 2016, regarding the Draft Environmental Assessment (EA) for the proposed improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230. We appreciate you taking the time to review the information, and we provide the following responses.

As stated in the Draft EA, we have anticipated the need for a National Pollutant Discharge Elimination System (NPDES) permit, and will: 1) follow all proper procedures to obtain the NPDES permit; and 2) adhere to permit requirements and conditions.

As stated in the Draft EA, the general contractor will obtain a noise permit before commencement of construction work for which noise levels exceed allowable levels, and will comply with conditions attached to the permit, in compliance with Chapter 11-46, HAR, "Community Noise Control."

We have reviewed the standard comments on the DOH Environmental Planning Office (EPO) website for applicability to the subject project. The Final EA will also include any relevant information from these standard comments not already included in the Draft EA.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

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DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
EMD/CWB

03002PCTM.16

March 1, 2016

Ms. Malia Cox
Project Manager
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Ms. Cox:

SUBJECT: Comments on the Draft Environmental Assessment (DEA) for the Improvements to the Department of Hawaiian Homelands (DHHL) Hoolehua Water System, PWS No. 230 Hoolehua, Island of Molokai, Hawaii

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your letter, dated February 17, 2016, requesting comments on your project. The DOH-CWB has reviewed the subject document and offers these comments. Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: http://health.hawaii.gov/epo/files/2013/05/Clean-Water-Branch-Std-Comments.pdf

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. You may be required to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55).

For NPDES general permit coverage, a Notice of Intent (NOI) form must be submitted at least 30 calendar days before the commencement of the discharge. An application for a NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. To request NPDES permit coverage, you must submit the applicable form ("CWB Individual NPDES Form" or "CWB NOI Form") through the e-Permitting Portal and the hard copy certification statement with the respective filing fee ($1,000 for an individual NPDES permit or $500 for a Notice of General Permit Coverage). Please open the e-Permitting Portal website located at: https://eha-cloud.doh.hawaii.gov/epermit/. You will be asked to do a one-time registration to obtain your login and password. After you register, click on the Application Finder tool and locate the appropriate form. Follow the instructions to complete and submit the form.

3. If your project involves work in, over, or under waters of the United States, it is highly recommended that you contact the Army Corp of Engineers, Regulatory Branch (Tel: 835-4303) regarding their permitting requirements.

   Pursuant to Federal Water Pollution Control Act [commonly known as the "Clean Water Act" (CWA)], Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may **result** in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40 of the Code of Federal Regulations, Section 122.2; and Hawaii Administrative Rules (HAR), Chapter 11-54.

4. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

5. It is the State's position that all projects must reduce, reuse, and recycle to protect, restore, and sustain water quality and beneficial uses of State waters. Project planning should:

   a. Treat storm water as a resource to be protected by integrating it into project planning and permitting. Storm water has long been recognized as a source of irrigation that will not deplete potable water resources. What is often overlooked is that storm water recharges ground water supplies and feeds streams and estuaries; to ensure that these water cycles are not disrupted, storm water cannot be relegated as a waste product of impervious surfaces. Any project planning must recognize storm water as an asset that sustains and protects

natural ecosystems and traditional beneficial uses of State waters, like community beautification, beach going, swimming, and fishing. The approaches necessary to do so, including low impact development methods or ecological bio-engineering of drainage ways must be identified in the planning stages to allow designers opportunity to include those approaches up front, prior to seeking zoning, construction, or building permits.

b. Clearly articulate the State's position on water quality and the beneficial uses of State waters. The plan should include statements regarding the implementation of methods to conserve natural resources (e.g. minimizing potable water for irrigation, gray water re-use options, energy conservation through smart design) and improve water quality.

c. Consider storm water Best Management Practice (BMP) approaches that minimize the use of potable water for irrigation through storm water storage and reuse, percolate storm water to recharge groundwater to revitalize natural hydrology, and treat storm water which is to be discharged.

d. Consider the use of green building practices, such as pervious pavement and landscaping with native vegetation, to improve water quality by reducing excessive runoff and the need for excessive fertilization, respectively.

e. Identify opportunities for retrofitting or bio-engineering existing storm water infrastructure to restore ecological function while maintaining, or even enhancing, hydraulic capacity. Particular consideration should be given to areas prone to flooding, or where the infrastructure is aged and will need to be rehabilitated.

If you have any questions, please visit our website at:http://health.hawaii.gov/cwb/, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

Alec Wong

ALEC WONG, P.E., CHIEF
Clean Water Branch

CTM:bk

c: EPO [via e-mail only]
Mr. Jeffrey Fujimoto, DHHL [via e-mail jeffrey.y.fujimoto@hawaii.gov only]

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
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DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

Mr. Alec Wong, P.E., Chief
Clean Water Branch
State of Hawai'i
Department of Health
P.O. Box 3378
Honolulu, HI 96801-3378

Attn: Engineering Section, CWB

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Wong:

Thank you for your letter dated March 1, 2016 (reference number 03002PCTM.16), regarding the Draft Environmental Assessment (EA) for the proposed improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230. We acknowledge your review of the project, have reviewed both the project specific and the standard comments (provided at http://health.hawaii.gov/epo/files/2013/05/Clean-Water-Branch-Std-Comments.pdf), and offer the following responses to your comments:

1. As stated in our letter to the Department of Health (DOH) Clean Water Branch (CWB), dated January 22, 2016 (see attachment), the project as proposed will meet the criteria of Hawai'i Administrative Rules (HAR) §11-54-1.1, §11-54-3, and §11-54-4 through §11-54-8 regarding antidegradation, designated uses, and water quality. The associated regulatory references have been included within the relevant sections of the Final EA.

2. As stated in our letter to CWB, dated January 22, 2016 (see attachment), and as stated in the Draft EA, we have anticipated the need for a National Pollutant Discharge Elimination System (NPDES) permit in compliance with §11-55, HAR, and will: 1) follow all proper procedures to obtain the NPDES permit; and 2) adhere to all applicable permit requirements and conditions.

3. As stated in our letter to CWB, dated January 22, 2016 (see attachment), consultation with the U.S. Army Corps of Engineers, Regulatory Branch (DA) was initiated in September 2015. It is not anticipated that the project will involve work in the waters of the United States; however, should permits/authorization be required, DHHL will work with DA to meet their requirements.

4. We acknowledge that discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 Water Quality Certification (WQC) are required, must comply with the State's Water Quality Standards as contained in §11-54 and §11-55, HAR, and that noncompliance may be subject to penalties.

5. As stated in our letter to CWB, dated January 22, 2016 (see attachment), we concur that water is a limited resource that needs to be managed appropriately and not wasted. Incorporating low-impact development and maintaining/improving hydraulic capacity have been identified as goals in the preliminary engineering report included as an appendix with the Draft EA. By changing storage requirements, and by improving the transmission of PWS 230, it is our belief that water stagnation will be reduced, less potable water will be lost due to pipe/equipment failure, and potential release of asbestos from leaching asbestos-cement piping will be minimized, improving water conservation and quality. The actual selection of strategies such as the use of native vegetation, pervious pavement, ecological bio-engineering, etc., will be conducted once the project enters into the design phase.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

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DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:
EPO 16-055

February 25, 2016

Ms. Malia Cox
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813
Email: mcox@pbrhawaii.com

Dear Ms. Cox:

SUBJECT: Draft Environmental Assessment (DEA) for the Proposed Improvements to the Department of Hawaiian Home Lands Hoolehua Water System, PWS No. 230, Molokai, Hawaii
TMK: Multiple

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your DEA to our office via the OEQC link:
http://oeqc.doh.hawaii.gov/Shared%20Documents/EA_and_EIS_Online_Library/Molokai/2010s/2016-02-23-MO-5B-DEA-Hoolehua-Water-System-DHHL-Improvements.pdf

EPO strongly recommends that you review the standard comments and available strategies to support sustainable and healthy design provided at: http://health.hawaii.gov/epo/landuse. Projects are required to adhere to all applicable standard comments. EPO has recently prepared draft Environmental Health Management Maps for each county. They are online at: http://health.hawaii.gov/epo/egis.

We suggest you review the requirements for the National Pollutant Discharge Elimination System (NPDES) permit. We recommend contacting the Clean Water Branch at (808) 586-4309 or cleanwaterbranch@doh.hawaii.gov after relevant information is reviewed at:

1. http://health.hawaii.gov/cwb
2. http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/standard-npdes-permit-conditions
3. http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/forms

Please note that all wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems". We do reserve the right to review the detailed wastewater plans for conformance to applicable rules. Should you have any questions, please review online guidance at: http://health.hawaii.gov/wastewater and contact the Planning and Design Section of the Wastewater Branch at 586-4294.

If noise created during the construction phase of the project may exceed the maximum allowable levels as set forth in Hawaii Administrative Rules, Chapter 11-46, "Community Noise Control". A noise permit may be required and should be obtained before the commencement of work. Please call the Indoor and Radiological Health Branch at (808) 586-4700 and review relevant information online at: http://health.hawaii.gov/irhb/noise.

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

You may also wish to review the draft Office of Environmental Quality Control (OEQC) viewer at: http://eha-web.doh.hawaii.gov/oeqc-viewer. This viewer geographically shows where previous Hawaii Environmental Policy Act (HEPA) {Hawaii Revised Statutes, Chapter 343} documents have been prepared.

In order to better protect public health and the environment, the U.S. Environmental Protection Agency (EPA) has developed a new environmental justice (EJ) mapping and screening tool called EJSCREEN. It is based on nationally consistent data and combines environmental and demographic indicators in maps and reports. EPO encourages you to explore, launch and utilize this powerful tool in planning your project. The EPA EJSCREEN tool is available at: http://www2.epa.gov/ejscreen.

We request that you utilize all of this information on your proposed project to increase sustainable, innovative, inspirational, transparent and healthy design.

Mahalo nui loa,

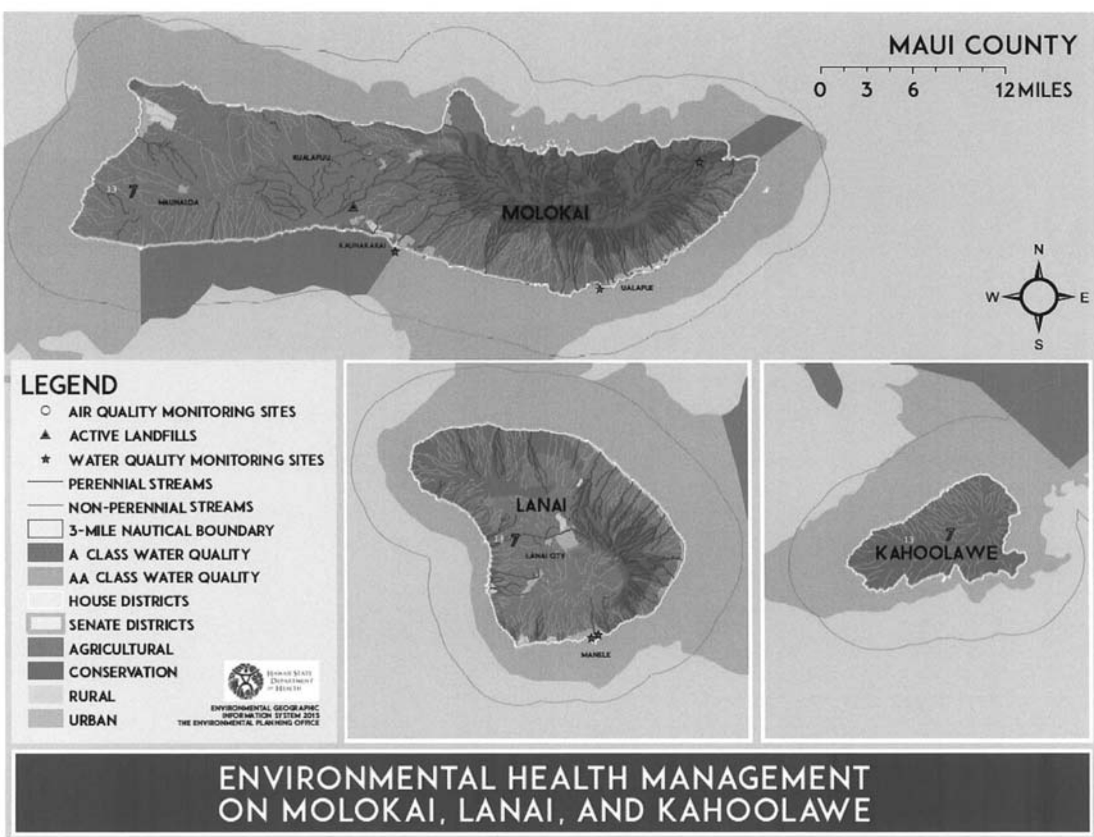
Laura Leialoha Phillips McIntyre, AICP
Program Manager, Environmental Planning Office

LM:nn

Attachment 1: EPO Draft Environmental Health Management Map
Attachment 2: OEQC Viewer Map of Area
Attachment 3: U.S. EPA EJSCREEN Report

c: Jeffrey Fujimoto, Dept. of Hawaiian Home Lands (Jeffrey.Y.Fujimoto@hawaii.gov)
DOH: DHO Maui, CWB, SDWB, WWB, SHWB, IRHB, SHWB {via email only}


hawaii.gov
Stay Connected
OEQC Viewer
hoolehua molokai
18 sites found
Results
Filter
Show sites with no location
MOLOKAI GENERAL HOSPITAL (FEA-FONSI)
Environmental Assessment (Applicant)
KAUNAKAKAI FIRE STATION (FEA-FONSI)
Environmental Assessment (Applicant)
Molokai Baseyard Improvements (FEA-FONSI)
Environmental Assessment (Agency)
Molokai Baseyard Improvements (DEA-AFNSI)
Environmental Assessment (Agency)
Notman Hangar Molokai Airport (DEA-AFNSI)
Environmental Assessment (Applicant)
Notman Hangar Molokai Airport (FEA-FONSI)
Environmental Assessment (Applicant)
Molokai Irrigation System Hydropower Plant (DEA-AFNSI)
Environmental Assessment (Agency)
Kiowea Park Phase II Improvements, Kalama'ula (FEA-FONSI)
Environmental Assessment (Applicant)
Ala Palaau (DEA-AFNSI)
Environmental Assessment (Agency)
Hybrid
Kualapuu
Hoolehua
Molokai Airport
Maunaloa
Palaau State Park
Kalaupapa National Historical Park


MAUI COUNTY
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KAUNAKAKAI
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LANAI
LANAI CITY
MANELE
KAHOOLAWE
LEGEND
AIR QUALITY MONITORING SITES
ACTIVE LANDFILLS
WATER QUALITY MONITORING SITES
PERENNIAL STREAMS
NON-PERENNIAL STREAMS
3-MILE NAUTICAL BOUNDARY
A CLASS WATER QUALITY
AA CLASS WATER QUALITY
HOUSE DISTRICTS
SENATE DISTRICTS
AGRICULTURAL
CONSERVATION
RURAL
URBAN
HAWAII STATE DEPARTMENT OF HEALTH
ENVIRONMENTAL GEOGRAPHIC INFORMATION SYSTEM 2015
THE ENVIRONMENTAL PLANNING OFFICE
ENVIRONMENTAL HEALTH MANAGEMENT
ON MOLOKAI, LANAI, AND KAHOOLAWE

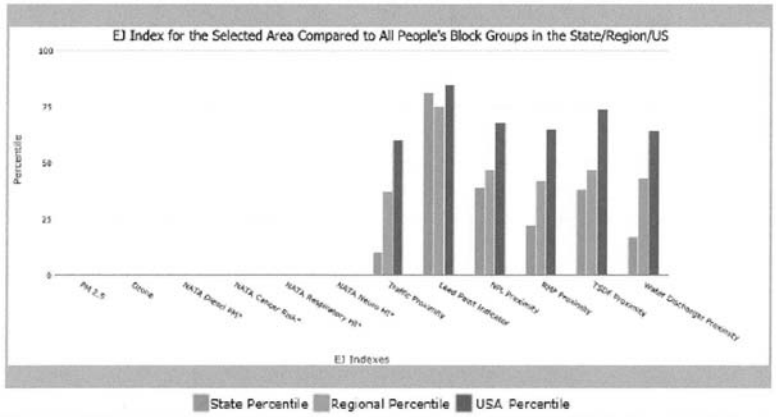
EPA United States Environmental Protection Agency

EJSCREEN Report

for 1 mile Ring Centered at 21.171156,-157.078346, HAWAII, EPA Region 9

Approximate Population: 324

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	N/A	N/A	N/A
EJ Index for Ozone	N/A	N/A	N/A
EJ Index for NATA Diesel PM*	N/A	N/A	N/A
EJ Index for NATA Air Toxics Cancer Risk*	N/A	N/A	N/A
EJ Index for NATA Respiratory Hazard Index*	N/A	N/A	N/A
EJ Index for NATA Neurological Hazard Index*	N/A	N/A	N/A
EJ Index for Traffic Proximity and Volume	10	37	60
EJ Index for Lead Paint Indicator	81	75	85
EJ Index for Proximity to NPL sites	39	47	68
EJ Index for Proximity to RMP sites	22	42	65
EJ Index for Proximity to TSDFs	38	47	74
EJ Index for Proximity to Major Direct Dischargers	17	43	64



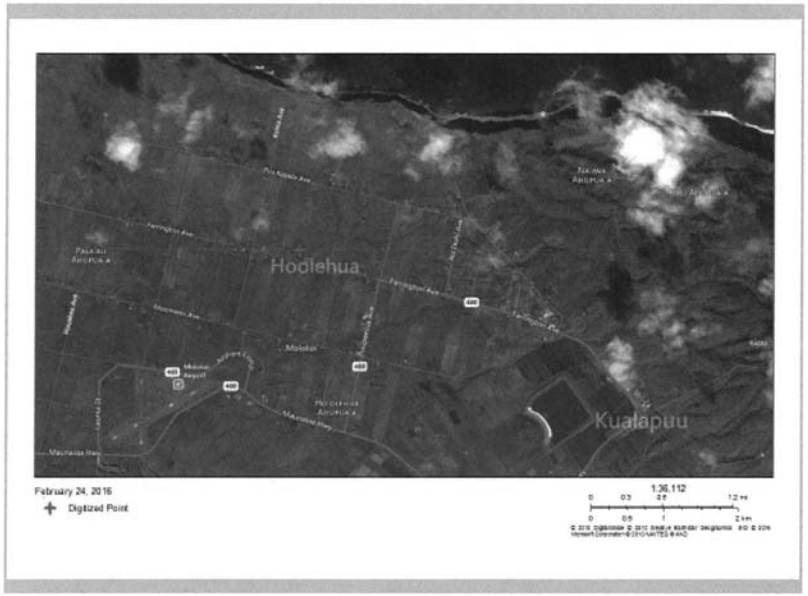
This report shows environmental, demographic, and EJ indicator values. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block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

EPA United States Environmental Protection Agency

EJSCREEN Report

for 1 mile Ring Centered at 21.171156,-157.078346, HAWAII, EPA Region 9

Approximate Population: 324



EPA United States Environmental Protection Agency

EJSCREEN Report

for 1 mile Ring Centered at 21.171156,-157.078346, HAWAII, EPA Region 9

Approximate Population: 324

Selected Variables	Raw Data	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m³)	N/A	N/A	N/A	9.95	N/A	9.78	N/A
Ozone (ppb)	N/A	N/A	N/A	49.7	N/A	46.1	N/A
NATA Diesel PM (µg/m³)*	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NATA Cancer Risk (lifetime risk per million)*	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NATA Respiratory Hazard Index*	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NATA Neurological Hazard Index*	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Traffic Proximity and Volume (daily traffic count/distance to road)	0.46	280	0	190	0	110	0
Lead Paint Indicator (% Pre-1960 Housing)	0.24	0.17	69	0.25	59	0.3	54
NPL Proximity (site count/km distance)	0.0099	0.092	29	0.11	7	0.096	7
RMP Proximity (facility count/km distance)	0.02	0.18	4	0.41	2	0.31	2
TSDF Proximity (facility count/km distance)	0.011	0.092	29	0.12	7	0.054	31
Water Discharger Proximity (facility count/km distance)	0.016	0.33	6	0.19	1	0.25	1
Demographic Indicators							
Demographic Index	68%	51%	91	46%	80	35%	88
Minority Population	84%	77%	55	57%	76	36%	87
Low Income Population	53%	25%	92	35%	76	34%	80
Linguistically Isolated Population	4%	6%	57	9%	42	5%	69
Population With Less Than High School Education	14%	10%	75	18%	51	14%	59
Population Under 5 years of age	6%	6%	49	7%	44	7%	48
Population over 64 years of age	11%	14%	36	12%	57	13%	47

* The National-scale Air Toxics Assessment (NATA) environmental indicators and EJ indexes, which include cancer risk, respiratory hazard, neurodevelopment hazard, and diesel particulate matter will be added into EJSCREEN during the first full public update after the soon-to-be-released 2011 dataset is made available. The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: http://www.epa.gov/ttn/atw/natamain/index.html.

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

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

February 24, 2016 3/3

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

Ms. Laura Leialoha Phillips McIntyre, AICP
Program Manager, Environmental Planning Office
State of Hawai'i
Department of Health
P.O. Box 3378
Honolulu, HI 96801-3378

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Ms. McIntyre:

Thank you for your letter dated February 25, 2016 (reference number EPO 16-055), regarding the Draft Environmental Assessment (EA) for the proposed improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230. We appreciate you taking the time to review the information, and we provide the following responses.

As stated in the Draft EA, we have anticipated the need for a National Pollutant Discharge Elimination System (NPDES) permit, and will: 1) follow all proper procedures to obtain the NPDES permit; and 2) adhere to all applicable permit requirements and conditions.

As stated in the Draft EA, the proposed project is not anticipated to involve the disposal of any wastewater, nor will it connect to the County wastewater system. If conditions change such that wastewater disposal is required, then the wastewater plans will conform to all applicable provisions of the Department of Health (DOH) Administrative Rules, Chapter 11-62, "Wastewater Systems." We understand that DOH may review detailed wastewater plans for the project.

As stated in the Draft EA, the general contractor will obtain a noise permit before commencement of construction work for which noise levels exceed allowable levels, and will comply with conditions attached to the permit, in compliance with Chapter 11-46, HAR, "Community Noise Control."

We have reviewed the standard comments on the DOH EPO website, as well as the Environmental Health Management Maps, for applicability to the subject project. We have also reviewed the Hawai'i Environmental Health Portal and its links to various sources of state environmental data. We have also reviewed the Office of Environmental Quality Control (OEQC) viewer, as well as the U.S. Environmental Protection Agency (EPA) environmental tools, EJSCREEN, and NEPAssist. The Final EA will also include any relevant information from these sources not already included in the Draft EA.

We acknowledge your objective to promote sustainable, innovative, inspirational, transparent, and healthy design in the state of Hawai'i. We hope to contribute to that vision through appropriate use of social and environmental data in the planning process.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

OFFICE OF
ENVIRONMENTAL QUALITY CONTROL

DAVID Y. IGE
GOVERNOR

SCOTT GLENN
INTERIM DIRECTOR

DEPARTMENT OF HEALTH, STATE OF HAWAI'I
235 South Beretania Street, Suite 702, Honolulu, HI 96813

Phone: (808) 586-4185
Email: oeqchawaii@doh.hawaii.gov

March 21, 2016

Jeffrey Fujimoto
Land Development Division
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawai'i 96805

Dear Mr. Fujimoto,

SUBJECT: Draft Environmental Assessment (EA) for the Ho'olehua Water System Project

The Office of Environmental Quality Control (OEQC) reviewed the Draft EA prepared for the proposed action and offers the following comments for your consideration.

OEQC commends the Department of Hawaiian Home Lands for the various necessary improvements to the Ho'olehua water system that provides water service to the DHHL residential, agricultural, and pastoral homestead communities in Ho'olehua and Kalama'ula, Moloka'i, along with the inclusion of a new one-megawatt photovoltaic (PV) system to help support the energy requirements of the water system. The attached Preliminary Engineering Report includes information suggesting the PV system leaves a substantial amount of electricity to be purchased from the utility to power to the water system. An explanation of the design criteria for the sizing of the PV system would be helpful in the EA.

Section 2.1.2 Existing Use makes passing reference to other water systems on the island, alluding to some that may be inter-connected to the subject system, and some that may be independent. Additionally, Section 2.2 c) Reasonable Growth, discusses how additional homesteads may be developed given the recent lifting of the moratorium on subdivision of agricultural and pastoral lots. This new development would likely impact the subject water system by increasing water service to newly subdivided areas. Given the expressed use of the subject water system for both residential and agricultural users, and the noted addition of new demand upon the water system and the underlying water resources of the island, OEQC believes the EA should discuss water conservation measures that would be employed throughout the system, along with the potential for cumulative impacts amongst connected and other water systems.

Thank you for the opportunity to comment on the Draft EA. OEQC looks forward to a response that also will be included within the project's Final EA. If you have questions about these comments, please consult myself or Tom Eisen in our office at (808) 586-4185.

Sincerely,

Scott Glenn, Interim Director

Cc: Malia Cox

16-237

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

Mr. Scott Glenn, Interim Director
State Hawai'i
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Glenn;

Thank you for your letter dated March 21, 2016. We value your input, and offer the following responses to your comments.

The size of the new one-megawatt photovoltaic (PV) system was developed by SPS Energy & Financial based on PWS 230's actual energy consumption over a 12-month period. This information has been included in the Final Environmental Assessment (EA). In addition, information from SPS Energy & Financial regarding funding options has been included in the Final EA appendices.

We acknowledge the Office of Environmental Quality Control's (OEQC) concerns regarding water conservation measures. This project is designed to improve the existing water system and fire protection capabilities. As proposed, it will not increase consumption by existing users. Further, no new users will be connected as a result of this project. However, we recognize that conservation of resources is part of the Department of Hawaiian Home Land's (DHHL) kuleana. This project is being pursued in an effort to protect and conserve this resource. Portions of the PWS 230 water system are over 80 years old, and the system wide unaccounted water loss is 50% higher than what is considered optimal. (All water systems have some unaccounted for water loss). Replacement of aging pipes as described in the EA is anticipated to reduce unaccounted water loss back into the normally accepted range. Additionally, the project includes the purchase of new digital water meters to replace existing meters. This will allow

operators to better track consumption. Both of these are important water conservation components of the project and are discussed in Section 3.4 the Final EA. This project is not increasing consumption. Therefore, there is no difference in cumulative impacts as they relate to consumption between the project and status quo/no action alternative. DHHL will continue to pursue its rights to the water resources on Moloka'i as was granted by U.S Congress through the Hawaiian Homestead Act and amendments.

Thank you again for your participation in this consultation process. Your letter will be included in the FEA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

O:\JOB16\1684.29 Molokai USDA water\Correspondence + Consultation\Correspondence\2015 update Correspondence\2015 Correspondence Comments\DEA Comments and Responses\RESPONSES\HI - OEQC response (revised 2).docx

DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
SAFE DRINKING WATER BRANCH
919 ALA MOANA BLVD., ROOM 308
HONOLULU, HI 96814-4920

In reply, please refer to:
File: SDWB
230H0316.docx

March 29, 2016

Mr. Jeffrey Fujimoto
Project Manager
Hawaii Department of Hawaiian Home Lands
Land Development Division
P.O. Box 1879
Honolulu, Hawaii 96805
[via Jeffrey.y.fujimoto@hawaii.gov]

Dear Mr. Fujimoto:

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (DEA) FOR THE PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HOOLEHUA PUBLIC WATER SYSTEM (PWS) NO. 230, MOLOKAI, HAWAII

The Safe Drinking Water Branch (SDWB) has reviewed the subject document and has the following comment:

> Projects proposing substantial modifications to existing public water systems must receive approval by the Director prior to construction of the proposed system or modification in accordance with HAR Section 11-20-30, "New and modified public water systems." These projects include treatment, storage and distribution systems of public water systems. The approval authority for projects owned and operated by a County Board or Department of Water or Water Supply has been delegated to them.

If there are any questions, please call Ms. Joan Corrigan of the SDWB Engineering Section at 586-4258.

Sincerely,

JOANNA L. SETO, P.E., CHIEF
Safe Drinking Water Branch

JC:cw

c: Ms. Malia Cox, PBR HAWAII & Associates, Inc. [via mcox@pbrhawaii.com]

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

Ms. Joanna Seto, P.E., Chief
State Hawai'i
Department of Health
Safe Drinking Water Branch
919 Ala Moana Boulevard, Room 308
Honolulu, HI 96814-4920

Attn: Ms. Joan Corrigan, SDWB Engineering Section

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Ms. Seto:

Thank you for your letter dated March 29, 2016 (Reference Number SDWB 230H0316.docx). We appreciate you taking the time to review the information provided and offer the following responses to your comments.

As stated in the Draft Environmental Assessment (EA), prior to the start of construction, construction plans for the proposed water system improvements will be provided to your office for review and approval as required by Hawai'i Administrative Rules Chapter 11-20-30.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

O:\JOB16\1684.29 Molokai USDA water\Correspondence + Consultation\Correspondence\2015 update Correspondence\2015 Correspondence Comments\DEA Comments and Responses\RESPONSES\H1 - DOH-SDWB response.docx

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

March 24, 2016

State of Hawaii
Department of Hawaiian Home Lands
Attention: Mr. Jeffrey Fujimoto, Project Manager
P.O. Box 1879
Honolulu, Hawaii 96805

PBR Hawaii & Associates, Inc. via email: mcox@pbrhawaii.com
Attention: Malia Cox
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Mr. Fujimoto and Ms. Cox:

SUBJECT: Draft Environmental Assessment (EA) for Improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230

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

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

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
LAND DIVISION
2016 MAR -2 PM 12:02
DEPT OF LAND & NATURAL RESOURCES STATE OF HAWAII

'16 FEB 26 AM 10:49 ENGINEERING

February 25, 2016

MEMORANDUM

TO: FR:

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

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment (EA) for Improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230
LOCATION: Parcels in Ho'olehua-Pala'au, Kalama'ula and Mo'omoni, Island of Molokai; TMK: Portions of 53 TMKs
APPLICANT: Department of Hawaiian Home Lands

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments on this project. Please submit any comments by **March 23, 2016.**

The DEA can be found on-line at: http://health.hawaii.gov/oeqc/ (Click on the Current Environmental Notice under Quick Links on the right.)

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

Attachments

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

Signed:

Print Name: Carty S. Chang, Chief Engineer
Date: 2/11/16

cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/ Russell Y. Tsuji

Ref.: **Draft Environmental Assessment (EA) for Improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230 Maui.009**

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.

(X) According to the Flood Insurance Rate Map (FIRM), the area covered by the Draft EA falls within various Flood Zone designations. These areas are regulated by the National Flood Insurance Program. Applicable regulations are indicated in bold letters below.

( ) The correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

(X) The project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Mario Siu Li at (808) 768-8098 of the City and County of Honolulu, Department of Planning and Permitting.

( ) Mr. Carter Romero (Acting) at (808) 961-8943 of the County of Hawaii, Department of Public Works.

(X) Mr. Carolyn Cortez at (808) 270-7253 of the County of Maui, Department of Planning.

( ) Mr. Stanford Iwamoto at (808) 241-4846 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

(X) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments: _____

( ) Other: _____

Should you have any questions, please call Mr. Rodney Shiraishi of the Planning Branch at 587-0258.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 3/1/14

FYI: THERE ARE (53) TMK's INVOLVED. THIS REQUEST CHECK'D AN INSUFFICIENT AMOUNT TO VERIFY FLOOD ZONE DESIGN.

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
2016 MAR 18 AM 10:49
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

RECEIVED
COMMISSION ON WATER
RESOURCE MANAGEMENT
2016 FEB 26 PM 2:24

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

February 25, 2016

MEMORANDUM

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

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment (EA) for Improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230
LOCATION: Parcels in Ho'olehua-Pala'au, Kalama'ula and Mo'omoni, Island of Molokai; TMK: Portions of 53 TMKs
APPLICANT: Department of Hawaiian Home Lands

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments on this project. Please submit any comments by **March 23, 2016.**

The DEA can be found on-line at: http://health.hawaii.gov/oeqc/ (Click on the Current Environmental Notice under Quick Links on the right.)

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

Attachments

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

Signed: Jeffrey T. Pearson, P.E.

Print Name: Deputy Director
Date: March 14, 2016

cc: Central Files

REF. 4258.4
1382.9

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

March 14, 2016

REF: RFD.4258.4

TO: Mr. Russell Tsuji, Administrator
Land Division Oahu, DLNR-LD

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

SUBJECT: Draft Environmental Assessment for Improvements to the Department of Hawaiian Home Lands Ho`olehua Water System, PWS No. 230

FILE NO.: RFD.4258.4
TMK NO.: TMK: Portions of 53 TMKs

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

Our comments related to water resources are checked off below.

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

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

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

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

☐ 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://hawaii.gov/dbedt/czm/initiative/lid.php.

☐ 6. We recommend the use of alternative water sources, wherever practicable.

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

☐ 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at

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

☐ 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

☒ 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.

☐ 11. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.

☐ 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.

☐ 13. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.

☐ 14. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

☐ 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.

☐ 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.

☐ 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.

☐ 18. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

☐ OTHER: The allocation situation in Kualapuu described on Table 2-2 on page 6 should be updated to show that allocation to well 0901-001 had been vacated by the Supreme Court. Also, the pending application for DHHL to use reservation should be supplemented by concurrent pending water use permit applications for MDWS (for a new total of 0.900) and Molokai Public Utilities (1.026) that are the subject of a potential competition mediation regarding these requests. There is also a pending matter of the disposition of the Supreme Court remand of contested case CCH-MO97-1 remand for of well 0901-001.

There is evidence that the MDWS Well 0801-003 and DHHL wells 0801-001 & 002 are causing upconing interference between each other at current pumping rates.. DHHL reporting of well use is lacking accurate salinity, water level and temperature readings to help understand potential solutions to conflict with interfering wells.

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

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M.K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

Mr. Russell Y. Tsuji
Land Administrator
State of Hawai'i
Department of Land and Natural Resources
Land Division
P.O. Box 621
Honolulu, HI 96809

Attn: Ms. Lydia Morikawa; Mr. Rodney Shiraishi; and Mr. Roy Hardy

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Tsuji:

Thank you for your letter dated March 24, 2016, regarding the Draft Environmental Assessment (EA) for the proposed improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230. We acknowledge your review of the project, and offer the following responses to the comments from the Department of Land and Natural Resources (DLNR) Agencies below:

1. **Engineering Division.** We acknowledge the Engineering Division's comments that, according to the Flood Insurance Rate Map (FIRM), the area covered by the Draft EA falls within various Flood Zone designations, and that these areas are regulated by the National Flood Insurance Program (NFIP). The Draft EA includes a discussion on the various Flood Zone areas, and recognizes the necessity of compliance with the rules and regulations of the NFIP presented in Title 44 of the Code of Federal Regulations (44CFR) and the Maui County Code for Flood Hazard Areas.

   As stated in Section 4.7.1 of the Draft EA, water demands and calculations will be provided to the DLNR Engineering Division so it can be included in the State Water Projects Plan Update during the design/construction phase of the Project.

2. **Commission on Water Resource Management (CWRM).** We acknowledge the CWRM's comments that: 1) the proposed water supply source for the project is located in a designated water management area; 2) a Water Use Permit is required prior to the use of

water; and 3) the Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments. This project does not include source development or any increase in water consumption. The replacement of aging infrastructure is anticipated to reduce water loss.

We also acknowledge the comments that: 1) the CWRM Water Permit allocation situation in Kualapu'u described on Table 2-2 on page 6 of the Draft EA should be updated to show that allocation to well 0901-001 had been vacated by the Supreme Court; 2) the pending application for DHHL to use reservation should be supplemented by concurrent pending water use permit applications for MDWS (for a new total of 0.900) and Moloka'i Public Utilities (1.026) that are the subject of a potential competition mediation regarding these requests; 3) there is also a pending matter of the disposition of the Supreme Court remand of contested case CCH-MO97-1 remand for of well 0901-001; 4) there is evidence that the MDWS Well 0801-003 and DHHL wells 0801-001 & 002 are causing upconing interference between each other at current pumping rates; and 5) DHHL reporting of well use is lacking accurate salinity, water level and temperature readings to help understand potential solutions to conflict with interfering wells.

We reiterate that this project does not include source development, and there are no actions proposed that will increase the rate of water consumption.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

PHONE (808) 594-1888 FAX (808) 594-1938

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
560 N. NIMITZ HWY., SUITE 200
HONOLULU, HAWAI'I 96817

HRD16-7621C

March 17, 2016

Malia Cox
PBR HAWAII & Associates, Inc.
1001 Bishop St., Suite 650
Honolulu, HI 96813

Re: Draft Environmental Assessment for Proposed Improvements to the Department of Hawaiian Home Lands Ho'olehua Water System, PWS No. 230
Kalama'ula, Kahanui, Nā'iwa, and Ho'olehua-Pālā'au Ahupua'a, Kona Moku, Moloka'i Mokupuni
Tax map key (2) 5-2-007:029, 030, 035, 040, 055, 078, 079, 080, 082-085; (2) 5-2-008:051, 052, 079, 084, 086-089, 091, 114: (2) 5-2-010:001, 002, 003: (2) 5-2-012:999; (2) 5-2-013:010, 017, 028-032; and (2) 5-2-033:001, 002, 003

Aloha Ms. Cox:

The Office of Hawaiian Affairs (OHA) is in receipt of your February 17, 2016 letter requesting comments on the draft environmental assessment (DEA) for the proposed improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230. The changes will service the Moloka'i homesteads of Ho'olehua-Pālā'au, Kalama'ula, and Mo'omomi. PBR Hawaii is acting as consultant to DHHL.

DHHL proposed improvements include a one-megawatt photovoltaic energy production farm, increased fire protection, new water storage tanks, chlorination facilities, booster pump, and pipe repair and replacements to address issues with the potable water system. It will also include improvements to maintenance yard facilities, storage and well site accessibility, and security. The proposed project will not increase the pumping rate of the water source for PWS No. 230.

OHA is the constitutionally established body responsible for protecting and promoting the rights of Native Hawaiians. Hawai'i law mandates OHA to "[s]erve as the principal public agency in the State of Hawai'i responsible for the performance, development, and coordination of programs and activities relating to native Hawaiians and Hawaiians; . . . and [t]o assess the policies and practices of other agencies impacting on native Hawaiians and Hawaiians, and conducting advocacy efforts for native Hawaiians and Hawaiians." Hawai'i Revised Statutes § 10-3.

The following comments reflect OHA's responsibility to better the conditions of Native Hawaiians, and are specifically intended to maximize the benefits of our beneficiaries.

Flora

OHA notes that none of the identified vegetation within the area of potential effect is endangered or threatened. Eight of the identified species are native to the Hawaiian Islands, and four are Polynesian-introduced, but all of them are common species.[1]

We appreciate the mitigation measures that are being taken to avoid unintentional introduction or transportation of new invasive plants to Moloka'i, by encouraging thorough washing and inspection of construction equipment, vehicles, and gear, and the purchase of raw materials from local Moloka'i suppliers.

Fauna

OHA understands that the area of potential effect is within the breeding grounds of the endangered 'ōpe'ape'a (Hawaiian hoary bat), the endangered nēnē (Hawaiian goose), the threatened 'a'o (Newell shearwater), the endangered 'alae kea (Hawaiian coot), the endangered ae'o (Hawaiian stilt), and the endangered 'io (Hawaiian hawk). We support the mitigation measures suggested in order to mitigate impact upon each species:

1. 'Ōpe'ape'a – no trimming or removal of woody plants greater than 15-feet tall during breeding season, between June 1 and September 15;
2. Nēnē – no construction activity to occur if nēnē is spotted by biologist on site during breeding season, December through April, and work will be halted if a nēnē nest is spotted within a 100-foot radius;
3. 'A'o, 'Alae kea, Ae'o, and 'Io – no night-time construction, and all lights associated with the project will be shielded so that bulbs can only be seen from below.

Moreover, OHA noticed in the DEA that the Hawaiian name was provided for the plant species but omitted for the animal ones. We would like to encourage the use of the Hawaiian name with the English and/or scientific translation of all species when available.

[1] DEA – Improvements of Hawaiian Home Lands Ho'olehua Water System PWS No. 230, by PBR HAWAII & Associates, Inc. February 2016, page 45.

Archeological and Historic Resources

An archaeological inventory survey was was conducted by Pacific Legacy, Inc. in 2011/2012 and a supplemental survey was conducted in 2015. During the surveys, 17 sites were identified, of which nine are traditional Hawaiian, seven historic, and one military in origin. The majority of the sites are present on the Kalama'ula homestead. In addition, all sites are designated under criterion "D" except for one burial site, State Inventory of Historic Places (SIHP) 801, under criterion "E."[2]

OHA agrees with the AIS's designation of burial site SIHP 801 as significant under criteria "D" and "E," but disagrees with the determination that SIHP 2568 and 2572 are significant only under criteria "D" without adequate justification. Site SIHP 2568 is described as "Traditional – This site is a probable lithic reduction sites area where basalt flakes were being produced;" and SIHP 2572 as "Traditional – Large lithic scatter where that [sic] probably included the production of stone adze performs [sic]."[3] Although both sites are similar, only SIHP 2572 is recommended for preservation and no justification is provided as to why one should be preserved over the other. OHA recommends that SIHP 2568 and 2572 be designated with criteria "D" and "E," and preserved accordingly, as these archaeological sites allow for the perpetuation and preservation of Native Hawaiian culture and associated practices.

OHA notes that HAR § 13-284-8(2)[4] requires consultation with OHA for all criteria "E" sites that will be impacted by the project to develop plans for mitigation. Moreover, our agency has observed that sites under criteria "D" are often destroyed after data recovery is completed. OHA would like to discourage DHHL from doing so, and to further urge the State of Hawai'i Department of Land and Natural Resources State Historic Preservation Division to follow with OHA's recommendation for preservation.

Cultural Resources

The DEA states that OHA and various civic clubs were consulted for the project, resulting in 17 invitations sent to individuals and organizations, but noted that no parties replied. Although, this satisfies the minimum requirements for the cultural impact assessment, OHA would like to advocate that in the future, DHHL contact each homestead association to provide the opportunity for a presentation to beneficiaries. We understand that this is not always feasible, but due to the unique structure of homesteads we strongly encourage it, especially for the Kalama'ula homestead where majority of the historic sites were identified.

[2] See Hawai'i Administrative Rules § 13-284-6(b).
[3] DEA – Improvements of Hawaiian Home Lands Ho'olehua Water System PWS No. 230, by PBR HAWAII & Associates, Inc. February 2016, page 50.
[4] HAR § 13-284-8(2) – "If properties with significance, so evaluated, under criterion "e" … are involved, the agency shall initiate a consultation process with ethnic organizations or members of the ethnic group for whom the historic properties have significance under criterion "e" to seek views on the proposed forms of mitigation. *For native Hawaiian properties which may be significant under criterion "e" the Office of Hawaiian Affairs also shall be consulted."* (emphasis added).

Mahalo for the opportunity to comment. Should you have any questions, please contact Jeannin Jeremiah at 594-1790 or by email at jeanninj@oha.org.

'O wau iho nō me ka 'oia 'i'o,

Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer

KC:jj

C: Jeffrey Fujimoto – Department of Hawaiian Home Lands
Colette Y. Machado – OHA Trustee, Moloka'i and Lāna'i Island
Gayla Haliniak-Lloyd – OHA Community Outreach Coordinator, Moloka'i Island

**Please address replies and similar, future correspondence to our agency:*
Dr. Kamana'opono Crabbe
Attn: OHA Compliance Enforcement
560 N. Nimitz Hwy, Ste. 200
Honolulu, HI 96817

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

Dr. Kamana'opono Crabbe
Attn: OHA Compliance Enforcement
560 N. Nimitz Highway, Suite 200
Honolulu, HI 96817

Attn: Jeannin Jeremiah

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Dr. Crabbe:

Thank you for your letter dated March 17, 2016 (reference number HRD16-7621C), regarding the Draft Environmental Assessment (EA) for the proposed improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230. We value your comments and offer the following responses:

1. We appreciate your support for the mitigation measures that are being taken to avoid unintentional introduction or transportation of new invasive plants to Moloka'i.

2. We also appreciate your support for the mitigation measures that are being taken to mitigate impact upon fauna species including the endangered 'ōpe'ape'a (Hawaiian hoary bat), the endangered nēnē (Hawaiian goose), the threatened 'a'o (Newell shearwater), the endangered 'alae kea (Hawaiian coot), the endangered ae'o (Hawaiian stilt), and the endangered 'io (Hawaiian hawk). The Hawaiian names of the fauna species will be used in addition to the English and scientific names in the Final EA.

3. We acknowledge your comments regarding the archaeological and historic resources. We concur that consultation with OHA is necessary for all criteria "E" sites that will be impacted by the development. The consultation requirement will be included in the mitigation measures described in the Final EA. Greater detail regarding the justification of significance criteria designations for SIHP 2568 and 2572 will be included in the final AIS. In addition, DHHL will make every effort to avoid destruction of significant sites (criteria E and D) wherever possible.

4. We also acknowledge your comments regarding the minimum requirements for the cultural

impact assessment and agree that consultation with homestead associations is important. While separate from the CIA process, DHHL did engage the Moloka'i Hawaiian Homestead Associations. The associations were provided multiple opportunities for consultation as part of the National Historic Preservation Act of 1966 (Section 106) process. The DHHL homestead association leadership on Moloka'i received written information regarding the project and had three opportunities to meet and discuss cultural resources and the Project. Informational meetings were held on December 1, 2011, and December 9, 2011, and October 1, 2015. Meeting attendees were encouraged to discuss cultural resources and wahi pana within the Project area and/or those outside the Project area that may otherwise be affected. Attendees were also asked to refer individuals with information regarding both cultural and natural resources to the DHHL Planning Office, or PBR Hawaii staff. Following the October 1, 2015, meeting, all attendees as well as those listed on the September 2015 U.S. Department of Interior, Native Hawaiian Organization list received follow-up correspondence via email if valid emails addresses were provided. The email follow up encouraged participation in the CIA process and provided the CIA consultant's contact information. We will include a summary of the Section 106 consultation process as an appendix in the Final EA.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

March 3, 2016

Jeffrey Fujimoto, Project Manager
Department of Hawaiian Home Lands
Land Development Division
P.O. Box 1879
Honolulu, HI 96805

Hello Jeffrey Fujimoto,

Thank you for sending information regarding the proposed project to improve treatment, storage and delivery of potable water supplied by PWS No. 230 to 2,400 customers including native Hawaiian residential, agriculture, and pastoral homesteads located in Ho'olehua-Pala'au, Kalama'ula and Mo'omomi on the island of Moloka'i. Under the provisions of the Safe Drinking Water Act, Section 1424(e), EPA is responsible for the review of projects that receive federal funding and are located in recharge areas that have received a Sole Source Aquifer Designation. Based on the information you provided, it does not appear that the proposed project will adversely affect the sole source aquifer.

Regards,

Leslie Ann Greenberg

Leslie Ann Greenberg
Environmental Protection Specialist
U.S. EPA, Region 9
Drinking Water Protection Section (WTR-3-2)
Tribal and State Assistance Branch
75 Hawthorne Street, San Francisco, CA 94105
tel. 415 972 3349 FAX 415 947 3549
Greenberg.leslie@epa.gov

cc: Malia Cox, PBR Hawaii & Associates, Inc.

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

Ms. Leslie Ann Greenberg
Environmental Protection Specialist
U.S. Environmental Protection Agency, Region 9
Drinking Water Protection Section (WTR-3-2)
Tribal and State Assistance Branch
75 Hawthorne Street
San Francisco, CA 94105-3901

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Ms. Greenberg:

Thank you for your letter dated March 3, 2016. We appreciate you taking the time to review the information provided. We acknowledge your comment that the proposed project will not adversely affect the sole source aquifer.

Thank you again for your participation in this consultation process. Your letter will be included in the Final Environmental Assessment (EA). If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

O:\JOB16\1684.29 Molokai USDA water\Correspondence + Consultation\Correspondence\2015 update Correspondence\2015 Correspondence Comments\DEA Comments and Responses\RESPONSES\US - EPA response.docx

United States Department of the Interior
U.S. GEOLOGICAL SURVEY
Pacific Islands Water Science Center
1845 Wasp Boulevard, Building 176
Honolulu, Hawaii 96818
Phone: (808) 690-9600/Fax: (808) 690-9599

March 8, 2016

Ms. Malia Cox, Project Manager
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813

Dear Ms. Cox:

Subject: Draft Environmental Assessment (EA) for Improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230, Moloka'i Hawai'i

Thank you for your letter regarding the subject DEA for review and comment by the staff of the U.S. Geological Survey Pacific Islands Water Science Center. We regret however, that due to prior commitments and lack of available staff, we are unable to review this document.

We appreciate the opportunity to participate in the review process.

Sincerely,

Stephen S. Anthony
Center Director

cc: Mr. Jeffrey Fujimoto, Project Manager
Department of Hawaiian Home Lands
Land Development Division
P.O. Box 1879
Honolulu, Hawaii 96805

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. ARIA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

Mr. Stephen S. Anthony, Center Director
United States Department of the Interior
U.S. Geological Survey
Pacific Islands Water Science Center
1845 Wasp Boulevard, Building 176
Honolulu, HI 96818

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Anthony:

Thank you for your letter dated March 8, 2016. We appreciate you taking the time to review the information provided. We acknowledge that you are not able to review the Draft Environmental Assessment (EA) or provide comments at this time regarding the subject project.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

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U.S. Department
of Transportation
**Federal Aviation
Administration**

Western-Pacific Region
Airports District Office

300 Ala Moana Blvd., Rm. 7-128
Honolulu, HI 96850
Mail: Box 50244
Honolulu, HI 96850-0001
Telephone: (808) 312-6028
Facsimile: (808) 312-6048

March 2, 2016

Department of Hawaiian Home Lands
Attn: Jeffrey Fujimoto, Project Manager
Land Development Division
P. O. Box 1879
Honolulu, Hawaii 96805

Dear Mr. Fujimoto:

SUBJECT: Draft Environmental Assessment for the Proposed Improvements to DHHL Ho'olehua Water System; Moloka'i, Hawai'i

We have reviewed the Draft Environmental Assessment for the Proposed Improvements to the Department of Hawaiian Home Lands Ho'olehua Water System located on the island of Moloka'i.

We could not determine the proposed location of the photovoltaic (PV) system; however, if it is located within 5 miles of Moloka'i Airport, we recommend you conduct a glint/glare analysis. The following website may assist you with preparation of a glint/glare analysis:

www.sandia.gov/glare

PV systems can become a safety issue to pilots and air traffic controllers due to glint/glare. Any glint/glare into Airport Traffic Control Towers is unacceptable. Low levels of glint/glare on the approach/departures for pilots are considered acceptable.

Please call if you have any questions.

Sincerely,

Gordon K. Wong
Lead Program Manager

Ronnie V. Simpson
Manager, Airports District Office

cc: PBR HAWAII & Associates, Inc. (Attn: Malia Cox, Project Manager)
HDOT-A

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

Mr. Gordon K. Wong, Lead Program Manager
U.S. Department of Transportation
Federal Aviation Administration
Western-Pacific Region, Airports District Office
300 Ala Moana Boulevard, Room 7-128
Honolulu, HI 96850-0001

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Wong:

Thank you for your letter dated March 2, 2016, regarding the Draft Environmental Assessment (EA) for the proposed improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230. We acknowledge your review of the project and offer the following response to your comments.

As indicated on the enclosed map, the proposed photovoltaic (PV) system is not located within 5 miles of Moloka'i Airport (MKK). The Final EA will include the revised graphic showing the location of the PV system 5.1 miles east of MKK.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

Enclosure

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

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ALAN M. ARAKAWA
Mayor
STEWART STANT
Director
MICHAEL M. MIYAMOTO
Deputy Director

MICHAEL RATTE
Solid Waste Division
ERIC NAKAGAWA, P.E.
Wastewater Reclamation Division

COUNTY OF MAUI
DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
2050 MAIN STREET, SUITE 2B
WAILUKU, MAUI, HAWAII 96793

March 16, 2016

PBR Hawaii & Associates, Inc.
ATTN: Malia Cox, Project Manager
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

**SUBJECT: DEPARTMENT OF HAWAIIAN HOMELANDS
DRAFT ENVIRONMENTAL ASSESSMENT
HO'OLEHUA WATER SYSTEM, PWS NO. 230
MOLOKAI, HAWAII**

We have reviewed the subject application per your February 17, 2016 request and have the following comments:

1. Wastewater Reclamation Division comments:
   a. There are no County owned and operated sewer or reclaimed water facilities within the project areas.
   b. We do not anticipate any potential effect to our infrastructure.
2. Solid Waste Division Comments:
   a. None.

If you have any questions regarding this response letter, please contact Mr. Michael Miyamoto at 270-8230.

Sincerely,

STEWART STANT
Director of Environmental Management

cc: Wastewater Reclamation Division
Jeffrey Fujimoto, Land Development Division, Department of Hawaiian Home Lands

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

Mr. Stewart Stant
Director of Environmental Management
County of Maui
Department of Environmental Management
2050 Main Street, Suite 2B
Wailuku, HI 96793

Attn: Mr. Michael Miyamoto

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Stant:

Thank you for your letter dated March 16, 2016, regarding the Draft Environmental Assessment (EA) for the proposed improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230. We appreciate you taking the time to review the information, and we acknowledge the following:

1. The Wastewater Reclamation Division (WRD) comments that there are no County owned and operated sewer or reclaimed water facilities within the project areas, and that WRD does not anticipate any potential effect to their infrastructure.

2. The Solid Waste Division has no comments.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

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ALAN M. ARAKAWA
MAYOR

JEFFREY A. MURRAY
FIRE CHIEF

ROBERT M. SHIMADA
DEPUTY FIRE CHIEF

COUNTY OF MAUI
DEPARTMENT OF FIRE AND PUBLIC SAFETY
FIRE PREVENTION BUREAU

313 MANEA PLACE . WAILUKU, HAWAII 96793
(808) 876-4690 . FAX (808) 244-1363

March 23, 2016

PBR Hawaii
Attn: Malia Cox
1001 Bishop St. Ste. 650
Honolulu, HI 96813

Re: Improvements to the DHHL Ho'olehua Water System
PWS No. 230
Molokai, Hawaii

Dear Malia:

Thank you for the opportunity to comment on this subject. Our department supports this project to improve the water system for the residents of Hawaiian Homelands on Moloka'i. At this time, our office provides the following comments:

- Fuel ASTs our permitted through the Fire Prevention Bureau. The permit application can be found on the Dept. of Fire & Public safety's page of the county's website.
- The installation of the system should follow "Best Engineering Practices" and the National Fire Protection Agency's standard for the installation of private service mains (NFPA 24).
- It is recommended that the installation/replacement of fire hydrants during the improvement of the water system meet, as best as possible, the required fire flows and hydrant spacing for the designated land-use of the areas: Agriculture (minimum 500 gpm with maximum spacing of hydrants at 500 feet) and Rural (1000 gpm with maximum spacing of hydrants at 500 feet).

If there are any questions or comments, please feel free to contact me at (808) 876-4693.

Sincerely,

Paul Haake

Paul Haake
Captain, Fire Prevention Bureau

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

Captain Paul Haake
Fire Prevention Bureau
County of Maui
Department of Fire and Public Safety
313 Manea Place
Wailuku, HI 96793

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Capt. Haake:

Thank you for your letter dated March 23, 2016, regarding the Draft Environmental Assessment (EA) for the proposed improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230. We appreciate you taking the time to review the information, and we offer the following responses:

1. As stated in Section 4.10.2 of the Draft EA, a Flammable & Combustible Tank (Fuel AST) Installation Permit will be obtained from the Maui County Fire Prevention Bureau prior to installation.
2. The installation of the system will follow "Best Engineering Practices" and the National Fire Protection Agency's standard for the installation of private service mains (NFPA 24). This will be reflected in the Final EA.
3. The installation/replacement of fire hydrants as part of this project will meet, as best possible, the required fire flows and hydrant spacing for the designated land-use of the areas: Agriculture (minimum 500 gpm with maximum spacing of hydrants at 500 feet) and Rural (1000 gpm with maximum spacing of hydrants at 500 feet). This will be reflected in the Final EA.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point

of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

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ALAN M. ARAKAWA
Mayor

DAVID C. GOODE
Director

ROWENA M. DAGDAG-ANDAYA
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
200 SOUTH HIGH STREET, ROOM NO. 434
WAILUKU, MAUI, HAWAII 96793

GLEN A. UENO, P.E., P.L.S.
Development Services Administration

CARY YAMASHITA, P.E.
Engineering Division

Highways Division

March 14, 2016

Ms. Malia Cox, Project Manager
PBR HAWAII & ASSOCIATES, INC.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Ms. Cox:

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT FOR IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM

We reviewed the subject application and have the following comments:

Comment from the Highways Division:

1. We recommend coordination with the County Department of Water Supply as we work together to provide emergency back-up support of the potable water systems.

Please call Rowena M. Dagdag-Andaya at (808) 270-7845 if you have any questions regarding this letter.

Sincerely,

for DAVID C. GOODE
Director of Public Works

DCG:RMDA:da
xc: Department of Hawaiian Home Lands
Highways Division
Engineering Division
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DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

Mr. David C. Goode
Director of Public Works
County of Maui
Department of Public Works
200 South High Street, Room No. 434
Wailuku, HI 96793

Attn: Rowena M. Dagdag-Andaya

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Goode:

Thank you for your letter dated March 14, 2016, regarding the Draft Environmental Assessment (EA) for the proposed improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230. We appreciate you taking the time to review the information, and provide the following response. DHHL will coordinate with both the Highways Division and the County Department of Water Supply particularly as it relates to emergency back-up support of the potable water systems.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

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ALAN M. ARAKAWA
Mayor

DON MEDEIROS
Director

MARC I. TAKAMORI
Deputy Director

(808) 270-7511

DEPARTMENT OF TRANSPORTATION

COUNTY OF MAUI
2145 Kaohu Street, Suite 102
Wailuku, Hawaii, USA 96793

February 26, 2016

Mr. Jeffery Fujimoto
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawaii 96805

Subject: Improvements to the Department of Hawaiian Home Lands Ho'olehua Water System

Mr. Fujimoto,

Thank you for the opportunity to comment on this project. We have no comments to make regarding this project.

Please feel free to contact me if you have any questions.

Sincerely,

Don Medeiros
Director

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P. O. BOX 1879
HONOLULU, HAWAII 96805

Mr. Don Medeiros, Director
County of Maui
Department of Transportation
2145 Kaohu Street, Suite 102
Wailuku, HI 96793

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Medeiros;

Thank you for your letter dated February 26, 2016. We appreciate you taking the time to review the information provided. We acknowledge that you have no comments at this time regarding the subject project.

Thank you again for your participation in this consultation process. Your letter will be included in the Final Environmental Assessment (EA). If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

ALAN M. ARAKAWA
Mayor

DAVID TAYLOR, P.E.
Director

PAUL J. MEYER
Deputy Director

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793-2155
www.mauiwater.org

March 28, 2016

PBR HAWAII & Associates, Inc.
Ms. Malia Cox, Project Manager
1001 Bishop St., Ste 650
Honolulu, Hawaii 96813

Re: Improvements to the Department of Hawaiian Home Lands (DHHL) Ho`olehua Water System
PWS No. 230 Draft Environmental Assessment (DEA)

Dear Ms. Cox:

Thank you for the opportunity to comment on the DEA for Improvements to the DHHL PWS No. 230, the Ho'olehua Water System. We understand that this action is being pursued in response to deficiencies identified within the aging infrastructure, and that the pumping rate of the water source (wells No. 0801-001 & 002) for PWS 230 will not increase. DHHL will coordinate with DWS and advise system users in advance of system outages relating to construction activities. This proposal will not negatively impact the Department of Water Supply's (DWS) water system on Moloka`i.

Pollution Prevention

Best Management Practices (BMPs) protect groundwater resources and should be noted in the EA and implemented during construction. The mitigation measures below will alleviate adverse impacts on water quality during construction:

- Prevent cement products, oil, fuel and other toxic substances from leaching into the water.
- Properly and promptly dispose of all loosened and excavated soil and debris material from drainage structure work.
- Retain ground cover until the last possible date.
- Stabilize denuded areas by sodding or planting as soon as possible. Replanting should include soil amendments and temporary irrigation. Use high seeding rates to ensure rapid stand establishment.
- Avoid fertilizers and biocides, or apply only during periods of low rainfall to minimize chemical run-off.
- Keep run-off on site.

We also recommend that the following BMPs designed to prevent contamination through and to the wells be included in the EA:

1. Inspect exposed parts of the well periodically for problems such as: cracked or corroded well casing, broken or missing well cap, damage to protective casing, settling and cracking of surface seals.
2. Ensure that the area around the well is sloped so that surface runoff drains away from the well.
3. Provide a well cap or sanitary seal to prevent unauthorized use of or entry into the well.
4. Provide for sediment removal or well cleaning as necessary.
5. Have the well tested once a year for fecal coliform or other constituents that may be of concern.
6. Keep accurate records of any well maintenance, such as disinfection or sediment removal, that might require use of chemicals in the well.
7. Mixing or using pesticides, fertilizers, herbicides, degreasers, fuels, or other pollutants near the well is to be avoided.
8. Do not locate any type of potentially polluting activity within 1,000' of the well for wellhead protection.

DWS notes that for the selected alternative #2, a 1,000 gallon above ground fuel storage tank will be installed at the well site. DWS is currently proposing a Wellhead Protection (WHP) Ordinance that will require a secondary containment facility, whose purpose is to intercept any leaks or release from the primary containment vessel or structure. Our Draft WHP Ordinance can be found at the following link:
http://www.mauicounty.gov/DocumentCenter/View/98294

Should you have any questions, please contact Staff Planner Marti Buckner at 463-3104 or marti.buckner@mauicounty.gov.

Sincerely,

David Taylor, P.E. Director
mlb
cc: engineering division

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M.K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

Mr. David Taylor, P.E., Director
County of Maui
Department of Water Supply
200 South High Street, Room No. 434
Wailuku, HI 96793

Attn: Ms. Marti Buckner

SUBJECT: REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT (CHAPTER 343) FOR PROPOSED IMPROVEMENTS TO THE DEPARTMENT OF HAWAIIAN HOME LANDS HO'OLEHUA WATER SYSTEM, PWS NO. 230, MOLOKA'I, HAWAI'I

Aloha mai Mr. Taylor:

We received your letter dated March 28, 2016, via email on March 30, 2016, six days after the deadline for comments regarding the Draft Environmental Assessment (EA) for the proposed improvements to the Department of Hawaiian Home Lands (DHHL) Ho'olehua Water System, PWS No. 230. We appreciate you taking the time to review the information, and provide the following responses.

We acknowledge your comment that Best Management Practices should be noted in the EA and implemented during construction. Due to the late submission of your comments we are unable to integrate them into the Final EA; however, we agree that the protection of groundwater resources is important. DHHL's Land Development Division will oversee construction contracts and has been provided with your letter listing both design and construction BMPs.

We also acknowledge your comment that Best Management Practices should be integrated into project design. Due to the late submission of your comments we are unable to integrate these design BMPs into the Final EA. However, we agree that the protection of groundwater resources is important and proper design can prevent contamination through and to the wells. DHHL's civil engineering consultant has been provided with your letter for integration into project plans during the design phase of the project.

We concur that the purpose of secondary containment is to intercept leaks or releases from primary containment vessels and/or structures, and we acknowledge that Maui is drafting a well head protection ordinance that will require secondary containment. The proposed 1,000 gallon above ground fuel storage tank will include secondary containment. The secondary containment vault system with integrated manual leak detection tubes was described in Section 4.8 of the Draft EA.

Thank you again for your participation in this consultation process. Your letter will be included in the Final EA. If you need any additional information, do not hesitate to contact the project point of contact, Ms. Gigi Cairel, Planner, Planning Office at (808) 620-9461, or our authorized agent, Ms. Malia Cox, of PBR HAWAII at (808) 521-5631.

Me ka mahalo,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

cc: Norman Sakamoto, DHHL
Gigi Cairel, Planner, DHHL
Niniau Simmons, DHHL
Joni Tanimoto, Akinaka & Associates Ltd.
Malia Cox, PBR HAWAII

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