NEIL ABERCROMBIE
GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P. O. BOX 1879
HONOLULU, HAWAII 96805

May 1, 2013

Mr. Gary Gill, Acting Director
Office of Environmental Quality Control
State of Hawaii
Department of Health
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Mr. Gill,

SUBJECT: Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the Anahola Solar Project, TMK (4) 4-7-004:002 (por.), Anahola, Kauai

The Department of Hawaiian Home Lands hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the Anahola Solar Project situated at TMK (4) 4-7-004:002 (portion), in Anahola on the island of Kauai for publication in the next available edition of the OEQC Environmental Notice.

Enclosed is a completed OEQC Publication Form, two copies of the DEA-AFONSI, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we will submit the summary of the action in a text file by electronic mail to your office.

Should you have any questions regarding the project, please contact me at 808.620.9451 or via email at linda.l.chinn@hawaii.gov or if you have questions regarding the DEA, you may contact Mr. Brad W. Rockwell of Kauai Island Utility Cooperative at 808.246.8289 or via email at brockwel@kiuc.coop.

Aloha,

Linda Chinn, Administrator
Land Management Division

Enc.

APPLICANT ACTION
SECTION 343-5(C), HRS
PUBLICATION FORM (JANUARY 2013 REVISION)

Project Name: **Anahola Solar Project Draft Environmental Assessment**
Island: **Kauaʻi**
District: **Kawaihau**
TMK: **(4)4-7-004:002**
Permits:

- **National Pollutant Discharge Elimination System – Notice of Intent [Construction] (NPDES-NOI[C])**
- **Noise permit**
- **Construction on a State Highway Permit**
- **Certificate of Public Convenience and Necessity**
- **Grading Permit**
- **Building Permit (Service Center only)**
- **Well Construction and Pump Installation Permit**

Approving Agency:
Department of Hawaiian Home Lands
State of Hawaiʻi
91-5420 Kapolei Parkway
Kapolei, HI 96707
Ms. Linda Chinn (808) 620-9451

Applicant:
Kauaʻi Island Utility Cooperative
4463 Pāheʻe Street
Līhuʻe, Hawaiʻi 96766-2000
Mr. Brad Rockwell (808) 246-8289

Consultant:
Planning Solutions, Inc.
210 Ward Avenue, Suite 330
Honolulu, Hawaiʻi 96814
Mr. Perry White (808) 550-4483

Status (check one only):

_✓_DEA-AFNSI	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov; a 30-day comment period ensues upon publication in the periodic bulletin.
__FEA-FONSI	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov; no comment period ensues upon publication in the periodic bulletin.
__FEA-EISPN	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov; a 30-day consultation period ensues upon publication in the periodic bulletin.
__Act 172-12 EISPN	Submit the approving agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov. NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.
__DEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
__FEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word

processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.

__ Section 11-200-23 Determination

The approving agency simultaneous transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the applicant. No comment period ensues upon publication in the periodic bulletin.

__Statutory hammer Acceptance

The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it failed to timely make a determination on the acceptance or nonacceptance of the applicant's FEIS under Section 343-5(c), HRS, and that the applicant's FEIS is deemed accepted as a matter of law.

__Section 11-200-27 Determination

The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.

__Withdrawal (explain)

Summary: KIUC is planning to construct, operate, and maintain a 12 megawatt photovoltaic facility, a substation,and a baseyard/customer service center. The project facilities would occupy 60 acres on a portion of a 422-acre parcel (TMK (4) 4-7-004:002) owned by the Department of Hawaiian Home Lands (DHHL), in Anahola, Kaua'i. The proposed facilities include:

1. A 53-acre photovoltaic facility, including panels, inverters, and transformers.
2. An adjacent 2-acre substation used for control equipment and to boost the power from the 12 kilovolts (kV) delivered by the PV system to the 57/69 kV voltage of KIUC's electrical transmission system. An integral Battery Energy Storage System (BESS) will be constructed within the proposed substation.
3. A 5-acre service center with an access drive, parking, 5 truck bays, and storage yard.

The parcel was formerly used for sugarcane cultivation but is currently fallow. DHHL must grant a General Lease to KIUC for the proposed project; this constitutes an applicant action, subject to Hawai'i Revised Statutes, Chapter 343. KIUC intends to seek financing from the U.S. Department of Agriculture (USDA) Rural Utilities Service (RUS) for the proposed project, making it a federal action subject to NEPA compliance.

Draft Environmental Assessment
ANAHOLA SOLAR PROJECT

ANAHOLA, KAUA'I

PREPARED FOR:

Kaua'i Island Utility Cooperative
USDA Rural Utilities Service
Department of Hawaiian Homelands

PREPARED BY:

PLANNING SOLUTIONS

MAY 2013

PROJECT SUMMARY

Project:	**Anahola Solar Project**
Applicant:	Kauaʻi Island Utility Cooperative 4463 Pāheʻe Street Līhuʻe, Hawaiʻi 96766-2000 Contact: Brad W. Rockwell (808) 246-8289
Approving Agency:	USDA Rural Utilities Service 1400 Independence Ave. SW Mail Stop 1571 Washington, DC 20250 Department of Hawaiian Home Lands State of Hawaiʻi 91-5420 Kapolei Parkway Kapolei, HI 96707
Location:	Anahola, Kauaʻi, Hawaiʻi
Proposed Project:	Installation of a ~12 MW photovoltaic facility including a dedicated substation with interconnections to the island-wide electrical grid and other ancillary facilities and construction of a Transmission and Distribution service center and base yard..
Tax Map Key:	(4) 4-7-004:002
Parcel Area:	422.15 acres
Project Area:	60 acres
Judicial District:	Kawaihau
State Land Use District:	Agriculture
County Zoning:	Agriculture
Required Permits & Approvals:	• NEPA Environmental Assessment • Chapter 343 Environmental Assessment • National Pollutant Discharge Elimination System – Notice of Intent [Construction] (NPDES-NOI[C]) • Noise permit • Construction on a State Highway Permit • Certificate of Public Convenience and Necessity • Grading Permit • Building Permit (Service Center only) • Well Construction and Pump Installation Permit
Anticipated Determination:	Finding of No Significant Impact
Parties Consulted:	See Chapter 9
Consultant:	Planning Solutions, Inc. 210 Ward Avenue, Suite 330 Honolulu, HI 96814 Contact: Perry White (808) 550-4483

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LIST OF FIGURES

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List of Acronyms

Acronym	*Phrase*
AHHA	Anahola Hawaiian Homes Association
AIS	Archaeological Inventory Survey
AC	Alternating Current
BER	Borrower's Environmental Report
BESS	Battery Energy Storage System
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CIA	Cultural Impact Assessment
CWP	Construction Work Plan
DHHL	Department of Hawaiian Home Lands
EA	Environmental Assessment
EIS	Environmental Impact Statement
EISPN	Environmental Impact Statement Preparation Notice
EPC	Engineering, Procurement, and Construction
HAR	Hawai'i Administrative Rules
HBA	Homeowner's Benefit Agreement
HCDC	Homestead Community Development Corporation
HCP	Habitat Conservation Plan
HRS	Hawai'i Revised Statutes
IPP	Independent Power Provider
KIUC	Kaua'i Island Utility Cooperative
KRS One	Kaua'i Renewable Solutions One
kV	Kilovolt
MW	Megawatt
MWh	Megawatt Hour
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
PPA	Power Purchase Agreement
PV	Photovoltaic
RDEP	Rural Development Electrical Programs
RFP	Request For Proposals
RUS	Rural Utility Service
TMK	Tax Map Key
USDA	United States Department of Agriculture

1. PROJECT OVERVIEW

1.1 BACKGROUND

The Kauaʻi Island Utility Cooperative (KIUC) is a not-for-profit, tax-exempt cooperative association governed by an elected nine-member Board of Directors. KIUC is entirely ratepayer-owned and is responsible for the production, purchase, transmission, distribution, and sale of electricity on the Island of Kauaʻi, Hawaiʻi. The cooperative is regulated by the Hawaiʻi Public Utilities Commission, and is required by law to provide and ensure the availability of reliable electrical service. KIUC owns and operates a variety of electric utility installations on the island of Kauaʻi. Figure 1.1 shows the locations of the major KIUC facilities throughout the island. These include fossil fuel-fired generating stations at Port Allen and Līhuʻe, two hydroelectric stations, and twelve electrical substations and switchyards. In addition, it owns and operates over 700 miles of electrical transmission (57/69 kV) and distribution (12.47 kV) lines, several thousand miles of lower voltage lines that deliver the electrical power to individual homes and businesses, and over 3,000 streetlights. In addition to the above, KIUC maintains and operates support facilities including service centers, baseyards, offices, and warehouses.

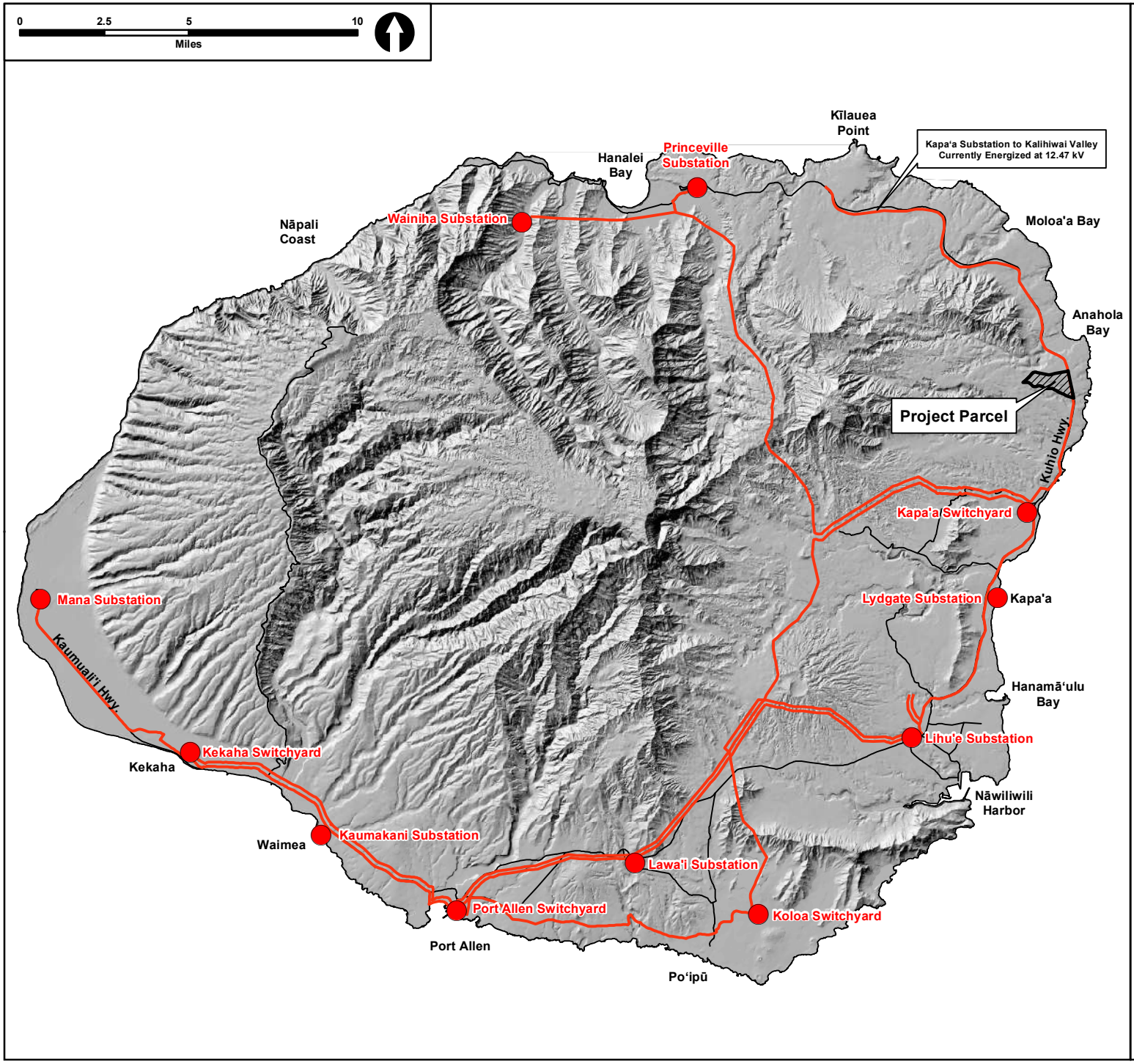
Through its subsidiary, KIUC Renewable Solutions One LLC (KRS One), KIUC is planning to construct, operate, maintain, and decommission as appropriate a 12 megawatt (MW) photovoltaic facility, including a dedicated substation with interconnections to the island-wide electrical grid. The Anahola Solar Project (the proposed Project) is situated approximately one-half mile inland from the shoreline on Kauaʻi's northeastern side, as shown on Figure 1.2. It is expected to produce 23,525 megawatt-hours (MWh) of electricity per year; this is 5.2 percent of KIUC's total electrical generation in 2010. The proposed facilities that collectively make up the proposed Project include:

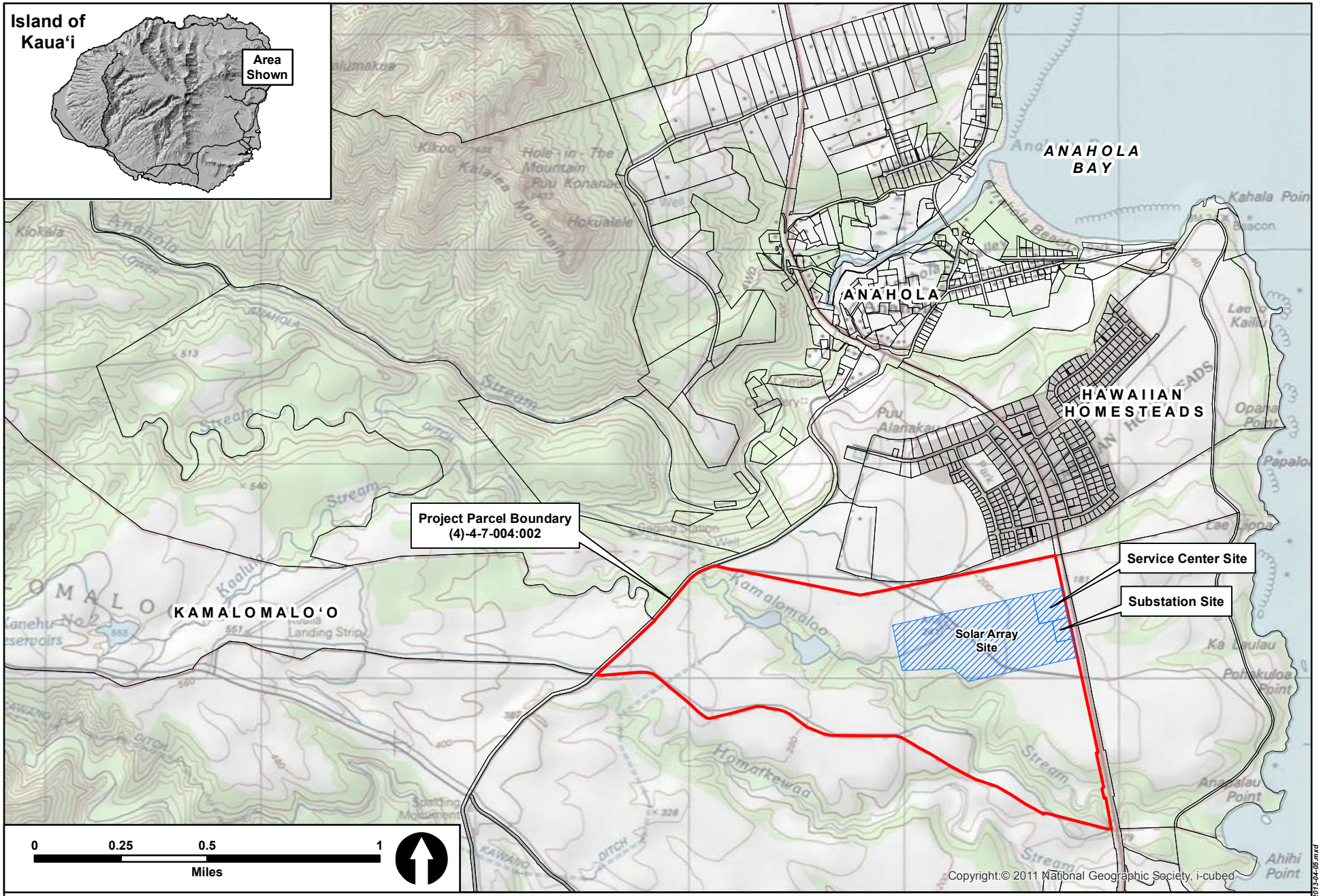
(1) Fifty-three acres of photovoltaic (PV) panels, inverters, and transformers providing up to 12 megawatts of electrical energy to KIUC's electrical grid.

(2) An adjacent two-acre substation, which will be used for control equipment for the solar farm and to raise the boost the power from the 12 kilovolts (kV) delivered by the PV system to the 57/69 kV voltage of KIUC's electrical transmission system. An integral Battery Energy Storage System (BESS) will be constructed within the proposed substation that will provide an electrical buffer between the PV system and KIUC's grid. Short cables linking the substation to the KIUC transmission grid will also be installed.

(3) A five-acre service center with access drive, public and employee parking, pole storage, and 5 truck bays. This project component also involves necessary improvements to Kūhiō Highway, including widening a section of the highway and the addition of an acceleration/deceleration lane to allow customers and service vehicles safe ingress and egress to and from the highway.

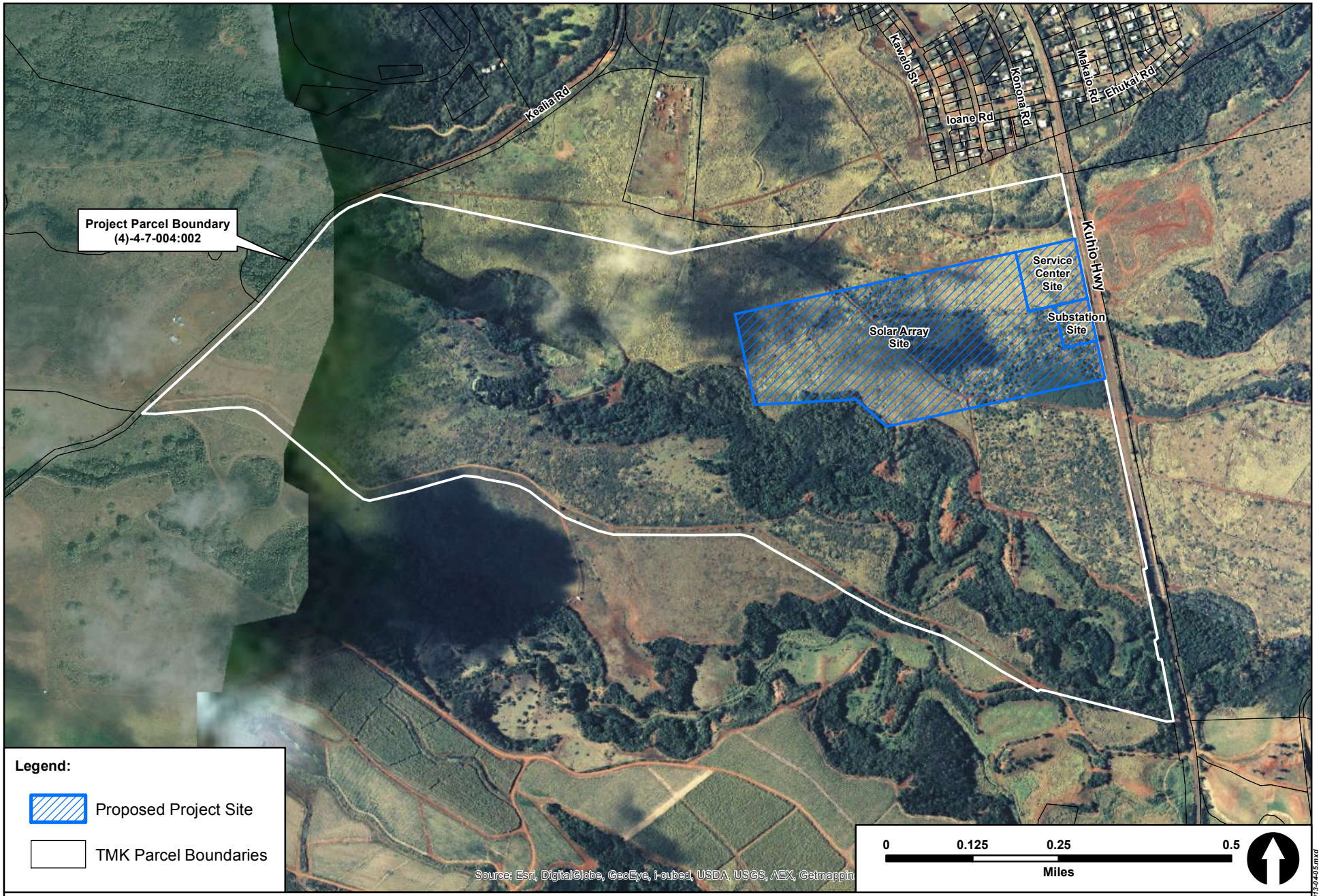
The proposed facilities would occupy approximately 60 acres on the *makai* portion of a large, 422-acre parcel (TMK (4) 4-7-004:002) in Anahola, Kauaʻi, Hawaiʻi (see Figure 1.2 and Figure 1.3). The parcel, which is owned by the Department of Hawaiian Home Lands (DHHL), was formerly used for sugarcane cultivation, but as shown in Figure 1.4, it is currently fallow. DHHL must grant a General Lease for the proposed project; the issuance of the lease constitutes an agency action, thereby making the proposed Project subject to State of Hawaii Administrative Rules, Chapter 343. KIUC intends to seek financing from the U.S. Department of Agriculture (USDA) Rural Utilities Service (RUS) to construct, maintain, and operate the proposed Project, which thereby makes it a federal action subject to review under the National Environmental Policy Act of 1969, the National Historic Preservation Act of 1966 (NHPA), the Endangered Species Act (ESA), and all applicable federal environmental law and regulation.


0
2.5
5
10
Miles
Legend:
KIUC 69 kV Transmission Lines
KIUC Switchyards & Substations
Kīlauea Point
Princeville Substation
Hanalei Bay
Kapa'a Substation to Kalihiwai Valley Currently Energized at 12.47 kV
Wainiha Substation
Nāpali Coast
Moloa'a Bay
Anahola Bay
Project Parcel
Kuhio Hwy.
Kapa'a Switchyard
Mana Substation
Lydgate Substation
Kapa'a
Kaumualiʻi Hwy.
Hanamāʻulu Bay
Kekaha Switchyard
Līhuʻe Substation
Kekaha
Nāwiliwili Harbor
Waimea
Kaumakani Substation
Lawaʻi Substation
Port Allen Switchyard
Koloa Switchyard
Port Allen
Poʻipū
Prepared For:
Kaua`i Island Utility Cooperative
Prepared By:
PLANNING SOLUTIONS
Source:
--Kaua`i Island Utility Cooperative
--State of Hawai`i GIS
Figure 1.1:
Major KIUC Facilities
Anahola Solar Project
Figure 1-1 Major KIUC Facilities 2013-04-18.mxd



Prepared For:	Prepared By:	Source:	Project:	Figure 1.2:
Kaua'i Island Utility Cooperative	PLANNING SOLUTIONS	-State of Hawaii GIS -County of Kauai GIS -ESRI	Anahola Solar Project	**Location Map**

Figure 1-2 Location Map 2013-04-05.mxd



Prepared For:
Kaua'i Island Utility Cooperative

Prepared By:
PLANNING SOLUTIONS

Source:
State of Hawaii GIS
County of Kauai GIS
ESRI

Project:
KIUC Anahola Solar Project

Figure 1.3:
Vicinity Map

Figure 1-3 Vicinity Map 2013-0405.mxd

View south along Kūhiō Highway from the project site entrance.

View north along Kūhiō Highway from the project site entrance.

View west towards location of proposed solar array from interior of project site.

View north across location of proposed solar array from interior of project site.

Prepared For:	Prepared By:	Source:	Project:	Figure 1.4:
KIUC	PLANNING SOLUTIONS	PSI December 29, 2011	KIUC Anahola Solar Project	**Photographs of Existing Conditions on Project Site**

Figure 1-4 Photographs of Existing Conditions 2013-04-05.cdr

This Environmental Assessment (EA) was prepared in accordance with the requirements of both State and Federal environmental impact assessment regulations. The applicable State of Hawai'i requirements are contained in Chapter 343, Hawai'i Revised Statutes and Hawai'i Administrative Rules, Title 11, Chapter 200. The applicable Federal environmental impact requirements are specified in the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. §4321 et seq., the regulations promulgated by the Council on Environmental Quality (CEQ) for implementing NEPA, 40 Code of Federal Regulations (CFR) Parts 1500–1508 and the guidelines contained in , and RUS's Environmental Policies and Procedures, 40 CFR Part 1794. This EA also addresses other laws, regulations, executive orders, and guidelines promulgated to protect and enhance environmental quality including, but not limited to, the Endangered Species Act, the Farmland Protection Policy Act, the Clean Water Act, and executive orders governing floodplain management, protection of wetlands, and environmental justice.

1.2 PROJECT PARTICIPANTS

1.2.1 KRS ONE

KIUC Renewable Solutions One, LLC (KRS One) is a for-profit subsidiary that was created and is wholly owned by KIUC; it was formed in September 2011 by approval by the KIUC board of directors. KRS One's sole purpose is to allow KIUC to access federal and state tax incentives that are available to private third-party photovoltaic developers. KIUC does not qualify for federal or state incentives because of its tax-exempt status as a not-for-profit cooperative. KIUC expects that up to 50 percent of the cost of the solar photovoltaic system will be paid for by the incentives. KRS One will have title only to the PV portion of the undertaking; KIUC itself will own and operate the proposed substation and service center. For the purposes of this document, KIUC and KRS One will be referred to collectively as "KIUC". KIUC intends to combine the tax incentives with funding through the Rural Utilities Service (RUS) to achieve a cost of capital below levels possible for any investor-owned project and below what would otherwise be available to the Cooperative.

1.2.2 RURAL UTILITIES SERVICE (RUS) INVOLVEMENT

KIUC proposes to finance the proposed project by reallocating loan funds from an existing loan commitment with RUS. The RUS Electric Program makes loans and loan guarantees to finance the construction of electric distribution, transmission and generation facilities, including system improvements and replacements required to furnish and import electric service in rural areas, and for demand-side management, energy conservation programs, and on- and off-grid renewable energy systems. The RUS Electric Program makes loans to corporations, states, territories and subdivisions, and agencies such as municipalities, people's utility districts, and cooperative, nonprofit, limited-dividend, or mutual associations that provide retail electric service to rural areas or supply the power needs of distribution borrowers in rural areas.

In order for the projects which it wishes to undertake to qualify for these funds, KIUC must comply with the terms of its loan and with applicable federal regulations. In accordance with 7 CFR Part 1710, borrowers of RUS must prepare a Construction Work Plan (CWP), a Borrower's Environmental Report (BER), and other supporting documents as part of the loan application process. The CWP is a document that details the proposed projects that are required to meet anticipated energy demand growth and improve service reliability and quality for the upcoming 2-4 year period. The BER directs the borrowers to 7 CFR Part 1794 to determine the appropriate level of review of a proposed project.

KIUC's current 2009-2012 Construction Work Plan (CWP) does not include the proposed project. At the time the 2009-2012 CWP was prepared, KIUC did not anticipate that photovoltaic technology would evolve as quickly as it has, and the renewable energy incentives that now exist were not

available. KIUC has submitted an Amendment to its 2009-2012 CWP, which requests the reallocation of funds that will allow for the construction of the proposed Project. The environmental review, in accordance with 7 CFR Part 1794, must be completed prior to the approval of this Amendment. The construction of the proposed project is classified as a proposal normally requiring an EA in accordance with § 1794.23(c).

1.2.3 HAWAIIAN HOMES INVOLVEMENT

In its investigation of suitable sites for renewable energy projects that it believed could benefit its members, KIUC worked with the State of Hawai'i Department of Hawaiian Home Lands (DHHL) and with representatives of the various Homesteader Associations on the island to determine if any of those areas might be suitable for the development of renewable energy projects. As a result of this effort, KIUC developed a close working relationship with the Homestead Community Development Corporation (HCDC), the tax exempt development arm of the homestead associations in the state, including the Anahola Hawaiian Homes Association (AHHA). Founded by the Council for Native Hawaiian Advancement in 2009, HCDC's mission is to develop community and economic facilities and projects important to homestead areas and the Native Hawaiian people.

After holding numerous meetings and consulting with their Board, HCDC reached an agreement with KIUC on the nature of its participation in a joint effort to develop a solar array in Anahola in the fall of 2011. The "Homestead Benefits Agreement", which was signed on April 17, 2012, is intended to serve as a model of collaborative efforts towards development and use of Hawaiian Home Lands for the direct benefit of Hawaiian Beneficiary organizations and the Native Hawaiian community at large. HCDC presented its proposal for use of the Anahola Solar Project site to the Board of the Hawaiian Homes Commission (the nine-member executive board that heads DHHL), which took up the request at its October 2011 meeting. During the meeting, the Hawaiian Homes Commission approved a License from the State of Hawai'i, Department of Hawaiian Home Lands to HCDC and KIUC for the Anahola Solar Facility, under §207 of the Hawaiian Homes Commission Act of 1920. The Commission's approval provided that the license will convert to a General Lease to HCDC upon completion of the required environmental documentation, which would then lease the area to KIUC.

Under the terms of the agreement between HCDC and KIUC, the two are to work collaboratively to develop the Anahola Solar Project, and HCDC is now conducting further community outreach consultation intended to identify a community benefits package to be implemented by KIUC. HCDC will provide input, counsel, and advice in a collaborative relationship with KIUC and KIUC's construction contractors to ensure that the Anahola Solar Facility is constructed and operated in a manner that preserves the cultural, aesthetic, environmental, and practical considerations unique to Hawaiian Home Lands. The agreement between the two organizations contains the following specific provisions:

- *Leadership Partnership.* To assist in this collaborative effort, HCDC and KIUC will form a project advisory committee comprised of members of the homestead community and KIUC leaders to coordinate and share information, studies, and plans, conduct community outreach, and serve as a forum to coordinate Native Hawaiian issues.
- *Predevelopment Costs Reimbursement*. KIUC will reimburse HCDC for the pre-development costs and efforts of HCDC including staffing and volunteer hours, community outreach sessions, beneficiary inquiries and consultation, project due diligence, research, protocol reviews and coordination with KIUC, in a total amount not to exceed $55,000.
- *Joint Development Fee*. KIUC will pay HCDC a $150,000 one-time Joint Development Fee when the Anahola Solar Project enters commercial operation.
- *Stakeholder Participation Payment*. KIUC will pay a Stakeholder Participation Payment in an amount equal to 1% of the value of power generated from the Anahola Solar Facility during the

prior calendar quarter. The "value of power" is set at $200 for each metered megawatt hour ("MWh") of energy generated by the Anahola Solar Facility.

- *Responsibility for Project Costs*. KIUC is responsible for all construction costs, the Environmental Assessment necessary for compliance with the requirements of Hawai'i Revised Statutes (HRS) Chapter 343 and the National Environmental Policy Act for the Anahola Solar Facility Site, and the reasonable legal cost of negotiating and documenting the License and General Lease from DHHL.
- *Project Signage*. KIUC will erect signage at the site denoting the collaborative development and use of Hawaiian Home Lands for the facility.
- *Construction Worker Qualification*. KIUC and HCDC use their best commercially reasonable efforts to conduct outreach and referrals of Anahola homestead residents to be considered for employment by contractors, and to encourage the use of Anahola business vendors for products and services, involved in the construction of the Anahola Solar Facility. They will make similar efforts with respect to employment to perform services including routine maintenance, inspections, troubleshooting, security, site housekeeping, or other services and internships, fellowships, and employment training.
- *School Curriculum Development*. KIUC will provide access to its staff and use its reasonable best efforts to assist HCDC in developing meaningful opportunities for junior and senior high school students to participate in a curriculum on utility operations and renewable energy technologies, including engineering, project design, operations, maintenance, and financing.
- *Information Sharing*. KIUC will assist and share non-proprietary information with HCDC as part of a collaborative effort to build HCDC's knowledge and capacity in aspects of developing, financing, and operating renewable energy generation projects.

1.2.4 REC SOLAR

In order to qualify for the available tax incentives, KIUC needed to commit a portion of the total project cost before the end of 2011. Accordingly, it issued a request for proposals (RFP) to prospective solar suppliers in the fall of 2011 using the standard RUS engineering, procurement and construction contract documents. On October 3, 2011, KIUC issued an RFP to over 20 bidders for an Engineering, Procurement and Construction (EPC) contract for a minimum 10 MW (AC) solar array. The RFP asked for bids that would:

- Maximize solar generation on the 50-acre Anahola site, noting that KIUC anticipated a minimum of 10 MW and a maximum of 14 MW depending on project layout and panel selection.
- Have an expected design life and performance warranty of 25 years.
- Provide an anticipated minimum output of 18,500 megawatt-hours (MWh) in the first year.

KIUC received nine bids by the October 17, 2011 submission deadline. KIUC evaluated all of the proposals that were submitted in response to the RFP using the evaluation factors listed in Table 1.1. After evaluating all of the proposals, KIUC contracted with REC Solar for the construction of the proposed solar array. REC Solar's participation in the project is limited to construction of the solar array; KIUC is responsible for operating the solar array once it is completed and for both construction and operation of the substation and service center.

Table 1.1 Factors Used to Evaluate Proposals

Bidder's ability to comply with all Scope of Work and Contract requirements.
Capacity and energy output profiles of the proposed project.
Availability and reliability of the power and energy output.
Environmental impacts of the proposed project.[1]
Contractor and equipment warranties have acceptable warranty periods, terms, and provisions.
The proposed project schedule meets all requirements, including the timing for completion of construction, testing, and completion of the project.
Total delivered cost of power.
Life of project cost evaluation.
Expected losses of power and energy output of the project over time.
Expected operations and maintenance costs and direct assignment facilities costs.
Rate impacts, if any.
Cost of compliance with all applicable state and federal laws, rules, and requirements.
The legal, engineering, and other costs required to implement the proposed project.
Overall project viability.
RUS compliance and approvals.
Ability to comply with all requirements/or timely obtaining Treasury grant/funding, applicable federal and state tax credits, and other incentives.
The overall responsiveness and timeliness of the Bidder's proposal.
The demonstrated responsibility of the Bidder - including the financial viability of Bidder and any parent or guarantor of services.
Price.
Inverter design (for example multiple smaller inverters instead of fewer larger inverters), programming.
Flexibility and ability to integrate with utility SCADA system.
Robustness of design and equipment (for example using stainless steel inverter enclosures instead of mild steel, galvanized racks instead of uncoated steel. etc.).
12kV electrical equipment and protection scheme.
Contractor experience in delivering successful projects of similar scope.
Source: KIUC (2011)

[1] With respect to environmental protection, bidders were required to confirm that that they would perform the work in compliance with all applicable Federal, State, and local Environmental Laws. For purposes of this Agreement, the term "Environmental Laws" was defined as meaning all Federal, state, and local laws including statutes, regulations, ordinances, codes, rules, and other governmental restriction and requirements relating to the environment or solid waste, hazardous substances, hazardous waste, toxic or hazardous material, pollutants or contaminants including, but not limited to the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §§ 9601, et seq., the Federal Water Pollution Control Act, as amended, 33 U.S.C. §§ 1251, et seq., and the Solid Waste Disposal Act, as amended, 42 U.S.C. §§ 6901, et seq.

1.3 REGULATORY PROVISIONS GOVERNING THE EA

This Environmental Assessment (EA) was prepared in accordance with the requirements of both State and Federal environmental impact assessment regulations. The applicable Federal environmental impact requirements are specified in the National Environmental Policy Act (NEPA) and its implementing regulations 40 Code of Federal Regulations (CFR) Parts (§§)1500–1508 and the guidelines contained in 42 U.S.C. §4321 et seq. and CFR Part 1794. The applicable State of Hawai'i requirements are contained in Chapter 343, Hawai'i Revised Statutes and Hawai'i Administrative Rues, Title 11, Chapter 200.

NEPA Compliance. In accordance with the National Environmental Policy Act (NEPA) and other applicable environmental statutes, regulations, and Executive Orders, RUS is required to integrate and consider the potential environmental effects that its actions (in this case providing federal financial assistance to KIUC) may have on the human environment prior to taking that action. It accomplishes this by evaluating the environmental consequences of applicant proposals to ensure that environmental values are given appropriate consideration in agency decision-making along with economic and technical factors within the agency's mission.

This document has been prepared in consultation with other government agencies, private organizations, and the public. If, after circulating the document for public and agency comment, RUS finds that the proposed project will not have a significant effect on the quality of the human environment, it will prepare a Finding of No Significant Impact (FONSI). Notification of the EA and FONSI will be published in the Federal Register and in newspapers with circulation in the proposal's area. If substantive comments are received on the EA, RUS may provide an additional period (15 days) for public review following the publication of its FONSI. If at any point in the preparation of an EA RUS determines that the proposal will have a significant effect on the quality of the human environment, it will initiate preparation of an Environmental Impact Statement.

Chapter 343 Compliance. As indicated above, the Hawaiian Homes Commission's approval of the license to HCDC provided that the license will convert to a General Lease to HCDC upon completion of the required environmental documentation. In this case, that documentation consists of an Environmental Assessment prepared in accordance with Chapter 343, HRS. For the purpose of compliance with that law and the implementing regulations (HAR 11-200), the issuance of the lease constitutes an "agency action" and the Department of Hawaiian Home Lands is the "approving Agency".

2. DESCRIPTION OF THE PROPOSED PROJECT

The locations within the overall parcel of the photovoltaic solar array, substation, and service center that collectively make up the proposed project are depicted in Figure 2.1. This chapter provides detailed information about the design of the proposed facilities, the construction materials, the procedures that would be used, the estimated costs, and the projected timeline.

2.1 SOLAR ARRAY

2.1.1 SOLAR ARRAY: DESCRIPTION

KIUC is proposing to construct a 53-acre photovoltaic solar array for electrical power generation. The array will consist of 59,000 ground-mounted photovoltaic modules installed on ~11,000 foundation piles. The construction would be phased as shown on Figure 2.2.

As shown in the elevation views and photographs in Figure 2.3, the modules (each of which is approximately 5.5 feet long by 3.25 feet wide) would be mounted in groups of four on galvanized steel cross-members supported by rows of steel piles. The lower end of each group of four modules would be a minimum of 2 feet above grade while the upper end would be approximately 9 feet above ground. Sufficient space (minimum of 6.5 feet) will be provided between the rows to allow ready access for maintenance work. Figure 2.4 provides the individual module specifications. The electrical cables that connect the individual photovoltaic modules to the larger electrical system will be located in buried PVC conduits designed for low-voltage underground DC and AC power runs.

The modules will be connected in twelve 1-MW (ac) groupings using inverters, transformers, pull boxes, interconnections, and other equipment situated with small compounds situated at the corner of the grouping that is closest to the substation. Connections will be via conductors in buried conduits.

2.1.2 SOLAR ARRAY: CONSTRUCTION ACTIVITIES

Construction activities will require the services of managers, heavy equipment operators, licensed journeyman electricians, and laborers working on-site. It will include the use of heavy, combustion-engine powered equipment including heavy and light utility vehicles, pick-up trucks, pile drivers, all-terrain forklifts, and excavators (see Table 2.1). Construction activities for the solar array and support facilities are described below.

Initial Site Preparation. REC Solar will begin by installing a 6-foot high chain-link security fence around the portion of the Service Center site that it will use as a construction baseyard and laydown area and around at least the lowermost portion of the area dedicated to the solar array and support facilities at the beginning of construction. REC Solar will build the construction access road leading from Kūhiō Highway at this time as well. It will erect security fencing around the remainder of the solar array area as soon as construction of site access roads makes it practical.

Figure 2.1. Overall Layout of Project Elements.

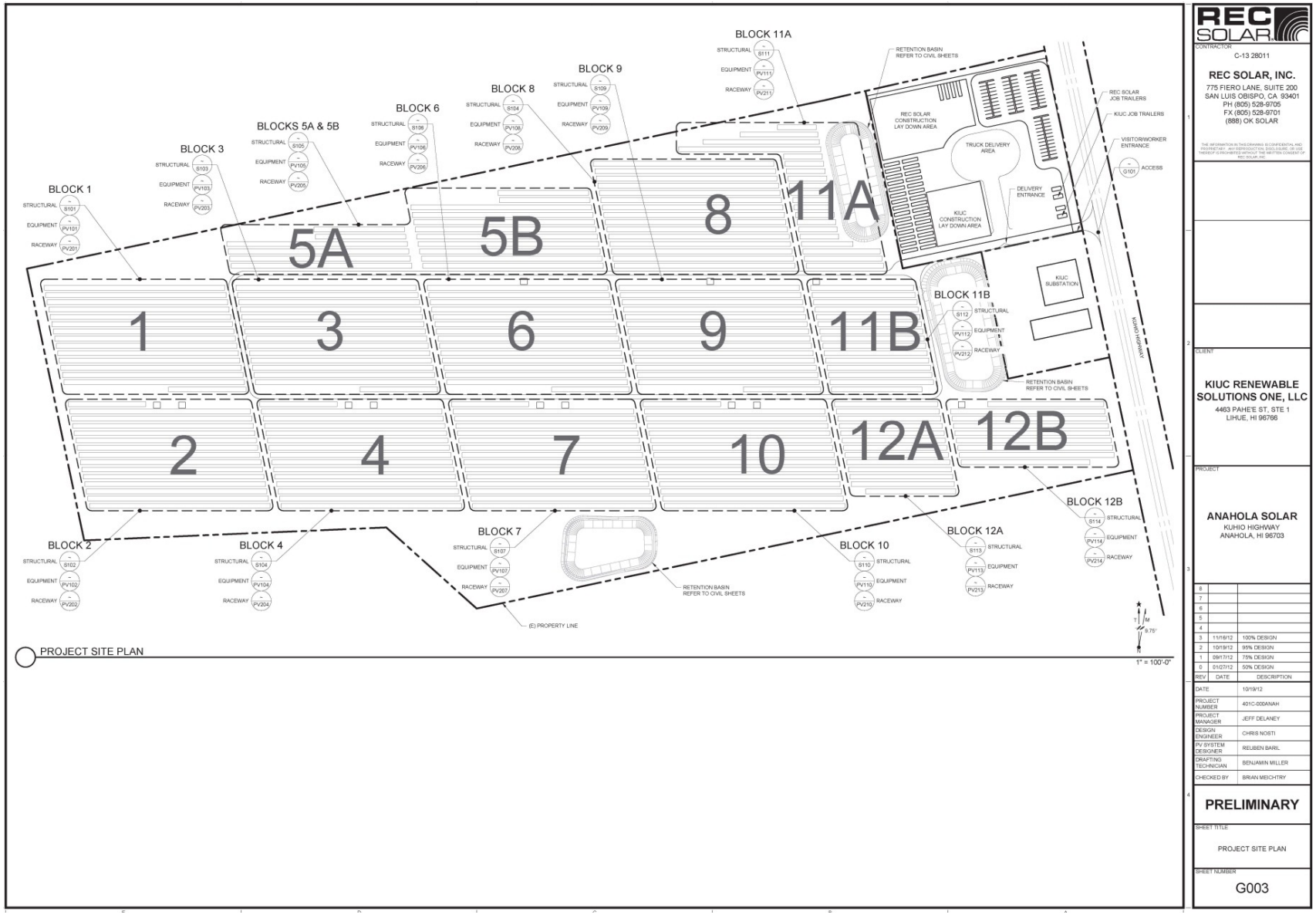


Figure 2.2. Phasing Plan for REC Solar Array

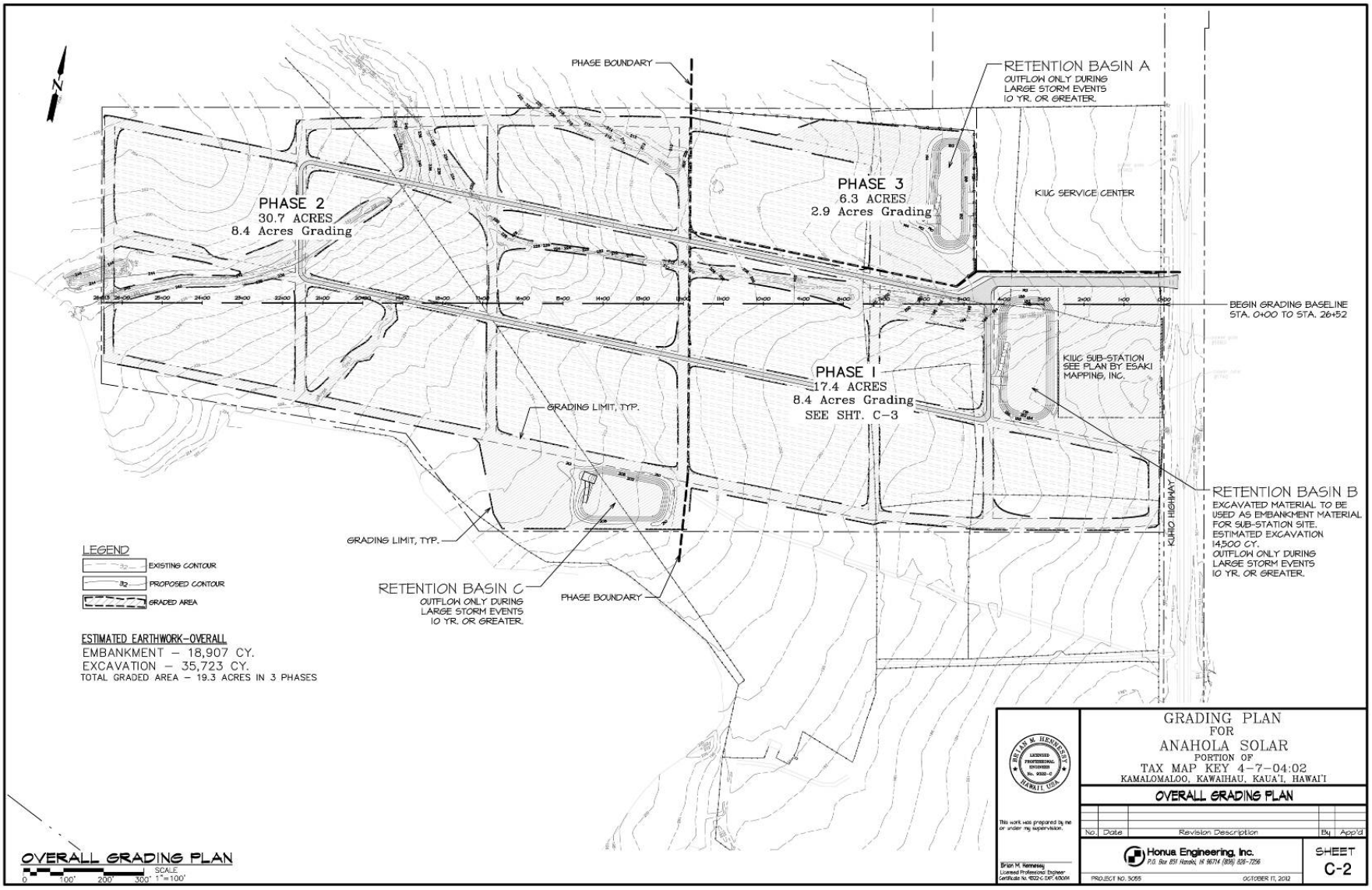
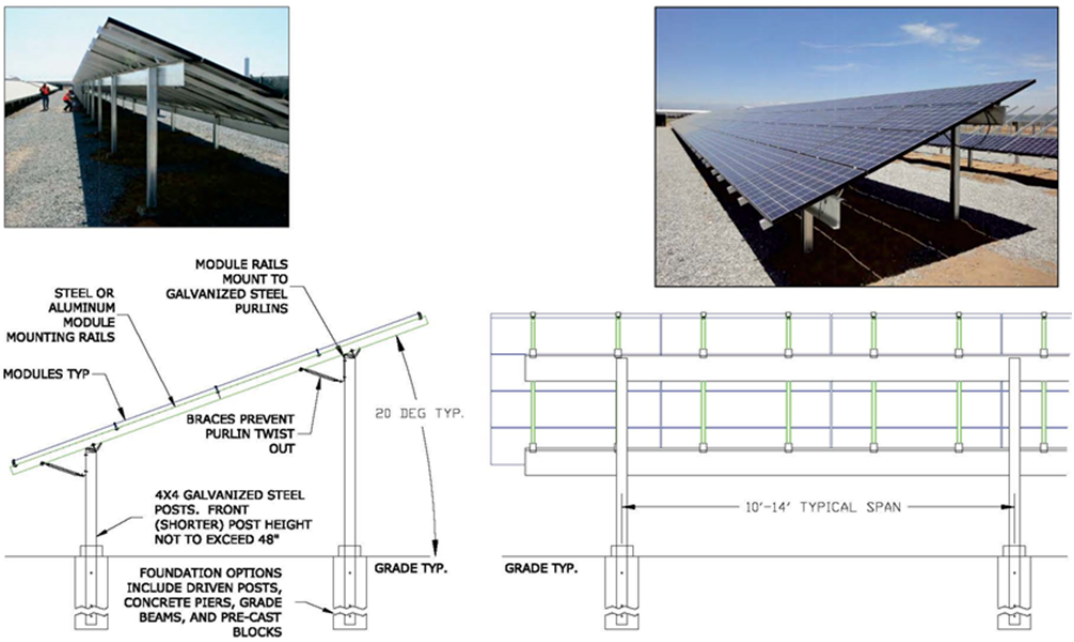


Figure 2.3 Typical Solar Array



Source: REC Solar

Figure 2.4. Individual Module Specifications

ELECTRICAL DATA @ STC	REC225PE	REC230PE	REC235PE	REC240PE	REC245PE	REC250PE
Nominal Power - P_{MPP} (Wp)	225	230	235	240	245	250
Watt Class Sorting - (W)	0/+5	0/+5	0/+5	0/+5	0/+5	0/+5
Nominal Power Voltage - V_{MPP} (V)	28.9	29.2	29.6	29.9	30.2	30.5
Nominal Power Current - I_{MPP} (A)	7.79	7.88	7.96	8.04	8.12	8.20
Open Circuit Voltage - V_{OC} (V)	36.2	36.5	36.7	37.0	37.2	37.5
Short Circuit Current - I_{SC} (A)	8.34	8.43	8.51	8.60	8.68	8.76
Module Efficiency (%)	13.6	13.9	14.2	14.5	14.8	15.1

Values at standard test conditions STC (airmass AM 1.5, irradiance 1000 W/m², cell temperature 25°C).
At low irradiance of 200 W/m² (AM 1.5 and cell temperature 25°C) at least 97% of the STC module efficiency will be achieved.

GENERAL DATA	
Cell Type	60 REC PE multi-crystalline cells 3 strings of 20 cells - 4 by-pass diodes
Glass	3.2 mm solar glass with anti-reflection surface treatment by Sunarc Technology
Back Sheet	Double layer highly resistant polyester
Frame	Anodized aluminium
Junction box	IP67
Cable	4mm² solar cable, 0.90m +1.20m
Connectors	Hosiden 4mm² (HSC 2009/2010) MC4 connectable

ELECTRICAL DATA @ NOCT	REC225PE	REC230PE	REC235PE	REC240PE	REC245PE	REC250PE
Nominal Power - P_{MPP} (Wp)	167	170	173	176	179	182
Nominal Power Voltage - V_{MPP} (V)	26.6	26.8	27.1	27.3	27.6	27.9
Nominal Power Current - I_{MPP} (A)	6.27	6.33	6.39	6.45	6.51	6.56
Open Circuit Voltage - V_{OC} (V)	33.4	33.6	33.8	34.1	34.3	34.5
Short Circuit Current - I_{SC} (A)	6.79	6.85	6.90	6.96	7.01	7.06

Nominal cell operating temperature NOCT (800 W/m², AM 1.5, windspeed 1 m/s, ambient temperature 20°C).

MAXIMUM RATINGS	
Operational Temperature	-40 ... +80°C
Maximum System Voltage	1000V
Maximum Snow Load	550 kg/m² (5400 Pa)
Maximum Wind Load	244 kg/m² (2400 Pa)
Maximum Series Fuse Rating	25A
Maximum Reverse Current	25A

Source: REC Solar

Table 2.1. List of On-Site Construction Equipment for Solar Arrays and Related Facilities

Description	*Quantity*
Vibratory Pile Driver	3
All-Terrain High Reach Fork Lift	3
Flat Bed Truck	3
All-Terrain People Mover with bed	4
Skid Steer	2
Field Generator	4
Crane	1
Water Truck	2
Dozer	1
Backhoe	2
Front End Loader	1
Excavator	2
Earth Compactor	1
Tractor with Mower Attachment	1
Dump Truck	1
Scraper (similar to CAT 657)	1
Grader (similar to John Deer 570)	1
Source REC Solar Transmittal #026 to KIUC dated November 8, 2012.	

Grubbing and Grading. The construction of the 53-acre solar array will begin with an incremental grubbing process. This process consists of dividing the site into 3 units, which will be sequentially grubbed and graded. Once an increment has been grubbed, it will be graded according to an approved grading plan using heavy diesel-powered equipment such as bulldozers, backhoes, graders, and scrapers brought to the project site via tractor trailer. This equipment will be transported to the site as needed and kept there for as long as they are needed; the equipment will be fueled by lube truck or temporary on-site fuel tank. The storage, maintenance, and fueling of these pieces of equipment will be in compliance with all applicable NPDES regulations and best management practices (BMPs).

As previously noted, construction of the solar array portion of the project will be carried out in three phases.

- *Phase 1*. The first phase will involve about 8.4 acres of grading on 17.4 acre portion of the site on the southeast corner of the project. The majority of the grading for this phase will be to create a pad for the KIUC sub-station site and the excavation of the first of three storm water retention basins (Retention Basin B) on the site. In addition, it will grade and install the following items within the phase limits: (*i*) the primary construction access road to Kūhiō Highway, (*ii*) the interior access drives for the array blocks, and (*iii*) the swales to direct runoff to the retention basin. This work will erase all traces of the abandoned irrigation ditches. Upon completion of the grading operations the disturbed areas will be hydro-seeded with mixture of rye grass for short term erosion protection and Bermuda grass for long term protection. All vegetation removed from the graded areas will be shredded on-site and used as mulch on the non-graded areas to provide weed control and minimize dust from the installation of the array blocks.

- *Phase 2*. Once the Phase 1 portion is stabilized, REC Solar will extend the access roads further inland and grade 8.4 acres of the 30.7 acre Phase 2 area in accordance with the pattern established in Phase 1. It will excavate Retention Basin C together with the swales and other grading needed to channel runoff into it. Site restoration will be the same as outlined for Phase 1.
- *Phase 3*. Finally, the same sequence that was used for the first two phases will be repeated in Phase 3. Phase 3, in the area above where the service center is to be constructed, consists of 6.3 acres, 2.9 acres of which will be graded, and includes the final basin, Retention Basin A.

Construction of Access Road and Internal Roads. As discussed in more detail in Section 2.3, the permanent main access road will not be in place when the solar array and substation are constructed. Consequently, the contractor will begin work by constructing a temporary construction access road. This temporary access road will start at a simple T-intersection at Kūhiō Highway that is centered on the permanent main access road. It will proceed uphill from that point before branching right into the service center site and left into the substation site. The stabilized construction entrance will consist of coarse aggregate and will drain to an adjacent retention pit. It will be approximately 30 feet wide and extend at least 50 feet from the edge of the pavement on Kūhiō Highway.

Once grubbing and mass-grading has occurred, the contractor will construct a main site access road extending *mauka* from Kūhiō Highway. Additional connector roads will be constructed as depicted in the conceptual site plan; these will include a 25-foot clearance around the perimeter of the solar farm to act as a maintenance buffer between the arrays and the new fence line. All roadways will be a minimum of 10 feet in width, with 4-foot grassed shoulders for the internal access roads inside the photovoltaic array. The access road from Kūhiō Highway to the entrance to the Service Center and substation will eventually be paved, while the secondary interior roads will be constructed of an all-weather material of gravel, recycled concrete or base rock.

Construction of Photovoltaic System and Mounts. The contractor will use a small pile-driver to install the galvanized steel posts which support the photovoltaic modules (see Figure 2.5(b) for illustration). The most likely installation device is a Pauselli 900 track-mounted pile-driver, an impact-style machine.[2] Once the piles are in place, galvanized metal pipe and rail frames will be bolted onto the array racking frames. Finally, the photovoltaic modules themselves will be affixed to the array racking frames.

Installation of Conduits and Wiring. The contractor will excavate two-foot (minimum) deep rectangular trenches in which it will place the conduits that will carry the electrical cables interconnecting the individual photovoltaic modules to the larger electrical system. The excavated soil will then be backfilled into the trench and the soil tamped back to the appropriate level of compaction, per code. All feeder wires installed in underground trenches will be placed within these PVC conduits. The excavation work for the conduits and wiring will be conducted with wheel- or track-mounted excavators followed by appropriate compaction equipment.

Electrical Equipment. In order to convert the DC power generated by the photovoltaic modules into AC power consistent with KIUC's electrical transmission system, the array will require the installation of inverters and transformers. For the inverters, Advanced Energy 500 kW Utility Interactive Inverters will be used. Each unit is capable of converting 500,000 watts of DC power into 3-phase, 60 Hz AC power. In total, 24 500 kW inverter units will be installed as part of the construction process, above ground on small concrete pads and metal skids. As noted above, the photovoltaic modules will be installed in 12 blocks, with two inverters per photovoltaic block. In addition to the inverters, 12 transformers will be installed, mounted on small concrete pads or metal

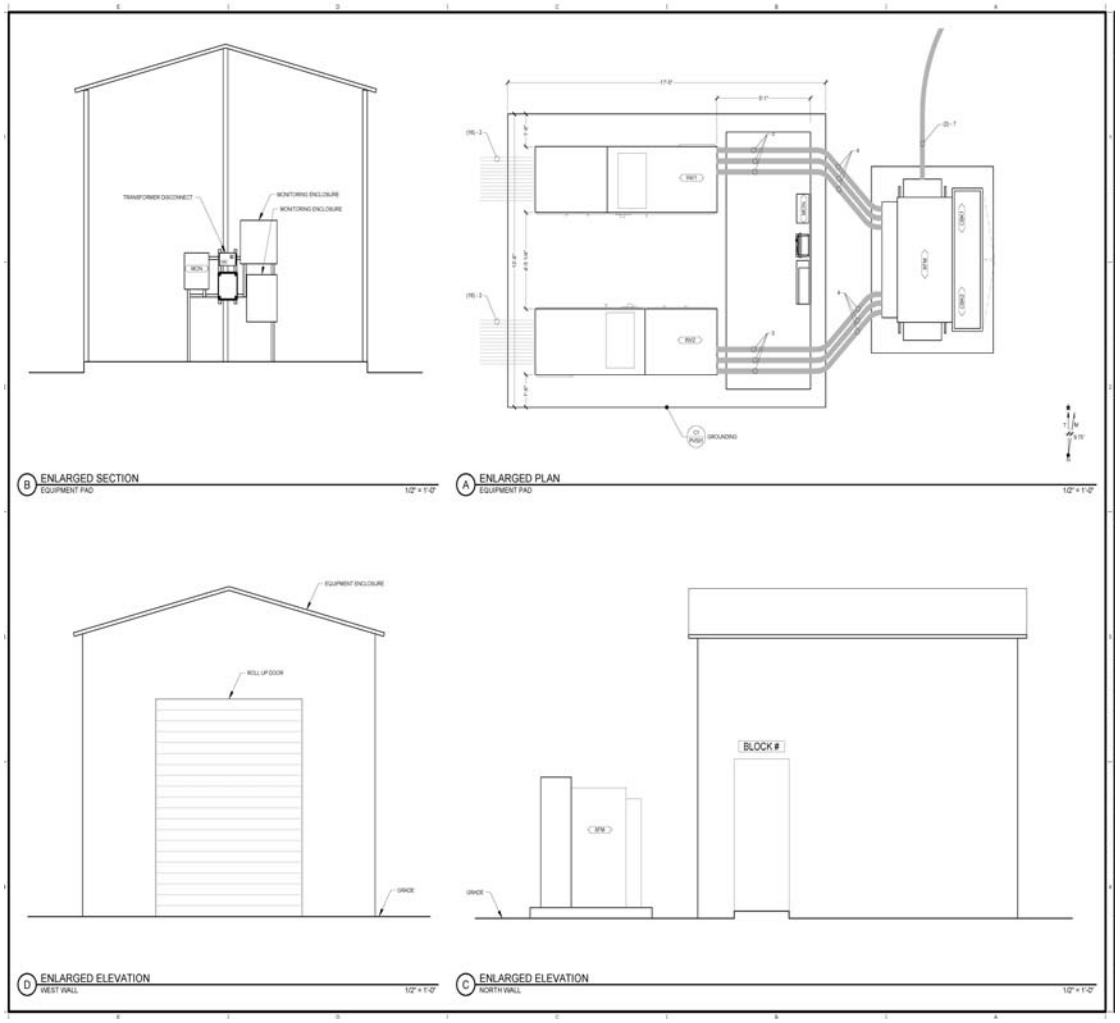
[2] This unit is powered by an air-oil-cooled, 64 horsepower/4-cylinder diesel engine. The INDECO 900 hydraulic-actuated hammer weighs ~1,200 pounds and produces impact energy of 1,060 joules. It can strike several hundred times per minute, although it typically operates below maximum speed. Maximum noise from the engine is 85 dBA.

skids. These transformers will step up the voltage of the solar array's electrical output; they are mineral-oil filled and housed in a green (or similar earth-tone) enclosure. Figure 2.6 contains conceptual plans (layout and elevations) for a typical equipment pad.

Figure 2.5 Illustration of Solar Array Construction Process

Description	*Illustrative Photograph*
 *(a) Erosion control measures have been set up, grubbing and grading is complete.*	 *(b) The pile driver drives the ground mount piles into the earth.*
 *(c) The horizontal mount structures are installed on their vertical foundations.*	 *(d) The photovoltaic modules are mounted on the horizontal rails.*
 *(e) Trenches are dug from the photovoltaic arrays to the inverter equipment pad location and conduits are laid.*	 *(f) The inverter and transformer pads are laid out, and the concrete foundation is poured and leveled.*
 *(g) The inverters, transformers, and other electrical equipment is placed on the pads.*	 *(h)The array is connected to the electrical grid and construction is complete.*
Note: These photographs are intended to illustrate major steps in the construction process and do not show every phase of the construction process.	
Source: All photos by REC Solar (2012) except for (b), retrieved from the web at: http://www.groundworkgroupltd.com/productdetails. php?prod=41&cat=48&par=45	

Figure 2.6 Conceptual Layout of Equipment on Each Equipment Pad



Source: REC Solar, Sheet PV401, 10/19/12, 95% design drawings.

Vegetation Management. Once graded, all disturbed slopes and bare land will be hydro-seeded with a grass seed mix as part of a comprehensive Vegetation Management Plan (VMP) designed in accordance with low-impact principles of site development.[3] This plan will be developed by the contractor's licensed horticultural staff and will emphasize non-invasive grass species, and be implemented in a manner that would discourage the incursion of noxious and invasive species during the construction and re-vegetation of the site. This plan will cover ongoing and long-term vegetation management practices, including invasive species countermeasures. A combination of mulch and a weed barrier fabric will be used under the solar arrays to control the growth of vegetation. In addition, once the grass is established, pre-emergent will be applied to areas directly underneath the solar arrays, so that the base of the array mount is free of low-lying grass and weeds. The area between the array rows will be planted with low vegetation, a combination of rye grass during the grow-in period and Bermuda grass for long-term soil stabilization with a maximum, mature height of

[3] In general, a Low Impact Development (LID) approach to site development works with existing topography and natural drainage patters, simultaneously addressing erosion, dust, and weed control.

10 to 12 inches. This vegetation will capture water and allow natural drainage to occur during and after the construction process.

2.1.3 SOLAR ARRAY: OPERATION AND MAINTENANCE

Photovoltaic Panel Cleaning. Typical maintenance of the photovoltaic modules themselves involves washing the surfaces with water containing no additive cleaners or chemicals as often as conditions require. KIUC work crews will obtain demineralized water from the Kapaia Generating Station's boiler feedwater and truck it to the solar array. They will clean dust and dirt which may accumulate on the module surfaces using a pressure nozzle. The frequency of washing will depend on the level and frequency of rainfall on the project site. This wash water would drain off and into the ground.

Electrical Equipment Maintenance. In addition to the above activities, periodic maintenance would include replacing air filters within the inverters when needed, testing connections with thermal imaging cameras and addressing any issues discovered, and sampling the mineral oil within the transformers. Once the solar array has been constructed, KIUC personnel will use the drive aisles to service and maintain the new equipment.

Vegetation Maintenance. Vegetation will be maintained and controlled throughout the life of the solar array. This maintenance program will consist of a combination of hand cutting, mowing using mechanized equipment, string trimming, and where required, application of localized herbicide. In addition, the site will require periodic reapplication of weed barrier fabric or sufficient mulch to maintain a 4-inch thick layer underneath panel arrays as a deterrent to vegetation growth. The complete Vegetation Management Plan is reproduced in Appendix C of this document.

2.1.4 SOLAR ARRAY: DECOMMISSIONING

The performance of the solar panels is guaranteed for a period of 25 years. It is likely that they will continue to perform adequately for a much longer period of time. Nonetheless, there will come a time when at least the panels will need to be replaced and eventually the system would be decommissioned and the site returned to its previous (or another not yet determined) use. Decommissioning the kind of photovoltaic system that KIUC has proposed is not something that has yet been done on any large scale. However, sufficient information is available to outline the activities that will have to be undertaken and the procedures most likely to be followed.[4]

The following facilities would be removed: (*i*) photovoltaic modules, panels and wiring; (*ii*) racking systems and support structures; (*iii*) inverters, transformers and generators; (*iv*) concrete foundations and underground infrastructure; (*v*) transformer and overhead/trenched electrical network; (*vi*) electrical poles; and (*vii*) safety fences.

In accomplishing this, KIUC would observe the following dismantling, demolishing, and disposal procedures for the above-ground structures:

- KIUC would disconnect the solar array system from the substation by first turning off the breaker switches and then severing the electrical cables.
- It would then disconnect the individual photovoltaic modules from the site electrical network and remove them from the support racks; it would re-use, recycle, or safely dispose of them offsite in accordance with applicable laws and regulations.

[4] Most of the materials in a solar power project are reusable or recyclable, and some equipment may have manufacturer take-back and/or recycling requirements. To the extent that these exist and are still in force, KIUC would avail itself of all of the opportunities that they present.

- KIUC would disconnect and remove the inverter and transformers; once this is done it would either send the components back to the manufacturer, re-use them, recycle them, or safely dispose of them offsite.
- KIUC would remove and demolish the transformer(s) and other electrical equipment in accordance with then-current standards and best practices.
- It would cut the ends of underground electrical lines, retrieve as much of the material as possible to reuse or recycle, and bury to the remaining conduits to approximately two feet below grade, leaving them in place.
- KIUC would remove underground infrastructure and protective electrical structures such as concrete electrical shelters and concrete pad foundations for inverters and transformers and backfill the area around them as necessary. Waste concrete would be recycled offsite by a concrete recycler.

KIUC will comply with all applicable regulatory requirements during the decommissioning of the solar array, including those which govern the handling and disposal of the disassembled components, some of which may require disposal according to toxic waste regulations (e.g., Resource and Conservation Recovery Act) unless they can be recycled.[5] KIUC intends that its decommissioning procedures will return the site to a state suitable for agricultural use.[6]

2.2 ANAHOLA SUBSTATION

KIUC is proposing to construct a new substation that would allow the Anahola photovoltaic system to feed power into the electrical grid by connecting it to the existing electrical power lines along Kūhiō Highway.[7] As depicted on Figure 1.3, the substation would be constructed on an approximately 2-acre portion of the land that DHHL has committed to KIUC. Access to the substation would be via Kūhiō Highway and the same new access road serving the solar array and the Anahola Service Center.

2.2.1 ANAHOLA SUBSTATION: PROPOSED FACILITIES

As illustrated on the conceptual site plan reproduced in Figure 2.7, the proposed substation would have several different types of equipment. These include switchgear, standard oil-filled ANSI/IEEE[8] transformers, voltage regulators, capacitors, and other electrical components. The transformers' purpose is to step the voltage up from the 12.47 kV voltage delivered from the solar array to the 69 kV voltage that is the standard for KIUC's island-wide transmission system. Each transformer would service two 12.47 kV circuits.

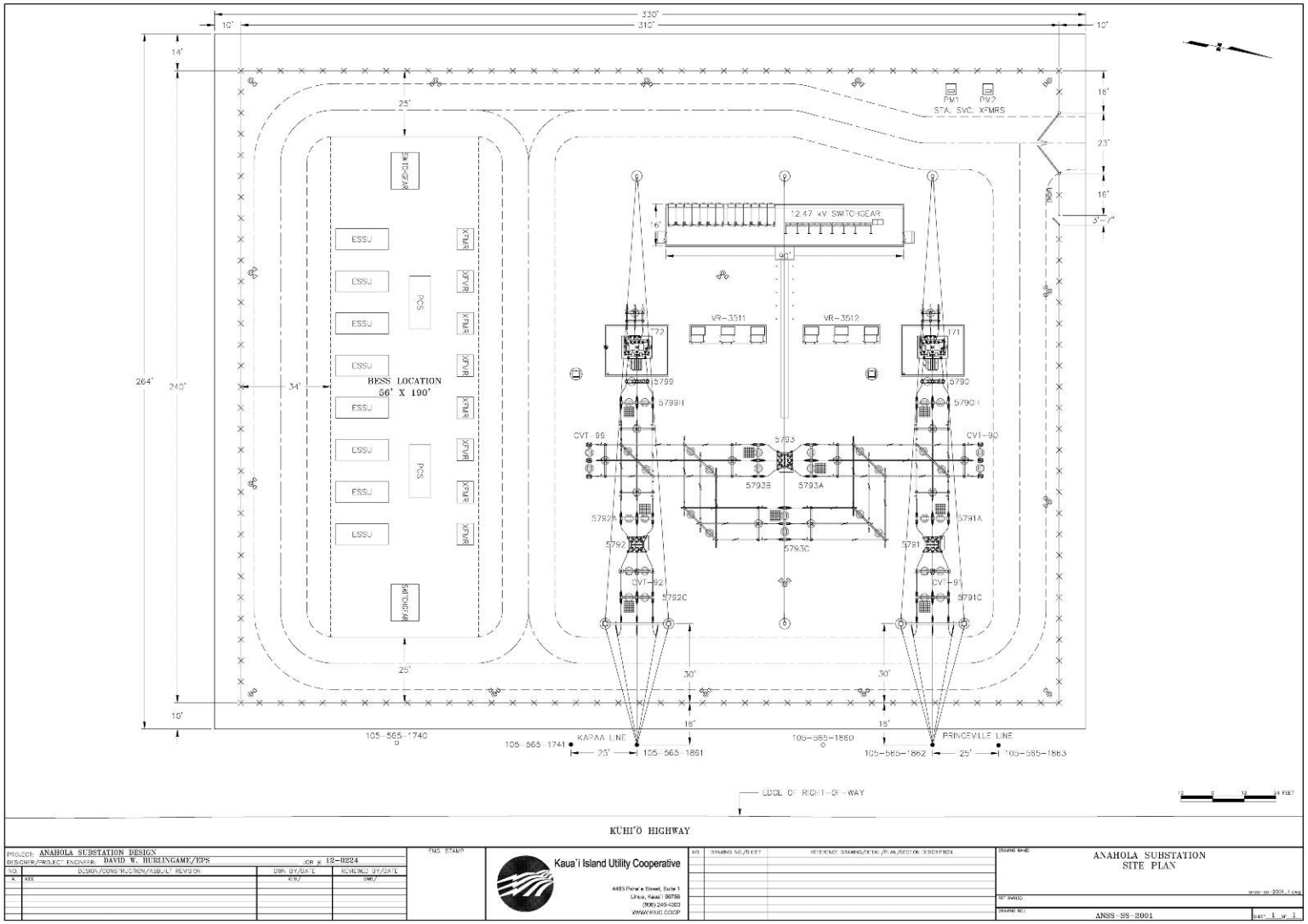
[5] The Resource and Conservation Recovery Act constitutes the primary set of rules governing wastes containing Cd, Se, Pb, Cu or Ag provided that these wastes are considered to be discarded material and are not included in any specific exclusions.

[6] KIUC believes that the agricultural capability/suitability of the great majority of the site will be as good as or better than its original state. This is because while a few areas where large chunks of concrete foundation remain may be more difficult to cultivate than was formally the case, this would be partially or wholly offset by the economic benefit to farming provided by the improved interior roadway system that would remain.

[7] Most of the power would be fed into the 69kV circuit, but some may also be routed directly into the 12.47 kV distribution circuit (composed of four wires) that is mounted on the same existing utility poles.

[8] American National Standards Institute (ANSI) is a private non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States. Institute of Electrical and Electronics Engineers (IEEE) is a non-profit professional association which propagates standards for the electrical and electronics industries.

Figure 2.7 Plan View of Proposed Substation



While the principal purpose of the substation would be to serve the solar array, it would have the added benefit of allowing the 69 kV-capable circuit that now passes the site to be energized at 69 kV rather than the 12.47 kV to which it is now limited.[9] That would lessen the energy losses that KIUC incurs in providing power to the area and decrease the probability of customers situated from Anahola to Haʻena experiencing electrical power outages when there are problems with KIUC's 69 kV cross-island power line.

The substation would be connected to the existing wood pole 69 kV circuit crossing in front (East) of the substation via an in/out loop consisting of 559.5 size AAAC conductors[10]. KIUC will also construct two underground 12.47 kV circuits from the substation to risers installed on the existing (or relocated) poles in front of the substation. Finally, the substation control equipment will be connected to KIUC's existing overhead fiber-optic communications system that is mounted on the same poles as the existing overhead transmission line.

The conceptual plan for the substation provides a 16-foot by 90-foot by 12-foot pre-manufactured control building. This small structure would house the relaying and protective controls, station control batteries, communications equipment and other necessary monitoring and control equipment, tools, and maintenance supplies. An approximately 45' high A-frame supporting the interconnection wires would link the proposed substation with the existing transmission line on the *mauka* side of the Kūhiō Highway right-of-way. It would be the tallest structure in the substation and would be topped with a lightning protection wire. Other structures within the substation would be lower, with none of them exceeding a height of 25' above grade.

KIUC will install landscaping along the Kūhiō Highway and Anahola Service Center sides of the facility (i.e., on its eastern and northern sides). Figure 2.8 and Figure 2.9 show conceptual landscape plan for the Service Center, Substation, and solar array frontage south of the substation. Plants used for landscaping will be selected for minimal irrigation and fertilization requirements when grown. No potable water or sanitary wastewater treatment facilities will be constructed. (Note: The landscaping extends southward from the substation just *mauka* of the highway right-of-way to block views of the solar panels that will be installed in that area.)

In addition to the normal electrical substation equipment, the proposed Anahola Substation also contains space for a Battery Energy Storage System (BESS). Incorporating a BESS system into the solar array/substation complex will allow KIUC to smooth the power output by providing real and reactive power, compensating for sudden output fluctuations in a matter of milliseconds.[11] The amount of power from an intermittent generation source such as solar that can be tied into the KIUC grid without sacrificing reliability is limited by three factors: (*i*) the availability of spinning reserve of online generating units; (*ii*) the speed with which additional firm power units can be started and brought online; and (*iii*) the capacity of online power-storage devices.[12] KIUC's existing base load (Kapaia Generating Station at 26.4 MW) and cyclic generating units (Port Allen Generating Station at 30.6 MW) can operate at 65 percent load without making significant compromises in operational

[9] KIUC is in the process of switching over from the 57.1 kV standard to which the system was originally constructed to the 69 kV that is its present design standard. Once KIUC replaces the few remaining pieces of 57.1 kV-rated equipment with equipment that meets its present standard it will energize the transmission grid at 69 kV. While it must continue to energize its transmission system at 57.1 kV until the conversion is complete, this report will use the term 69 kV.

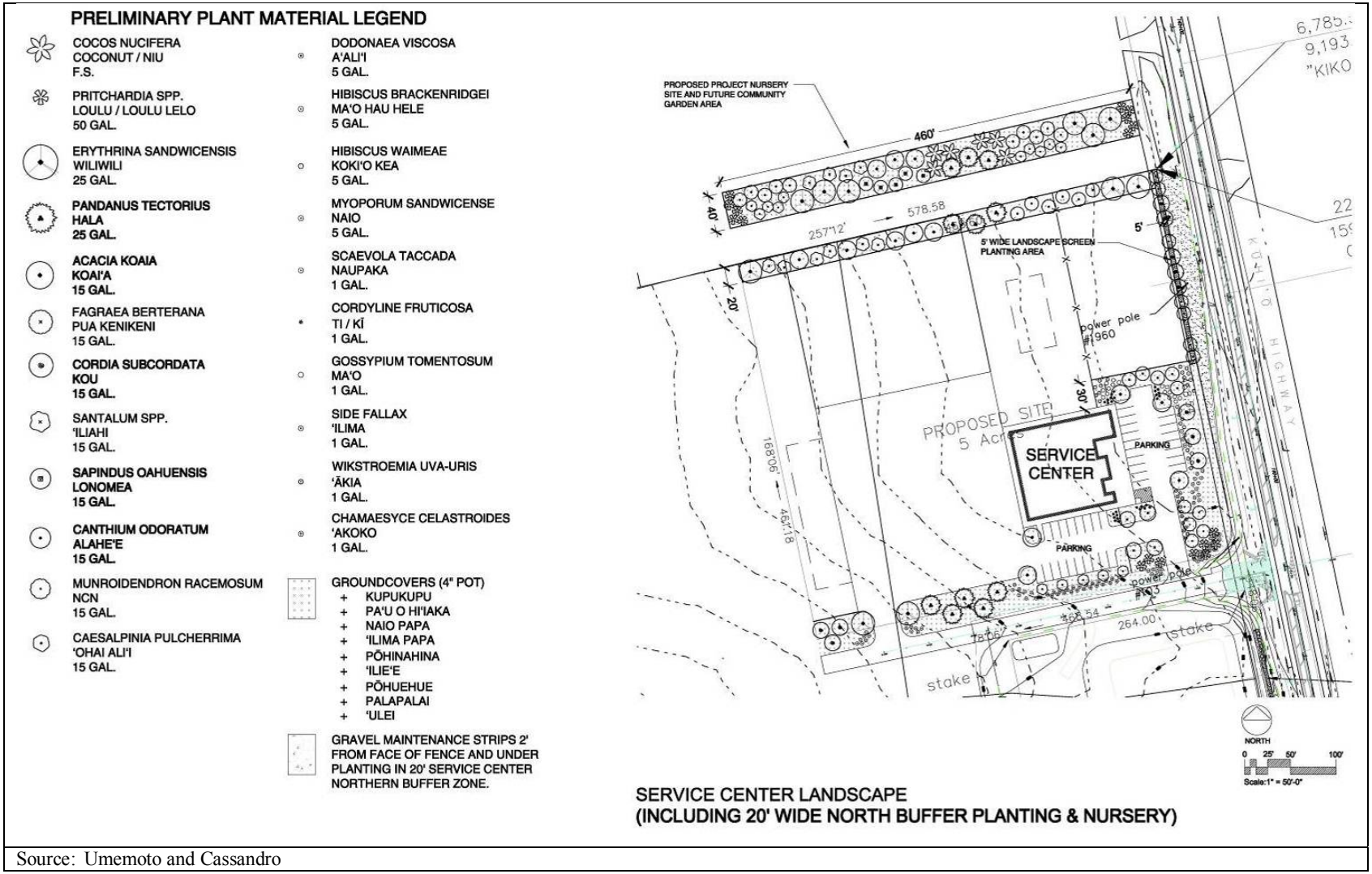
[10] These conductors (wires) are made of an aluminum alloy. Each wire is composed of 19 strands 0.1716 inch diameter strands, is 0.85 inches in diameter, and has a cross-sectional area of 0.4394 square inch.

[11] Power in an electric circuit is the rate of flow of energy past a given point of the circuit. In alternating current circuits, energy storage elements such as inductance and capacitance may result in periodic reversals of the direction of energy flow. The portion of power that averaged over a complete cycle of the AC waveform, results in net transfer of energy in one direction is known as real power. The portion of power due to stored energy, which returns to the source in each cycle, is known as reactive power.

[12] "Reserve" is the amount of generating capacity a central power system must maintain to meet peak loads; "spinning reserve" is the capacity of generating units connected to the electrical system that are immediately ready to provide power the grid sufficient to meet all users' needs.

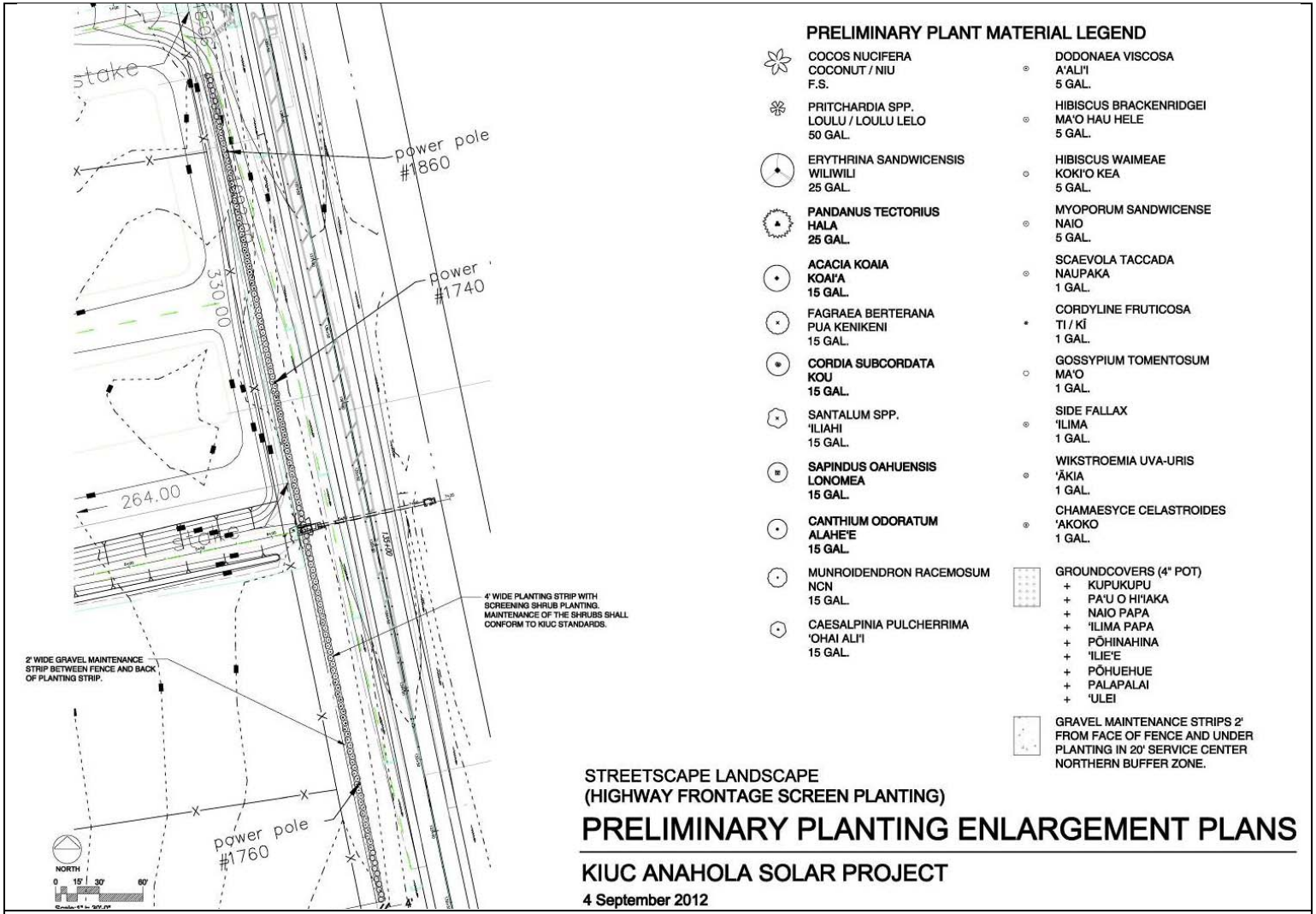
efficiency, and down to 50 percent load without violating air emissions limits. Consequently, KIUC's existing base and cyclic generation capacity can operate with a maximum of 20 MW of spinning reserve. The BESS system will provide buffering to ensure that the grid can accommodate the solar array's output without being compromised. The result is for a more predictable flow of power from the solar array to KIUC's electrical grid; this, in turn, will give KIUC the ability to respond to other system events, such as loss of generation and system faults.

Figure 2.8 Conceptual Landscape Plan: Service Center



Source: Umemoto and Cassandro

Figure 2.9 Conceptual Landscape Plan: Substation



Source: Umemoto and Cassandro

Figure 2.10 BESS 20-Foot Container Module

Typical module in 20-foot container.

Interior of battery module showing canisters that are part of fire protection system.

Source: http://www.rechargenews.com/multimedia/archive/00044/Acciona_baterias_de__44857b.jpg

As depicted on the site plan, the BESS system at Anahola would be comprised of several units, each contained in a separate 20-foot-long container. Each container holds: (*i*) a Lithium-ion battery, (*ii*) a supervisory and power management system, (*iii*) an active cooling system, and (*iv*) a fire prevention system. The modular design of this BESS system and the inclusion of a fire control system within each container minimizes the likelihood that a fire within a particular unit will catastrophically damage it. It also ensures that even if such damage were to occur it would be restricted to only one part of the overall BESS; the system is interconnected in such a way that other, undamaged units would continue functioning normally. The fire protection system helps insure that the kind of fire that occurred at the BESS serving one O'ahu wind farm (which consisted of all batteries within a single building with no fire protection system) cannot occur at Anahola.

2.2.2 ANAHOLA SUBSTATION: CONSTRUCTION ACTIVITIES

KIUC will begin construction of the substation by grubbing and grading the site, pouring the concrete footings for the major structures and the foundation of the control building described below, and laying down coarse gravel over most of the operations area to facilitate drainage and avoid pooling of storm water near the electrical equipment. This would be followed by construction of the control room and installation of the transformers, voltage regulators, A-frame, H-frames, and other electrical equipment. Irrigation of the landscaping would be done using water trucks as required during the early phases of growth, but this will be discontinued as the plantings mature.

Based on preliminary grading plans for the facility, KIUC anticipates that a substantial amount of fill will be needed on the substation site. Nearly all of this will be consist of material excavated during construction of the retention basins on the adjacent area where the solar array will be erected. However, some material (such as gravel) will need to be imported for use as structural fill and surface-finishing.

2.2.3 SUBSTATION: OPERATION AND MAINTENANCE ACTIVITIES

The Anahola Substation would be unstaffed, and electrical equipment within the substation would be remotely monitored and controlled by an automated system. Components of the substation will require periodic maintenance and may require emergency repair. In general, maintenance will entail

visual inspection, repainting of components, etc. Routine maintenance would include equipment testing, equipment monitoring, and periodic repair. KIUC personnel would generally visit the substation three to four times per month for routine maintenance that includes equipment testing, equipment monitoring, and repair.

Once established, substations typically have indefinite (i.e., very long) life spans, with even specific pieces of equipment such as transformers and switches typically performing satisfactorily for decades. Hence, little heavy maintenance work is typically required.

2.2.4 SUBSTATION: DECOMMISSIONING

Because the Anahola Substation would serve much more than just the Anahola Solar Project, its decommissioning is not anticipated in the foreseeable future. If and when KIUC does determine that there is no longer needed, the equipment would be removed and disposed of in accordance with the standards in place at the time. While it is possible to do so, KIUC does not presently envision removing the gravel that it would use as the surface cover over most of the substation. The continued presence of this material will prevent, or substantially reduce, the opportunity to use the area for nursery and other similar activities where use of the soil is necessary.

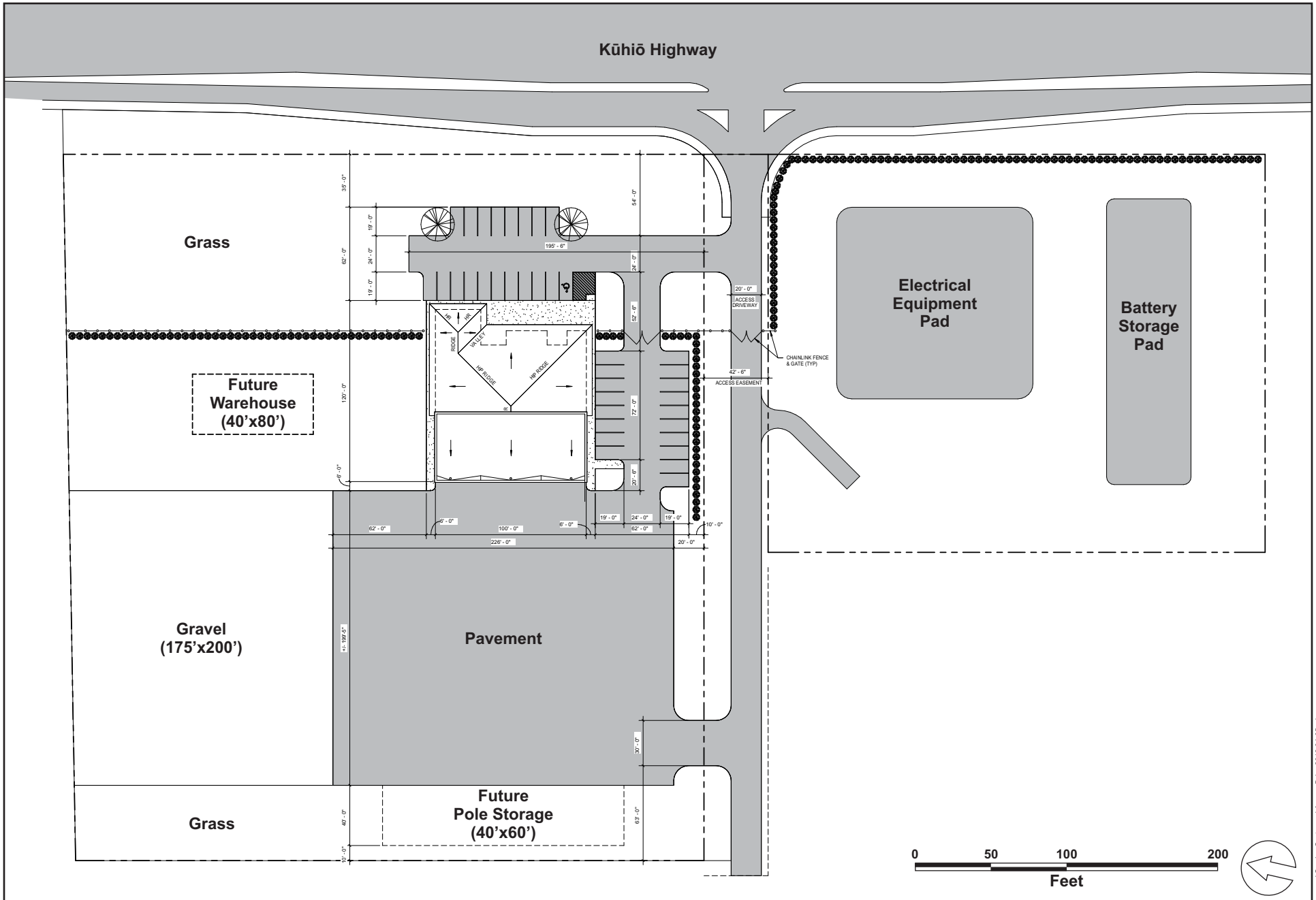
2.3 ANAHOLA SERVICE CENTER

The Anahola Service Center and the access drive serving the project will occupy 5 acres of the 60-acre lease area; 4.5 acres for the service center/transmission and distribution (T&D) Department baseyard and 0.5 acres for the access drive. This new service center will provide the following:

- A new structure containing approximately 4,230 square feet of space for planners and line crews. This would house office space, locker and restroom facilities, a small conference room, a storage room, a break room, and a 1,400 square-foot community meeting room for use by the public and the utility.
- 4,500 square feet of warehouse and garage space, including five enclosed truck bays; and
- An outside area or "baseyard" for storage of vehicles, equipment, and materials such as poles.

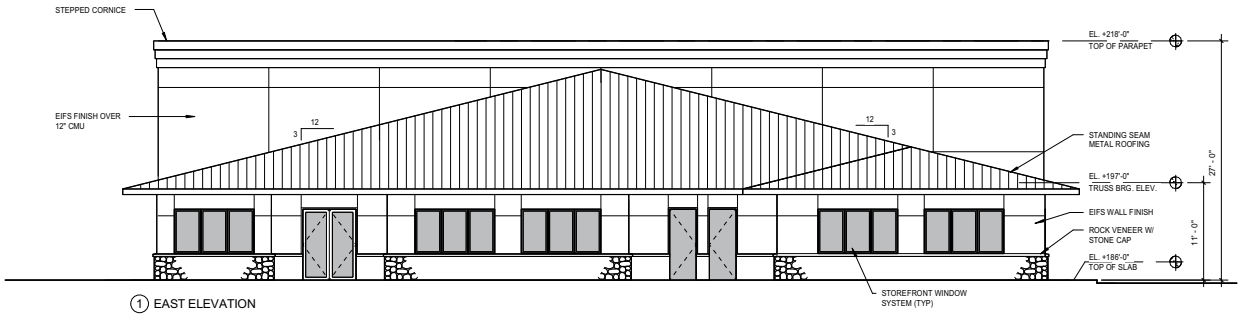
As noted in Section 3.2 below, new rules mandate proper containment areas and racks for the storage of utility poles, and a concrete warehouse area for the storage of transformers, which meet current EPA guidelines. Facilities designed to meet these federal standards are incorporated in the proposed service center.

KIUC will construct a new roadway to provide access to the Anahola Service Center. Figure 2.11 and Figure 2.12 show plan and elevation views of the proposed service center. Figure 2.13 is a conceptual rendering of the structure. The design of the proposed intersection with Kūhiō Highway is shown in Figure 2.14. It meets all State of Hawai'i Department of Transportation standards, and the project engineer has confirmed with the Department that the design concept is satisfactory. Both the temporary and permanent access road will be designed by a Hawai'i-licensed civil engineer. KIUC does not expect to be able to provide the final design until after the substation and solar array are completed. The contractors will develop an emergency vehicle access plan and share that with the relevant emergency response agencies.

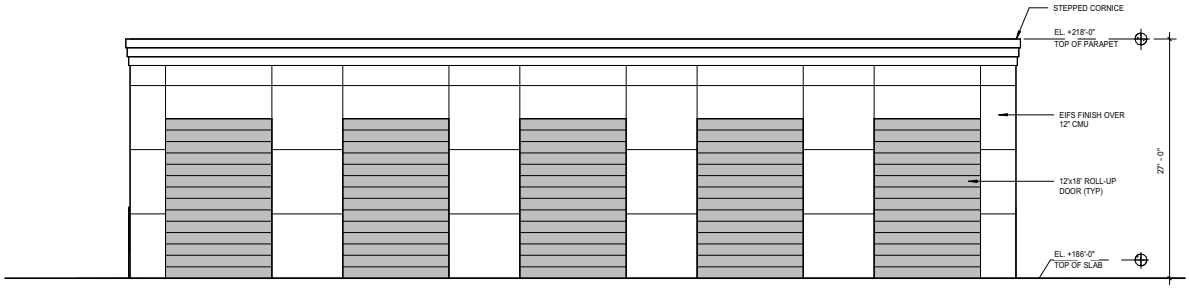


Prepared For:	Prepared By:	Source:	Project:	Figure 2.11:
Kaua'i Island Utility Cooperative	PLANNING SOLUTIONS	Marc Ventura, AIA, LLC	Anahola Solar Project	**Plan View of Service Center and Access Drive**

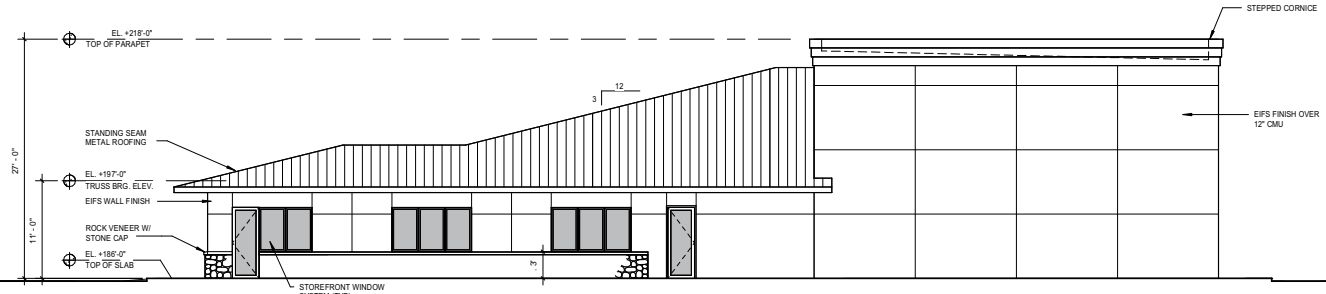
Figure 2-11 Site Plan of Proposed Service Center and Access Drive 2013-04-05.cdr



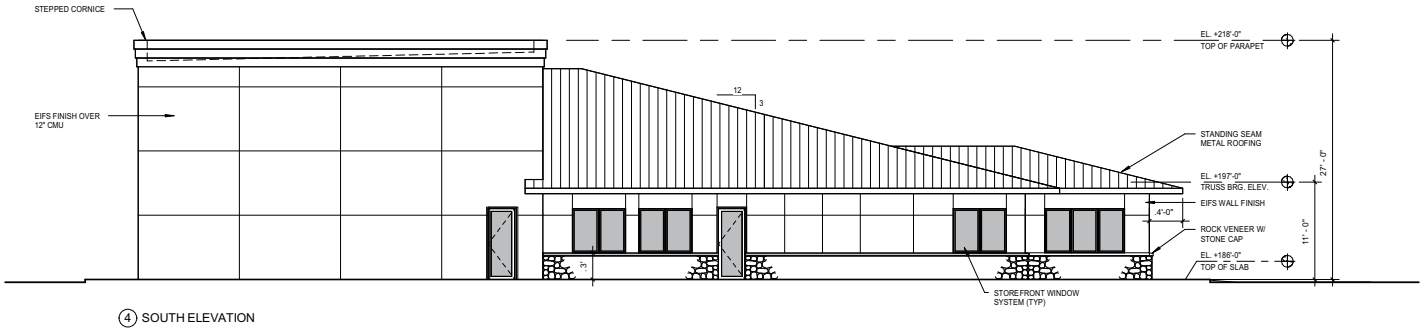
1 EAST ELEVATION



2 WEST ELEVATION



3 NORTH ELEVATION



4 SOUTH ELEVATION

Prepared For:	Prepared By:	Source:	Project:	Figure 2.12:
KIUC	PLANNING SOLUTIONS	Marc Ventura AIA, LLC	Anahola Solar Project	**Elevation View of Proposed Service Center**

Figure 1-7 Elevation View of Proposed Service Center 2013-04-05.cdr

Prepared For:
Kauai Island Utility Cooperative

Prepared By:
PLANNING SOLUTIONS

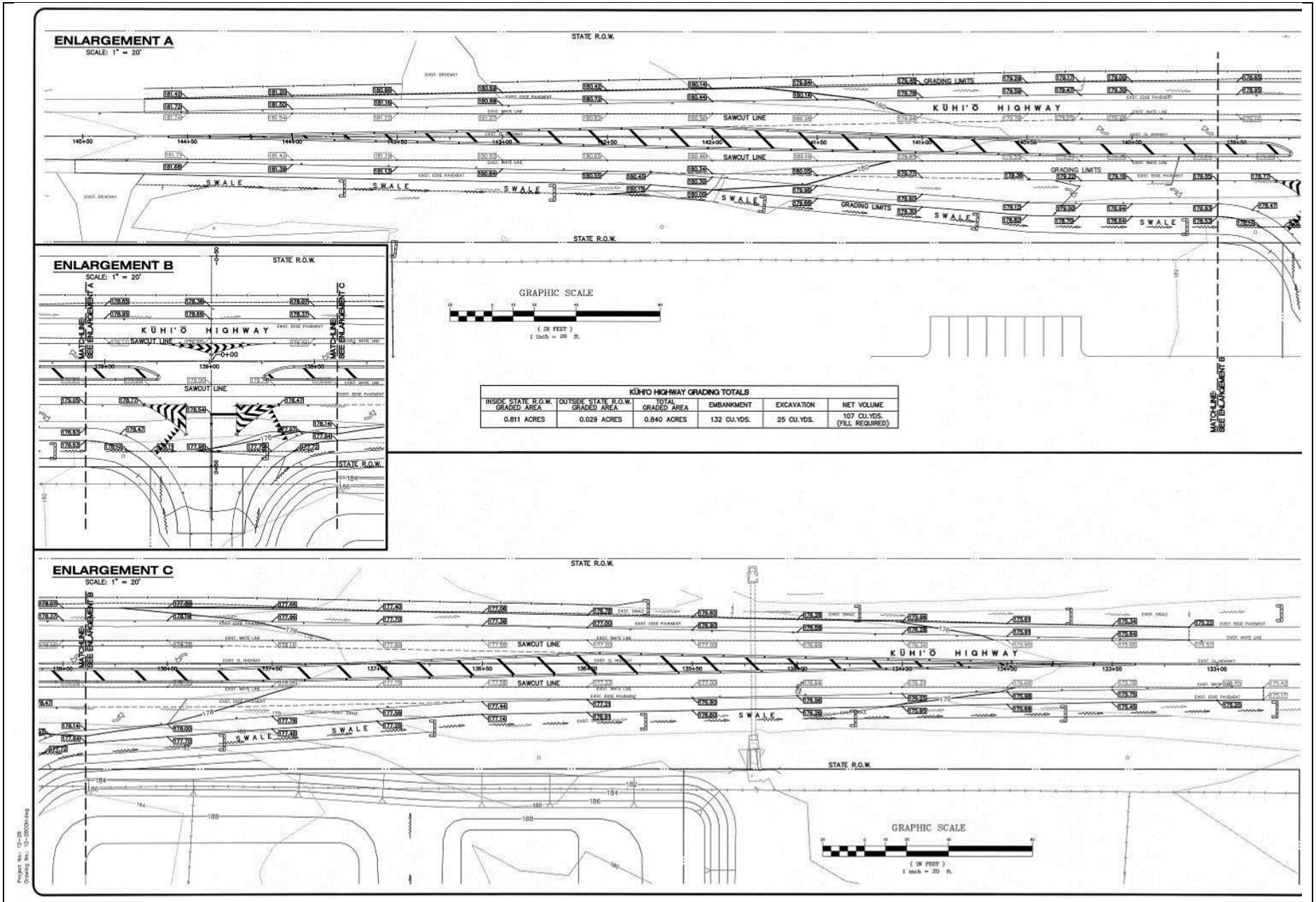
Source:
Mark Ventura, AIA, LLC

Project:
Anahola Solar Project

Figure 2.13:
Conceptual Rendering of Proposed Service Center

Figure 2-13 Conceptual Rendering of Proposed Service Center 2013-04-05.cdr

Figure 2.14. Kūhiō Highway Site Access Road Intersection Design



KŪHI'O HIGHWAY GRADING TOTALS

INSIDE STATE R.O.W. GRADED AREA	OUTSIDE STATE R.O.W. GRADED AREA	TOTAL GRADED AREA	EMBANKMENT	EXCAVATION	NET VOLUME
0.811 ACRES	0.029 ACRES	0.840 ACRES	132 CU.YDS.	25 CU.YDS.	107 CU.YDS. (FILL REQUIRED)

Source: Esaki Surveying and Mapping

2.3.1 ANAHOLA SERVICE CENTER: CONSTRUCTION ACTIVITIES

Once use of the Service Center site as a laydown area for the solar array and substation is complete, construction of the new service center would commence with grading of the 5-acre site to create a level surface for the structure. Some additional select fill material will be brought into the service center site from elsewhere on island. The construction of the service center building will involve concrete structural walls, a concrete or metal roof, and interior plumbing and electrical work for the offices and other areas intended for use by personnel or the public. Other work will include installation of water, sewer, electrical, and communication connections, installation of equipment intended to meet fire control needs and the EPA's SPCC rules for storage of utility poles and electrical transformers, also paving for the external and internal parking areas. The entire frontage of the service center along the highway will be landscaped with native plants.

2.3.2 ANAHOLA SERVICE CENTER: OPERATIONS AND MAINTENANCE

Once constructed, the new service center will be kept in service indefinitely, with a projected lifespan of 40 years or more. This service center will replace the temporary facility at Kapa'a, which will be permanently decommissioned. The new service center will require a level of maintenance typical for similar office buildings. In general, maintenance will entail visual inspections, repainting, and regular care of surrounding landscaping.

2.3.3 ANAHOLA SERVICE CENTER: DECOMMISSIONING

If and when it is decommissioned, it is possible that the building could be put to an alternative use. If that does not occur, the buildings would be demolished. At that time, the site could be returned to its original condition.

2.4 IMPLEMENTATION SCHEDULE

The estimated construction start date and duration for the photovoltaic array and substation are presented in Table 2.2. The implementation schedule for the service center is shown in Table 2.3.

Table 2.2 Preliminary Project Schedule: Solar Array and Substation

Task	*Estimated Start Date*	*Estimated Duration (in months)*
Final Design	January 2012	12
Construction of Solar Array	Q3 2013	9
Construction of Substation	Q3 2013	6
Source: KIUC (2012)		

Table 2.3 Preliminary Project Schedule: Service Center

Task	*Estimated Start Date*	*Estimated Completion Date*
Design Engineering	September 1, 2011	January 31, 2013
PUC Approvals	February 1, 2013	November 30, 2013
Environmental Planning	July 1, 2012	December 31, 2013
RUS CWP Amendment	December 31, 2012	December 31, 2013
Permitting	July 1, 2014	January 31, 2015
Procurement & Construction	April 1, 2015	December 31, 2016
Source: KIUC (2012)		

2.5 PROJECT COSTS

KIUC has prepared preliminary construction cost estimates based on the facility concepts presented above. These estimates are summarized in Table 2.4.

Table 2.4 Estimated Project Costs

Component	*Cost ($)*
Solar Array	**38,585,831**
Substation and BESS[1]	**14,900,000**
Service Center	**5,400,000**
Other Costs[2]	**1,500,00**
Total	**54,985,831**
Note 1: This consists of $7,400,000 for the Switchgear and transformers and $7,500,000 for the BESS. Note 2: These costs include landscaping, the Homeowner's Benefit Agreement (HBA) and legal fees associated with the project.	
Source: KIUC (2012)	

3. PURPOSE & NEED OF THE PROPOSED PROJECT

3.1 NEED FOR PHOTOVOLTAIC ARRAY AND SUBSTATION

KIUC's need for the proposed facilities stems from its: (*i*) obligation to meet the requirements of the State of Hawai'i's Renewable Portfolio Standards (RPS) law; (*ii*) desire to improve the reliability of electrical service in the area between Kapa'a and Anahola and on the North Shore; and (*iii*) commitments as a publicly-regulated utility and as a not-for-profit cooperative.

Renewable Standards. KIUC's need for the proposed facilities stems from its obligation to meet the requirements of the State of Hawai'i's Renewable Portfolio Standards (RPS) law. The State of Hawai'i's RPS law, Hawaii Revised Statues §269-91, sets minimum requirements for the use of renewable sources of energy for electrical generation such as wind, solar, and biofuels. The law requires that 40 percent of generation be met by renewable resources by 2030, with several interim goals to be met prior to that date. The RPS goals and their target dates are summarized in Table 3.1 below. In addition, Act 234 of the Session of Laws for 2007 establishes a framework for reducing greenhouse emissions to the levels emitted in 1990 by the year 2020. Thus, there is a growing legal mandate for the exploration of clean, renewable energy generation in the State of Hawai'i.

Table 3.1 Renewable Portfolio Standards Dates and Targets

Year	*Target as a Minimum % of Total Sales*	*Energy Savings Included*
2010	10%	Sale of electricity plus energy savings via efficiency programs and solar water heaters included.
2015	15%	Through sales of electricity only.
2020	25%	Through sales of electricity only.
2030	40%	Through sales of electricity only.
Source: KIUC Strategic Plan 2010-2025 (KIUC, 2009)		

During the past several decades, the KIUC system has grown increasingly dependent on imported fossil fuels. This, due to the slow decline of the sugar industry, which in the 1980s provided over 50 percent of Kaua'i's energy from biomass and hydropower combined with an increase in the use of electrical power. In 2010, for example, KIUC consumed 30 million gallons of oil to generate 92 percent of Kaua'i's electricity. The remaining 8 percent was generated solely by hydropower, since Kaua'i's last sugar industry biomass boiler shut down in late 2009. Some of that hydropower was from KIUC-owned facilities and some of it was generated by others who have Power Purchase Agreements (PPAs) with the utility. In view of this situation, KIUC faced a clear need to increase the amount of electricity that it obtains from renewable sources.

KIUC's Strategic Plan responded to the challenge by setting a renewables target that is even more ambitious than that required by the State's RPS. It calls for renewable resources to generate 50 percent or more of Kauai's electricity by 2023, and directs its portfolio approach to developing additional renewable energy resources. KIUC has taken the following actions to ensure that it meets the RPS requirements and Strategic Plan Goals:

- Signed a Power Purchase Agreement (PPA) with Green Energy LLC for a 6.7 MW biomass plant.
- Signed PPAs for seven MW of solar-voltaic power at two other locations (1 MW at Kapa'a and 6 MW at Port Allen).

- Negotiated a contract with SolarCity to build a 12-megawatt solar photovoltaic project on land that KIUC has agreed to lease from Grove Farm Co.; the 30-40 acre facility would be constructed on a 67-acre site just east of Kōloa on Māhāʻulepū Road, between the Kōloa Bypass Road and the old Kōloa Mill.
- Investigated whether additional biomass or hydro-power can be obtained, either through the development of KIUC-owned facilities or through PPAs with Independent Power Producers (IPPs).
- Actively worked to determine whether additional hydro development is feasible, either through additions to its own facilities or through new or modified PPAs with IPPs.

As it has pursued these projects, KIUC has learned that most renewable options have relatively long development timelines. None of the hydro and biomass proposals that have been investigated by KIUC in the past two decades have yet come to fruition, largely due to the extensive permitting requirements and community opposition. Wind power, a renewable option that is being developed on all of the other islands, is currently not feasible due on Kauaʻi due principally to the substantial populations of endangered seabirds that are present on the island. The regulatory process, which includes preparing Habitat Conservation Plans and acquiring Incidental Take Permits under Section 10 of ESA and the equivalent State of Hawaiʻi laws and regulations (Chapter 195D, Hawaiʻi Revised Statutes) is time-consuming and likely to result in very high monitoring and mitigation costs. Furthermore, most of Kauaʻi's prime wind locations are on private land whose owners have indicated that they are not interested in developing wind farms.

Hundreds of small residential and commercial solar installations have been installed and connected to the KIUC electrical grid in accordance with the provisions of the State of Hawaiʻi Public Utility Commission-approved "KIUC Tariff No. 2".[13] These systems are all privately owned and operated, but their construction and operation has been greatly facilitated by the existence of this standardized tariff. They have helped to reduce Kauai's overall dependence on oil, but they are too small to have had more than an incremental effect (see the bottom row in Table 3.2 below).

Table 3.2 Kauai's Power Generation Fuel Mix: 2003-2011

Fuel Mix Percentage	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
Biomass	0.3%	0.4%	0.5%	0.4%	0.3%	0.2%	0.5%	0.0%	0.0%
Fossil Fuel	94.5%	92.0%	91.6%	91.8%	94.2%	91.4%	90.5%	90.9%	89.0%
Hydro	5.2%	7.6%	7.9%	7.8%	5.4%	7.6%	7.9%	7.8%	8.8%
Photovoltaic	0.0%	0.0%	0.1%	0.1%	0.1%	0.8%	1.1%	1.4%	2.1%
Source: Kauai Island Utility Cooperative (2013)									

In mid-2011, with few options to rapidly and assuredly increase the percentage of electricity generated from renewable resources to meet the legal requirements for renewable energy, KIUC decided to take a more direct approach. Solar pricing had become competitive with oil, and KIUC determined that permitting solar projects involved less risk than other renewable options. At that time KIUC began developing a solar project large enough to allow it to make significant steps towards its

[13] Tariff No. 2 establishes the policies and procedures that must be followed by both KIUC and distributed generation units connected with KIUC's electric system. In doing so, KIUC utilized as its starting point in preparing these Policies and Procedures the standard procedures issued by the Federal Energy Regulatory Commission ("FERC") on May 12, 2005, as amended, to govern the interconnection of generators no larger than 20 MW. These Policies and Procedures were approved by the Commission in Decision and Order No. 24238, issued on May 22, 2008, in Docket No. 2006-0498, as subsequently approved by Order issued on June 26, 2008.

Strategic Plan and RPS targets while not being so large that it would adversely impact system reliability due to the intermittent nature of solar energy. Ultimately, KIUC determined that a solar project in the 10 to 14 MW (AC) range represented the appropriate balance between those two objectives, a size which would provide approximately 5 to 6 percent of the energy used in KIUC's system. A 10 to 14 MW solar facility would also make a significant contribution to KIUC's efforts to meet or exceed its RPS and Strategic Plan goals and fulfill its responsibilities to its members as a not-for-profit cooperative.

Reliability of Electrical Power Supply . In addition to meeting the renewable energy standards discussed above, KIUC must also ensure that all its members receive reliable electrical service. While the Anahola Solar Project is in and of itself sufficient reason to construct a substation in the planned location, its presence there will also benefit the KIUC electrical system by improving the reliability of electrical service in the region.

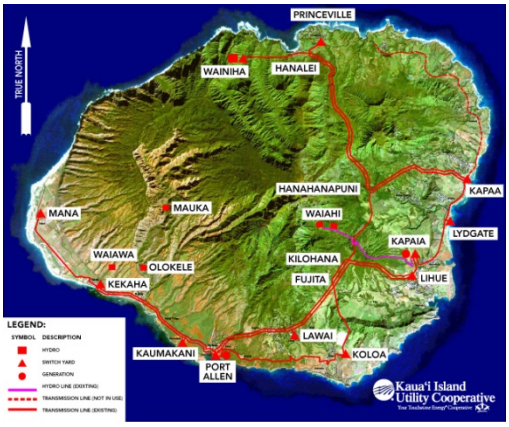
From a customer perspective, the reliability of an electric utility system includes two components: (*i*) continuity of service and (*ii*) power quality.

- *Power reliability* (i.e., continuity) is the capacity to deliver electricity to customers within accepted standards and in the amount desired. The degree of reliability is measured by the frequency, duration, and magnitude of outages. Reliability indices typically consider aspects such as the number of customers, the connected load, the duration of the interruption, the amount of power interrupted, and the frequency of interruption. Fewer and shorter outages are superior to more frequent and/or longer outages.
- *Power quality* is the capacity to maintain a steady frequency (60 Hz) and nominal circuit voltage. Power quality often involves safety issues (e.g., grounding and elevated neutral voltages). Today's electronic loads are susceptible to momentary interruptions and other disturbances (e.g., spikes). In turn, these power quality problems have a huge economic impact on KIUC's customers.

The two measures are related; if a utility cannot maintain the proper voltage, the situation can trigger an outage. KIUC tracks the performance of its system with respect to this criterion, and its records show that electrical service to the portion of the island that is served only by the 12.47 kV distribution lines emanating northward from the Kapa'a Substation and outward from the Princeville Substation Anahola is less reliable than is desirable.

In addition to these two factors, KIUC's system planning must also take into account forecast increases in the amount of electricity used by its customers in the corridor served by the transmission and distribution facilities. In this case, it is peak use that is of principal concern, because it is peak use (rather than average) that determines the capacity of the electrical transmission and distribution facilities that are needed.

The only electrical power line presently serving the northern part of the island that is energized at transmission line voltage is the 12.6-mile long "69 kV Cross-Island Line" (see Figure 1.1 and the sketch at right), which begins at the Hanahanapuni Tap in the mountains above Kapa'a and ends at the Princeville Substation. This single transmission-voltage circuit has left the North Shore area vulnerable to outages and service disruptions by not giving the utility dual transmission-voltage paths to serve the area. Instead, as a backup the Princeville Substation must rely on a 20-mile long 12.47 kV distribution voltage line that connects it and the Kapa'a Substation. When only this 12.47 kV feed is in service and customer use of



electricity is high, the voltage level drops, adversely affecting power quality or causing a complete power outage.[14] To the extent that electrical power use along the corridor served by the line increases, the situation will tend to get worse over time.

If the Anahola Substation is constructed as planned, it will allow the portion of the 69 kV-capable power line that was installed between the Kapa‘a Substation and the eastern side of Kalihiwai Valley during 1989-1991 to be energized at it full 69 kV capacity from Kapa‘a to Anahola. Electricity used by customers located between the Anahola and Kapa‘a substations will then receive power through the path with the least electrical resistance (and, therefore, with the lowest line losses). Customers to the west of Anahola will receive power through a shorter distribution circuit as well. In normal circumstances this will lower line losses and make it easier to maintain the required voltage; in situations where the cross-island line circuit is out of service, KIUC is much more likely to be able to fully meet the electrical needs of customers on the northern side of the island.

Cooperative Commitment to Community and Sustainable Development. In addition to KIUC’s responsibilities to provide safe, reliable, and affordable power, as a cooperative, KIUC must also adhere to the seven (7) cooperative principles, which includes a concern for community and its sustainable development. In furtherance of this commitment, KIUC and DHHL signed an Energy Charter in 2009, which stated that they would collaborate to enable native Hawaiians and the broader community to work together in leading Hawai‘i’s efforts to achieve energy self-sufficiency and sustainability. The Charter requires that KIUC and DHHL identify sustainable renewable energy projects for DHHL’s available lands, with preference to projects that provide benefits to the trust lands, native Hawaiian community, the DHHL, and KIUC. By siting projects on DHHL lands, KIUC would provide revenue to the local economy and further engage the native community in sustainable development efforts. KIUC therefore determined that siting of the proposed solar facility on DHHL lands would be preferred, though sites off of DHHL lands would be considered.

3.2 NEED FOR THE SERVICE CENTER

KIUC’s Transmission and Distribution Department has not added any additional construction or line personnel since 1988, and currently services all its customers across the island from just two service centers, including the ‘Ele‘ele Service Center located in the Southwest of Kaua‘i and the Kapa‘a Service Center, located on the East coast in Kapa‘a Town. In 2005, KIUC conducted an assessment of the existing support facilities, entitled “KIUC Service Center Study”, which is reproduced in Appendix H. The study identified customer service issues associated with the inaccessibility of the existing infrastructure for the growing communities of the North and Eastern Shores. It also identified existing operational issues at the existing Kapa‘a Service Center, including access for customers and KIUC employees which results in safety issues from heavy traffic congestion.

Customer Service Issues. The study identified customer service issues associated with the inaccessibility of the existing infrastructure for the growing communities of the northern and eastern shores. There are two particularly important aspects of this. The first is that the location of the existing facilities makes it difficult (because of overly long distance and/or traffic congestion) for customers who need service to reach them. The second is that the relatively great distance between

[14] In the mid-1980s, KIUC’s predecessor, Kaua‘i Electric (KE) received PUC permission (D&O 9134 issued on May 5, 1987) to install a 20-mile transmission circuit connecting the Kapa‘a and Princeville Substations. Construction began in 1989, but settlement of a court suit caused KE to suspend construction just short of the intersection of Kūhiō Highway and the eastern end of Kalihiwai Road (4.5 miles short of the Princeville Substation). As a result of the settlement, the entire circuit between the Kapa‘a and Princeville Substations has never been energized at more than 12.47 kV, preventing it from carrying all of the power it was designed to transmit.

the existing baseyards and the facilities and customers whom they must serve make it difficult to conduct service calls quickly and efficiently.

Kapa'a Service Center Operational Issues. There is no left turn off of Kūhiō Highway into the Kapa'a Service Center, nor is there an acceleration-deceleration lane. Once there, the Kapa'a Service Center is surrounded by a locked security fence, leaving customers to conduct their business with KIUC representatives in a portable trailer outside the perimeter fence. Access is a problem for KIUC employees as well; workers need to stand in the middle of the highway, blocking traffic, to allow trailer trucks to enter and exit the facility. The continuing difficulties associated with moving large trucks and pieces of equipment in, and out of, the Kapa'a Service Center, increases response times for service calls to the North Shore. This problem is further exacerbated by the heavy traffic congestion which frequently occurs in Kapa'a Town. In addition, KIUC would have difficulty meeting the U.S. Environmental Protection Agency's (EPA) newly instituted and more stringent Spill Prevention, Control, and Countermeasure (SPCC) rules at the Kapa'a Service Center, which require KIUC to upgrade the spill containment capability of its pole and transformer storage facilities due to the limited area that is available to make improvements. Also, the Kapa'a Service Center warehouse and storage areas are in the tsunami inundation zone; during tsunami warnings personnel and emergency response equipment (e.g., service trucks) need to be moved to higher ground.

KIUC ultimately determined that construction of a new service center was required to address the customer service and accessibility issues for the benefit of both KIUC staff and members. A location nearer (than Kapa'a) to the North Shore would allow KIUC employees responding to service calls in that area to act more rapidly and efficiently, by basing personnel, equipment, and materials closer to the areas where they will be needed. It would also create a point of service for customers coming from North Shore communities which would be closer, easier, and safer to access. Finally, it would create a spacious and modern facility outside of the tsunami evacuation zone which is designed in accordance with the latest federal Spill Prevention Controls and Countermeasures (SPCC) regulations.

3.4 OBJECTIVES & PURPOSE OF THE PROPOSED PROJECT

Table 3.3 lists KIUC's objectives for each component of the proposed project. Achieving these objectives would benefit DHHL beneficiaries as well, and the lease arrangements would provide an income stream to DHHL that would not otherwise be available.

Table 3.3 Project Objectives

12 MW Photovoltaic Solar Farm
• Provide safe reliable power to KIUC's consumers at the lowest possible cost. • To help KIUC meet or exceed the State of Hawaii's RPS requirements. • To make significant progress towards KIUC's Strategic Plan to achieve 50 percent renewable generation by 2023. • To reduce Kauai's dependence on imported fossil fuels. • Improve system stability and provide voltage support to the North Shore during contingencies.
Substation
• To step up electrical power generated by the solar facility for interconnection with the KIUC transmission system. • Break the Kapa'a-Princeville transmission line into two independent segments, improving reliability.
Service Center
• To distribute KIUC staff and facilities more efficiently, with infrastructure closer to the growing North Shore community. • To improve customer access to KIUC planners. • To create additional material and equipment storage in a facility designed for this use. • To reduce response times for line crew responding to service calls.
Source: Kaua'i Island Utility Cooperative (2012).

4. ALTERNATIVES EVALUATED IN THE EA

The NEPA statutes require the evaluation of the alternatives to the proposed action, 42 USC 4332 (1)(c)(iii). The CEQ's implementing procedures further define this process, by stating that the NEPA document must evaluate a range of all reasonable alternatives to the proposed action, 40 CFR § 1502.14). RUS's bulletin for the preparation of EAs, entitled, *Bulletin 1794A-601 Guidance for Preparing an Environmental Report for Projects Requiring an Environmental Assessment*, provides further guidance to define this range of alternatives, through the following subject areas that should be addressed:

(1) Alternative corridors, routes, or locations (sites);

(2) Other methods to provide service;

(3) Alternative construction methods and materials;

(4) Alternative designs;

(5) Load management and energy conservation;

(6) Alternative generation technologies; and

(7) Combinations of the above technologies.

At the State level, Title 11, Chapter 200 of the Hawai'i Administrative Rules (HAR §11-200) contains the Department of Health's environmental impact rules. This section: (*i*) defines the assessment process for "applicant actions" such as the one that KIUC is proposing; (*ii*) requires that the approving State of Hawai'i agency (in this case the Department of Hawaiian Home Lands) analyze alternatives, in addition to the proposed project in its environmental assessment; and (*iii*) establishes the required contents of environmental assessments. Among the requirements listed is the identification and summary of the impacts and alternatives considered.

In accordance with those Federal and State requirements and as part of its continuing review of its operational and facility needs, KIUC considered a number of alternatives before choosing the proposed project. This process consisted of defining the objectives of the project (see Table 3.3), identifying possible alternatives (including those specifically mandated by NEPA and Chapter 343), and evaluating each alternative with respect to the project's objectives.

As discussed in Section 3.1, KIUC's analysis of other renewable energy technologies (e.g., wind, biomass, hydropower, etc.) showed that they were not viable alternatives and would not allow KIUC to meet the project alternatives outlined in Table 3.3. Because of these considerations, and because the solar facility and the substation are inextricably linked, KIUC focused its analysis of alternatives on alternate sizes, locations, and timetables for photovoltaic facility development.

KIUC determined that the solar array and substation were inextricably linked, such that the substation would be required to step up the generated energy to 57.1 kV to feed into the existing KIUC transmission system. Locating the substation elsewhere would require a longer run of the lower-voltage feeder from the solar farm. The increased distance would, in turn, increase both the cost of installing the connection and the energy lost as the electrical power travels through the wires. Therefore, the solar facility and the substation were sited as a singular unit.

KIUC evaluated a number of different solar power alternatives during the planning process for the Anahola Solar Project; however, only two merit review under the environmental impacts section: (*i*) the proposed project, a 12 MW photovoltaic facility in Anahola, Kaua'i; and (*ii*) the "no action" alternative as mandated by NEPA and Chapter 343 requirements. The reasons why the other alternatives failed to meet the project's purpose and need are discussed in Section 4.2.

4.1 NO ACTION

Solar Array. Under the "No Action" alternative, the proposed solar array would not be constructed. Without this facility, KIUC would be unable to meet the increasing demand for electricity on Kaua'i with renewably sourced energy and would not be able to meet the RPS requirements instituted by the State of Hawai'i. It would continue to use existing (and potentially other planned) power sources, the great majority of which rely on fossil fuels.

Substation. Under the "No Action" alternative, the new substation would not be constructed. The principal need for the substation is to connect the solar farm, which would not be built under the "No Action" alternative, to KIUC's transmission system. However, the presence of a substation at Anahola would also allow KIUC to: (*i*) substantially reduce line losses that it now experiences in transmitting power at 12.47 kV over the full 22-mile distance from Kapa'a to Princeville and (*ii*) improve the reliability of service to North Shore communities from Anahola onward.[15]

Service Center. "No action" for this component of the project means that all T&D activities on the eastern and northern sides of the island will continue to be based at the existing, and inadequate, facility in Kapa'a. It also means that the nearest point where North Shore residents and businesses will be able to conduct business with KIUC will remain in Līhu'e.

In sum, the "No Action" alternative would not achieve the objectives of the proposed project. Consequently, it is not considered a feasible or desirable alternative, and is included in this EA solely to fulfill the legal requirements of NEPA and its implementing regulations and the comparable State requirements (Chapter 343, Hawai'i Revised Statutes/Hawai'i Administrative Rules §11-200) and to provide a baseline against which to measure the impacts of the proposed project.

4.2 SOLAR ARRAY AND SUBSTATION ALTERNATIVES CONSIDERED AND ELIMINATED

4.2.1 ALTERNATE LOCATIONS

As discussed Section 3.1, KIUC considered the possibility of locating the proposed solar project at several locations before deciding upon Anahola. KIUC determined between 45 and 63 acres would be required for a 10-14 MW photovoltaic, and began the selection process by identifying sites of an appropriate size. A review of solar resource maps for Kaua'i Island, land ownership and land use classification information, proximity to substations and transmission lines, the needs of the electric grid as a whole, and the potential benefit to the community were all used to identify a limited number of areas that could be candidates for a large solar photovoltaic project. Solar resource maps for the island of Kaua'i show that almost any site not located in the central part of the island possesses relatively abundant solar resources. This is contrary to popular perception, which is that the west side of the island is the sunniest, and hence best for generating solar power. KIUC also considered land costs, construction costs, and access to nearby transmission lines as they potentially significantly impact the cost of energy from a solar photovoltaic project. Three potential areas were identified through this screening process as most suitable, including Wailua, Kekaha, and Anahola.

Wailua. The Wailua area was identified as preferable given its proximity to KIUC's load center, which is between Līhu'e and Kapa'a (as noted in Section 3.1). Placing a source of generation near to the load center would limit the amount of electrical line loss, since the power would not have to be transmitted very far prior to use. The project site is a privately-owned parcel KIUC identified a privately owned parcel in Wailua that site possesses adequate solar energy resources to meet the

[15] This benefit accrues from the fact that it would generally be possible to serve users from the Anahola Substation northward with the existing 12.5 kV circuits even when the 69 kV cross-island line is out of service.

desired requirements for photovoltaic energy generation (see Figure 4.1). KIUC's analyses indicated that the. Though located in a favorable location for connectivity to the electrical grid, several other factors contributed to making this location less desirable than the preferred alternative (Anahola), including the following:

Figure 4.1 Alternate Locations Considered.

Wailua Site Considered | *Kekaha Site Considered.*

Source: KIUC October 17, 2011, Briefing to the Hawai`i Public Utilities Commission and Consumer Advocate,

- The site contained marshy soil, and this was judged likely to complicate construction and, in all likelihood, increase the construction cost.
- The site is on an east-facing hillside, which has less sun exposure.
- In order to use this site, KIUC would have had to construct a new segment of transmission line so that it could connect the solar array with the existing KIUC transmission grid.
- Lastly, the asking price of the parcel of land was very high considering the limitations of the site.

Kekaha. Solar maps indicate that the Kekaha area is among the best areas on the island of Kaua'i in terms of solar energy resources. KIUC evaluated two parcels in Kekaha, both belonging to a private trust. The first is in the foothills between Kekaha and Waimea towns. It is limited by several environmental factors including terrain, soil conditions, and shading. The second site, also between Kekaha and Waimea towns, has suitable topography, but has high potential for flooding due to the low elevation (below sea level). The construction costs for the second site would also be high due to the silty soil conditions. A substantial transmission line extension for interconnection to the KIUC grid would also be required for both of these sites. Finally, at the time of site selection, KIUC was talking with two independent power providers (IPPs) contemplating projects of 5 MW each in this same area. In light of this possibility, KIUC felt that it would not be prudent to consider building a 12 MW facility in the same locale, as the concentration of solar projects could adversely affects grid reliability during cloud cover or line faults. While KIUC ultimately opted not to enter into agreements with the two IPPs, these factors did influence the site selection process for the solar facility.

Preferred Alternative (Anahola). The Anahola site was determined to be the preferred alternative due to the site's suitability for solar development, easy integration and potential benefits to the electrical

grid, zoning, and ownership and associated community benefit. Solar suitability maps indicate that the Anahola is slightly less insolation (i.e. the intensity of solar radiation energy on a given surface) than Kekaha, but the level is more than sufficient to produce high levels of output from a solar installation.

The solar facility and substation on the Anahola site will be easily integrated into the existing electrical grid, such that an existing transmission line runs along the Kūhiō Highway, adjacent to the project site. This allows the substation serving the solar farm to connect directly to the existing transmission system without requiring the installation of additional poles. Interconnection to the transmission system, as opposed to the distribution system, is essential for a project of the desired size because a project feeding only into lower voltage (in this case 12.47 kV) local distribution systems would be limited in output to avoid unacceptable fluctuations and resultant reliability issues. Another advantage of the preferred site is its location far from existing generation sources; inserting power into a point in the system that is presently served only by distant generating sources will help to reduce line losses as electricity travels along the transmission circuit, improving the overall efficiency of the KIUC system.

There are also indirect benefits to the electrical system in selecting the Anahola site for construction of the solar facility and substation in improving reliability in underserved areas. By construction of the substation at the Anahola site, KIUC will be able to energize the existing 69-kV-ready power line that runs from the Kapa‘a Substation to Kalihiwai at its design voltage rather than at the 12.57 kV distribution-level voltage at which it is presently limited. This will allow KIUC to improve system reliability for the entire Kapa‘a-Princeville transmission corridor. KIUC will also be able to extend high voltage power beyond Kapa‘a area, which is not currently possible. Construction of the substation would also create an opportunity to sectionalize the transmission grid; sectionalizing a transmission line strengthens a systems protection against line faults and enables faults to be detected more quickly when they occur. The site will allow for the creation of a final link in a transmission circuit between Kalihiwai and Princeville and therefore allowing KIUC to transmit power to the North Shore via cross-island or North Shore transmission corridors. Overall, the Anahola solar site’s location at the southern edge of the North Shore area offers an opportunity for KIUC to improve system stability and provide voltage support to the North Shore, particularly during contingencies.

The agricultural zoning of the area allows the property to be developed for the proposed use without undue uncertainty or delay, and discussions with the landowner (the Department of Hawaiian Home Lands) showed an eagerness to make the land available for the type of project that KIUC was contemplating. As a publicly-regulated utility and as a not-for-profit cooperative, KIUC has a responsibility to not only focus on the members’ needs for reliable service, but to also work towards sustainable development of the communities that KIUC serves. In light of this commitment to community, DHHL and KIUC signed an Energy Charter in 2009, which stated that DHHL and KIUC would collaborate to, “identify suitable renewable energy projects for the Department’s available lands.” The Anahola site represents a commitment to KIUC’s cooperative responsibilities to the community and the 2009 DHHL/KIUC Energy Charter. The Anahola site would provide revenue for the community via the DHHL and the Anahola Homestead Community Development Corporation (HCDC) through the lease agreement and the creation of local jobs during construction, operation, and maintenance of the proposed project. The proposed project, as the first of its kind, represents a commitment to the Native Hawaiian community by establishing a model for future partnerships between KIUC, Native Hawaiian organizations, and the State of Hawai‘i. KIUC believes that such partnerships are important to maintaining its place in the community that it serves.

4.2.2 ALTERNATE SIZES

KIUC’s proposed Anahola Solar project was sized at 12 MW principally because this scale represented a balance between reaching the Strategic Plan and RPS targets without being so large as

to threaten system reliability. KIUC considered constructing a smaller solar array, however, choosing to do so would have reduced the extent to which KIUC would have been able to take advantage of the very significant tax incentives that were due to expire at the end of 2011. It would also have led to higher per-megawatt costs for the transmission interconnection (i.e., for the substation). Because KIUC's analysis indicated that the 12 MW facility could be readily accommodated in its system, there were no apparent advantages to a smaller facility. The proposed sizing of the substation was determined to match the proposed 12 MW solar facility; any reduction would leave it too small to accommodate both the required electrical switching and transformer equipment and the BESS.

4.2.3 ALTERNATE TIMING (DELAYED ACTION)

A delayed action would mean that KIUC would not lease the Anahola parcel from DHHL and would not construct a solar project there at the present time, instead delaying construction until some later date. There were several compelling reasons why a delayed action would not meet KIUC's immediate project goals or its broader strategic objectives. The most immediate concern is the effect that a delay would have on KIUC's ability to capitalize on the opportunity presented by §1603 of the American Recovery and Reinvestment Act of 2009 (the "ARRA"). Under the conditions imposed by this act, tax incentives were made available that average 25-28 percent of the total project cost. The ARRA Tax Grant has no volume cap, but it does impose deadlines which dictated the project's timeline to a substantial degree.

- In order to qualify for this incentive, safe harbor requires non-refundable investment of 5 percent of the qualifying cost of the project by December 31, 2011. KIUC and its subsidiary KRS One met this requirement by purchasing photovoltaic panels and inverters.
- The ARRA further stipulates that the facility be in service by January 1, 2017.
- The deadline for applying for ARRA tax grants (which KIUC and its subsidiary have met) was October 1, 2012.

Delaying action past the point at which KIUC made the tentative decision to proceed with the proposed Anahola Solar project would have made it unable to take advantage of the tax incentives, which the cooperative estimated would increase the cost by at least $10 million. Such a sharp increase in cost would have substantially reduced the net benefit of the project, possibly even bringing the viability of the project into question.

In addition to the financial penalty the delay would impose, it would deprive KIUC's customers of the substantial benefits that substituting solar energy for fossil fuel has for the natural environment and for Kaua'i's economy. The cooperative estimates that each month the project is delayed its customers spend $250,000 more for electricity produced with fossil fuels than they would were it produced with solar. KIUC believes that the sooner that additional solar energy is brought online and reduces Kauai's dependence on fossil fuels, the sooner the economic and environmental benefits described in this report can be realized. Extending development over a longer period of time tends to escalate costs and increase the potential for erosion and other adverse effects on the natural environment, and would prevent KIUC from meeting. Finally, delaying the construction of the proposed Anahola Solar Project would jeopardize the utility's ability to meet the goals of its Strategic Plan and the State of Hawai'i RPS requirements.

4.3 SERVICE CENTER ALTERNATIVES CONSIDERED AND ELIMINATED

4.3.1 ALTERNATE SIZE/LOCATION

The 2005 KIUC Service Center Study evaluated potential site based on six criteria, including: (*i*) availability of land for purchase or lease; (*ii*) associated cost of procuring that land; (*iii*) proximity to the highway for ease of access by customers and employees; (*iv*) location in relationship to the

identified need for additional service infrastructure on the east and north shores of the island; (*v*) proximity to existing or planned KIUC infrastructure; and (*vi*) the relative availability of existing municipal water supply. KIUC evaluated several possible locations for the proposed service center.

Keālia Site. KIUC entered into discussion with Sleeping Giant Sotheby's International Realty to scope possible property owners with land available and appropriate for a service center in the Keālia area. A developer in the area was identified, with land available near the rodeo and historic post office. Ultimately, the site was determined not to be viable as there was insufficient flat acreage and there were constraints on maintaining the historic post office in its original form.

Old Līhu'e Plantation Mill Site. KIUC discussed the possibility of leasing a portion of the Old Līhu'e Plantation Mill site, owned by Grove Farms Co., Inc. This site was eliminated from consideration due to budgetary constraints and the cost of a potential lease.

Makai Anahola Site. In 2006, KIUC spoke with DHHL representatives about the possibility of a service center in Anahola, on a 4-acre parcel on the *makai* side of Kūhiō Highway, just north of the proposed site. This site was subsequently eliminated from consideration, and the present site selected instead, to better conform to DHHL's Anahola Regional Plan, published in June 2009.

Preferred Alternative (Anahola). DHHL directed KIUC to the location that is being proposed as it fits well with the Department's plans for its extensive landholdings in the region, and it offered an attractive lease price as well. The location adjacent to Kūhiō Highway simplifies access by customers and employees, and the spot is well placed in relationship to the identified need for additional service infrastructure on the east and north shores of the island and to existing and planned KIUC infrastructure. The site is also adjacent to the existing Anahola water system, making an extension of that system to serve the potable water needs of the service center a relatively simple proposition. The selection of this site also further supports the relationship between KIUC and DHHL as described above. KIUC assessed numerous locations within the parcel, but ultimately determined the proposed location was best due to the following reasons: (*i*) placing the facility on the eastern edge of the selected parcel minimized the need for additional access roadways and infrastructure; (*ii*) the terrain found further west and south on the parcel was steeper and included some natural drainage ways that would obstruct the construction process; and (*iii*) shifting the service center site farther north within the parcel would place it closer to the residential community in Anahola.

4.3.2 ALTERNATE TIMING: DELAYED ACTION

The Anahola Service Center has been in the planning stages since 2005, when the need for a shift in utility infrastructure was first clearly identified. As such, the proposed project is equivalent to a "delayed action", the service center having been delayed several times since then. Under this alternative, KIUC would not construct a new service center in Anahola and would continue to operate out of its two existing service centers, in 'Ele'ele and Kapa'a. This would mean that KIUC would not be able to meet the project objectives identified in Table 1.2. Service to the east and north sides of the island would not be expedited and customer access to KIUC planners would not be improved.

5. AFFECTED ENVIRONMENT, ENVIRONMENTAL IMPACTS, & MITIGATION MEASURES

This chapter describes the potential environmental effects of the proposed Project. The term "project site" refers to the entire 60-acres on which KIUC would develop facilities, unless stated otherwise. The chapter is organized by resource area (e.g., air quality, noise, geology and soils, water quality, etc.). The discussion under each topic begins with an overview of existing conditions. The scale of this discussion is dependent on the resource; where appropriate, the larger environmental context (e.g., Northeast Kaua'i) is discussed, and in other cases the focus is narrower (e.g., the project TMK parcel). The discussion also distinguishes between short-term construction impacts and those that may result from the facilities' continuing long-term presence, including impacts associated with operation, maintenance, or decommissioning. As discussed previously in Chapter 2, the substation and service center facilities which are part of the proposed project do not have a predetermined service life expectancy and are expected to remain in operation indefinitely. Consequently, the discussion of potential decommissioning impacts is limited to the photovoltaic solar array. Where appropriate, the discussion includes the measures that KIUC proposes to take to minimize or mitigate potential adverse effects.

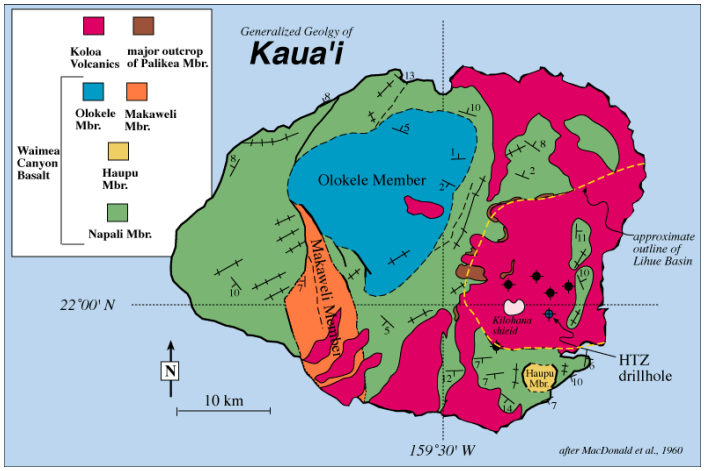
5.1 TOPOGRAPHY, GEOLOGY, AND SOILS

5.1.1 EXISTING CONDITIONS: TOPOGRAPHY, GEOLOGY, AND SOILS

Kaua'i has a land area of slightly more than 550 square miles. Roughly circular in shape, its most striking physiographic features are a high central plateau topping out at over 5,000 feet at the summits of Wai'ale'ale (5,148 feet) and Kawaikini (5,243 feet), steep cliffs and deeply incised valleys along the northern Nāpali coast; the 3,600 foot deep Waimea Canyon; the broad Līhu'e Basin on the southeastern quadrant of the island; and extensive coastal plains. It consists of a single great shield volcano, which is deeply eroded and partly veneered with much later volcanics.

Kaua'i, like the other Hawaiian Islands, was formed by magma that erupted from a hotspot on the earth's crust. Over time, the eruptions formed a typical Hawaiian shield volcano. Kaua'i is thought to have been formed by two or more shield volcanoes.

Figure 5.1 Generalized Geology of Kaua'i Island



The main mass of Kaua'i is believed to be about 3 to 5 million years old, although there were a few small eruptions on the island as late as about 400,000 years ago. Figure 3.1 illustrates the major rock units that are present. The oldest is the Makaweli member of the Waimea Series lavas and is shown in green (Clague & Dalrymple, 1988). The Olokele Member of the Waimea Series (shown in blue) occupies a large area in the center of the island. The Waimea Canyon scarp probably represents a major collapse at the beginning of the post-shield (or declining) stage. Post-shield-building volcanic soils of the Olokele Member of the Waimea Canyon Basalt may have in filled a major caldera-like collapse structure to form the present day broad summit area of Mt.

Wai‘ale‘ale and the Alaka‘i Swamp. The Makaweli series volcanics fill a graben-like feature in the southern part of the island. The major east-west trending Haupu Mountain ridge, between Po‘ipū and Līhu‘e, is composed of the Haupu Member of the Waimea Canyon Basalt. This is thought to be a structural remnant of the original shield-building and/or post-shield volcanic stage of the island.

After a long period (probably about 0.5 to 1.5 million years) of no eruptions and great erosion of the Waimea Series lavas, eruptions began again. Lavas from this second period of great eruptive activity formed the Kōloa series volcanics. The surface expression of these lavas, which underlie the Anahola site, are depicted in red on the map. This post-erosional stage of volcanism on Kaua‘i is particularly well-developed, especially on the eastern side of the island. Very late stage explosive volcanic vents and cones of the Kōloa Volcanics such as Kilohana Crater, Kīlauea Crater, and 35-40 other smaller but similar features are present throughout the eastern portion of the island. The very steep eastern facing scarp of Wai‘ale‘ale was formed in part by the collapse of the Līhu‘e Basin.

The proposed Anahola Solar Project is located approximately one-half-mile (~2,700 feet) inland from the shoreline at its closest point to the shore. The land on which the PV arrays would be constructed stretches from an elevation of approximately +180 feet above mean sea level (msl) near Kūhiō Highway to an elevation of approximately +250 feet above msl at its upper end. The Substation site, which is adjacent to the highway, lies between +180 and 190-fee msl.

No exceptional slopes are present on the area where the solar facilities, substation, or Service Center would be developed. Of the 53 acres of the solar array site, 7 acres are 0-2 percent slope, 36 acres are 2-5 percent slope, 8 acres are 5-10 percent slope, and only 2 acres are greater than 10% slope. All of the land on the 2-acre substation site has a slope of 5 percent or less; the same is true of the proposed Service Center site. According to the USDA Web Soil Survey (2011) and the USDA Soil Survey (1972), all the soil present on the project site is classified as Līhu‘e Silty Clay (LhB), with moderately rapid permeability appropriate for commercial agriculture.

The Land Study Bureau’s Detailed Land Classification rates the agricultural suitability of soils using a 5-class productivity rating. The rating is expressed using the letters “A”, “B”, “C”, “D” and “E”, with “A” representing lands of the highest productivity, and “E” the lowest or very poorly suited for agricultural production. The Land Study Bureau productivity ratings for the areas on which the proposed facilities will be located is “B”. The project site is located entirely on land designated as “Prime” agricultural land by the Agricultural Lands of Importance to the State of Hawai‘i (ALISH) map. Prime agricultural land is land best suited for the production of food, feed, forage, and fiber crops. The land has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated properly and managed according to modern farming methods.

5.1.2 PROBABLE CONSTRUCTION IMPACTS ON TOPOGRAPHY, GEOLOGY, AND SOILS

Construction of the Anahola Solar Project would involve extensive grubbing and vegetation removal, but it entails only a modest amount of actual earthmoving and would have little effect on the overall topography. The estimated cut and fill for the project components are identified in Table 5.1. Not all of the material that is cut will be suitable for use as structural fill. Hence, the contractor may need to import up to 100 cubic yards of material (such as gravel, rock, sand, etc.) capable of creating a strong and stable foundation for key project components. The excess material, i.e., the difference between the volume that will be removed and the amount that will be added to achieve the desired finish grade will either be spread on nearby areas within DHHL’s property or trucked off-site to a location where it can be used or disposed of properly. Minimal grading will be required in most areas of the project site, but grading will be required in areas where the existing slope greater than 10 percent and some depressions will need to be filled. By far the most extensive earthwork in the PV areas will be for the three storm water runoff retention basins that are planned.

Where practicable, material excavated from grading will be used as substrate for the concrete pads under the electrical inverters and transformers, and for the substation area where it will level out areas around a mound on that site. Estimated quantities for these cut and fill volumes are provided in Table 5.1 below.

Table 5.1 Estimated Earthmoving Volumes

Facility	*Estimated Volume (in cubic yards)*		
	Cut	*Fill*	*Import (+)/Export (-)*
Solar Array Phase 1	-16,400	887	-15,513
Anahola Substation	-2,842	14,557	+11,715
Phase 1 Total	-19,242	15,444	-3,798
Solar Array Phase 2	-11,075	3,216	-7,859
Solar Array Phase 3	-8,248	148	-8,100
Anahola Substation	See Note 2.	14,500	-11,715
Anahola Service Center	-6,192	3,762	-2,430
Total	-63,999	52,514	-11,485
Note 1: Access and internal roads are included in the solar array grading phases. Note 2: 1,690 c.y. of cut for the substation are included in Phase 1 calculations.			
Sources: REC Solar (October 17, 2012) Grading Plans Sheets C-3, C-4, and C-5 for Solar Array and Internal Access Roads; Esaki Surveying and Mapping, Inc. Substation Grading Plan dated May 18, 2012, Sheet C-6 for Substation; dated 11/13/2012.			

The soil composition will be altered on over half of the property. In a few areas where select fill will be required (e.g., roadbeds, foundations, substation, etc.), the existing soil composition of the property will be altered in ways that will discourage its return to agricultural use following decommissioning of the solar facilities. However, the areas where this would occur represent just a few percent of the 60-acre project site. The changes that would occur over the vast majority of the property will leave its agricultural potential unchanged.

The vast majority of the project site would be occupied by the solar array, which will be emplaced with racking systems mounted on piles, directly on the existing pasture without need for excavation or foundations which could compromise future agricultural use of the lands beneath. Pursuant to the requirements of the Farm Policy Protection Act (FPPA), KIUC consulted with the Natural Resources Conservation Service (NRCS) on behalf of RUS, filing two USDA Form AD-1006 Farmland Conversion Impact Ratings (one for the PV arrays and the Anahola Substation and one for the Service Center) (see Appendix D). The consultation was required because the project will involve the use of federal funds for the conversion of prime agricultural lands to non-farmland use. Based on the impact ratings, RUS and NRCS concluded that this project was wholly consistent with the FPPA. As no significant geologic resources (e.g., sand or gravel) are present, the proposed project does not have the potential to lessen their availability for other uses. All of the soils and underlying rock that would be affected by the proposed project are suitable for construction of the proposed facilities as they are designed.

5.1.3 PROBABLE OPERATIONAL IMPACTS ON TOPOGRAPHY, GEOLOGY, AND SOILS

The ongoing operation and maintenance of the facilities covered by this report do not involve activities that have the potential to significantly affect topography, soils, or geologic resources.

Maintenance of good ground cover and the use of appropriate vegetation management procedures are essential to preventing substantial soil loss over the long term. That, in turn, will maintain the health and productiveness of the soils so that they can, if deemed appropriate, be returned to agricultural use when the PV arrays are decommissioned. The vegetation management plan that is included in Appendix C describes the methods that will be used to maintain the protective cover in good health for the life of the project. KIUC believes they are adequate to achieve that purpose. Moreover, it will carefully monitor conditions on the site once it assumes responsibility for the solar arrays and stands ready to take immediate corrective action should that be necessary.

5.1.4 PROBABLE DECOMMISSIONING IMPACTS ON TOPOGRAPHY, GEOLOGY, AND SOILS

As indicated earlier in this report, the system is expected to remain in operation for a minimum of 25 years, and it is likely that it will perform adequately for a much longer period of time. When the decision is made to decommission it, the work can be done without any substantial effect on topography or soils, and the area will be returned to much the same condition it is in at present. Manually dismantling the panels and the associated racking and removing the vertical supports using a backhoe and chocker chain would cause minimal soil disturbance. Removing the buried conduits would involve slightly greater disturbance (including mixing of soil profiles (i.e., topsoil with subsoil), compaction, and rutting, but immediate backfilling and revegetation would prevent unnecessary erosion/soil loss. The potential for erosion would be reduced if the buried conduits were left in place, but this would constrain subsequent agricultural use of the strips within which the buried conduit is located.

5.2 HYDROLOGY

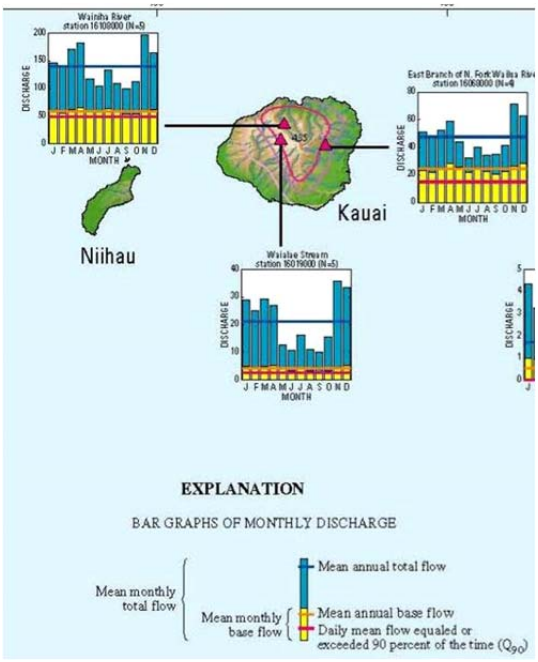
5.2.1 EXISTING CONDITIONS: HYDROLOGY

This section describes the existing movement, distribution, and quality of surface and groundwater on Kaua‘i and in and around the project site. It begins by broadly describing the existing conditions on the island and then narrowing the focus to the project site and the project’s likely impacts to water resources. The subject is broken into two related parts. The first addresses surface water resources, such as ponds, rivers, streams, and their floodplains; the second describes the origin and movement of groundwater through the permeable lavas that underlie the project site.

5.2.1.1 Existing Conditions: Surface Water

Kaua‘i’s surface water hydrology differs somewhat from the other main Hawaiian Islands. Most of the streams radiate out from the Wai‘ale‘ale-Kawaikini massif in all directions, cutting through intrusive dikes that retard the groundwater movement toward the ocean from high rainfall areas in the interior. In the process they tend to receive large influxes of groundwater throughout their length. Thus, unlike most Hawaiian streams, many of those on Kaua‘i actually gain flow as they descend (i.e., they are gaining streams). As a result of this, in some parts of Kaua‘i more than 65 percent of mean annual rainfall becomes stream runoff. This proportion is far higher than the 30 percent of mean annual rainfall that the U.S. Geological Survey estimates runs off as streamflow throughout the State of Hawai‘i.

Even on Kaua‘i, the percentage of rainfall that directly runs off varies spatially among basins and temporally within a basin. Within a basin, the percentage of rainfall that runs off varies temporally among individual storms, and may range from less than 5 to greater than 90 percent. The percentage of rainfall that runs off is generally highest in areas which have relatively high average rainfall, experience high-intensity rainfall, have low-permeability soils, have steep slopes, possess a water table at or near the land surface, or where the antecedent soil moisture is high.



As illustrated by the examples shown to the left, there are substantial differences between different drainages with respect to the seasonality of streamflow, base flow, total discharge, and other factors. At 19.5 miles, the Waimea River-Po'omau Stream is the longest stream on Kaua'i. Other long rivers on the island include the Makaweli River (15.1 miles), the Wainiha River (13.8 miles), the Hanapepe River (13.3 miles), and the Wailua River (11.8 miles). At 140 million gallons per day, the Hanalei River has the highest average discharge. Occupying 424 acres, the Waita Reservoir, which is located on the southern side of the island near Kōloa, is the largest surface water body.

The project site is situated within the 0.9 square-mile Kamalomalo'o watershed. One perennial waterway, Kamalomalo'o Stream, runs along the southern boundary of the project site. Hōmaikawa'a Stream (~1,650 ft. away) and Anahola Stream (~3,000 ft. away) are more distant. Selected characteristics of the Kamalomalo'o watershed are shown in Table 5.2 below.

Table 5.2 Selected Characteristics of Kamalomalo'o Watershed

Name	***Drainage Area***	***Percent by State Land Use District***		
		Conservation	***Agricultural***	***Urban***
Kamalomalo'o	0.9 sq. mi.	2.6%	97.4%	0%
Source: *Atlas of Hawaiian Watersheds & Their Aquatic Resources* (2008)				

Observations during sites visits and a review of data from the State of Hawai'i GIS system, records from the State of Hawai'i Commission on Water Resource Management, the U.S. Geological Survey 1:24,000 scale topographic map and the U.S. Fish and Wildlife Service (http://www.fws.gov/wetlands/data/ mapper.html), indicate that there are no lakes or wetlands in the project site. During plantation days, a pair of irrigation water storage ponds fed by the Lower Anahola Ditch and Kawaho Ditch was situated in a depression approximately one-thousand feet directly west of the Anahola Solar Project site. Examination of recent satellite photography of the area shows that water is no longer impounded.

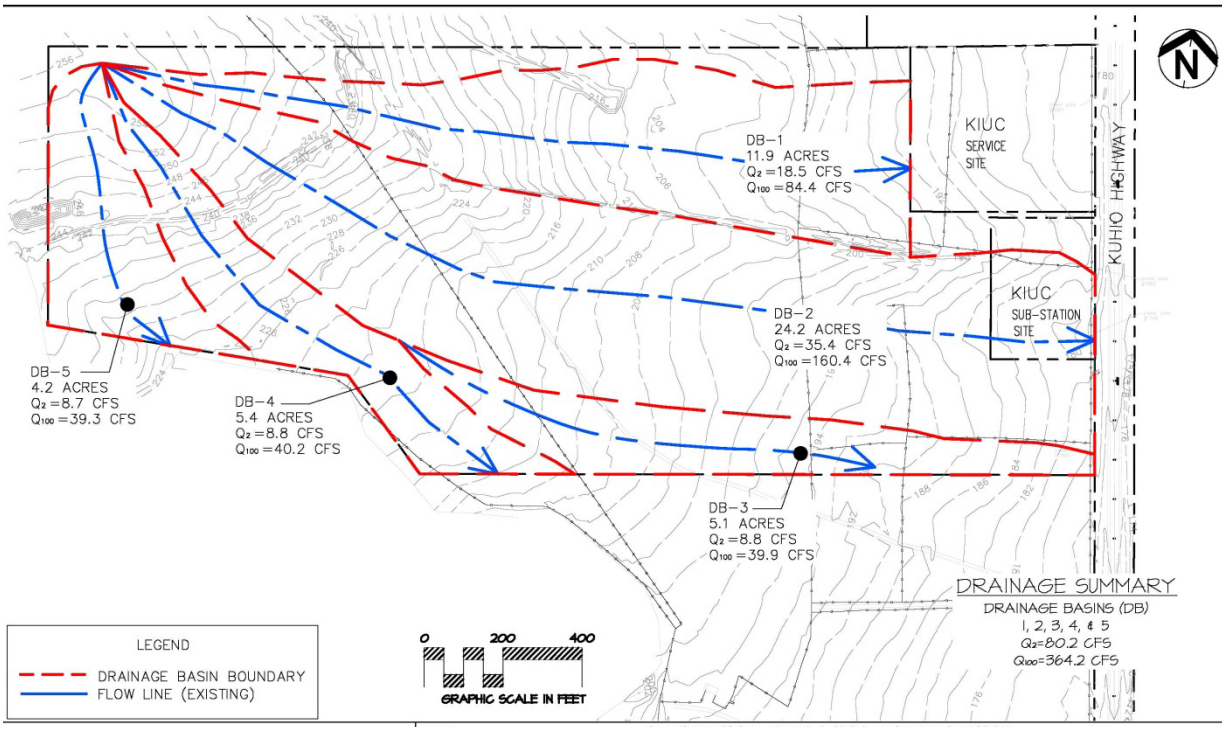
According to the *Atlas of Hawaiian Watersheds and Their Aquatic Resources* (2008), the affected reach of Anahola Stream (the only one of the waterways near the project site listed in the Atlas) does not have a significant level of abundance of native insects or other fauna. There are no known federally-listed threatened, endangered, or candidate species in Anahola Stream; there were however some species of native macrofauna.

Based on the latest available (2007) Flood Insurance Rate Map (FIRM) for the area, the entire project site lies in Flood Zone X. Zone X is defined as the flood insurance rate zone that corresponds to: (*i*)

areas outside the 500-year floodplain; (*ii*) areas within the 500-year floodplain where the water depth resulting from the 100-year flood is less than 1 foot; (*iii*) areas where the contributing drainage area is less than 1 square mile; and (*iv*) areas protected from the 100-year flood by levees. Because of the low probability of flooding, no base flood elevations or depths have been defined within the zone.

Honua Engineering Inc. has prepared a more detailed delineation of drainage basins within the area that would be used for the proposed PV facilities and substation (see Figure 5.2); each drainage basin concentrates storm water runoff to its respective downstream outlet to neighboring downstream properties. Based upon the current coverage of the property of pasture grass and brush with fair coverage, Honua Engineering used a runoff coefficient of 65 for the runoff calculations. Estimates of the existing peak flows from these areas are shown on the drawing for recurrence intervals of 2 and 100 years and are summarized in Table 5.3.

Figure 5.2. Existing Drainage Basins: Project Site



Source: Exhibit 2, Honua Engineering Inc., *Preliminary Drainage Analysis Report* dated September 19, 2012.

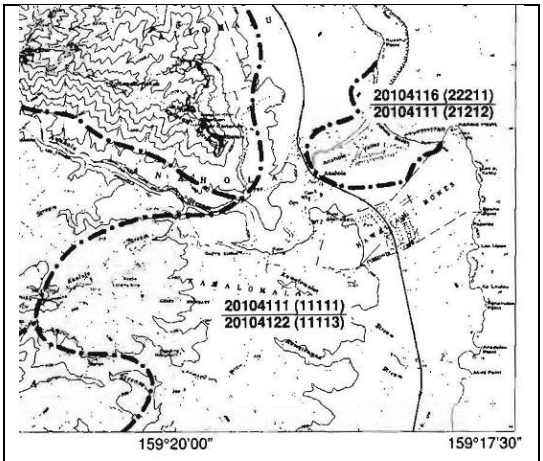
Table 5.3. Existing Peak Discharge (in cfs) for Design Storms

Drainage Basin	*2-year Event – 7*	*100-year Event – 18*
DB-1 (11.9 acres)	18.5	84.4
DB-2 (24.2 acres)	35.4	160.4
DB-3 (5.1 acres)	8.8	39.9
DB-4 (5.4 acres)	8.8	40.2
DB-5 (4.2 acres)	8.7	39.3
PV SITE TOTAL	***80.2***	***364.2***
Note: Volumes are measured at downstream end of drainage areas. Discharge rates are in cubic feet per second (cfs).		
Source: Tabulated by Planning Solutions, Inc. from Exhibit 2, Honua Engineering Inc. *Preliminary Drainage Analysis Report* dated September 19, 2012.		

5.2.1.2 Existing Conditions: Groundwater

The Makaleha Mountains inland of the project site are exposures of the Nāpali formation. A formation is a grouping of basaltic lavas produced by the shield volcano that forms the island. A large remnant of the Nāpali rises above the Koʻolau platform near Papaʻa, which is a short distance north of Anahola. Where the mountains plunge beneath the lavas that make up the Koloa platform (on which the site is situated) an unconformity of old alluvium occurs. The Koloa formation carries poorly permeable perched aquifers while the Nāpali contains high level dike aquifers.

Figure 5.3 Aquifer Designation



Source: Mink and Lau (September 1992).

The State of Hawaiʻi Commission on Water Resource Management (CWRM) has established ground-water hydrologic units to provide a consistent basis for managing ground water resources. The units are primarily determined by subsurface conditions, with each island divided into regions that reflect broad hydro-geological similarities while maintaining hydrographic, topographic, and historical boundaries where possible. As shown in Figure 5.3, the project site overlies the Anahola Aquifer (20104) of the Līhuʻe Hydrologic Unit.[16] Mink and Lau (September 1992) classified the aquifer according to its development stage, utility, salinity, uniqueness, and vulnerability to contamination using a system based on the U.S. Environmental Protection Agency groundwater classification system (see Table 5.4). Because the upper and lower formations beneath Anahola differ from one another, there are two numbers applicable for Anahola. The CWRM has determined that the sustainable yield of the aquifer is approximately 17 million gallons per day. In cases where CWRM has determined that special limits are required in

[16] The southern boundary of the aquifer is the Wailua drainage divide; the northern boundary is the Hanalei-Kawaihau District line and reaches the sea just north of Moloaʻa Bay; and the interior boundary follows the crest of the Makaleha Mountains. Total area is 45 square miles.

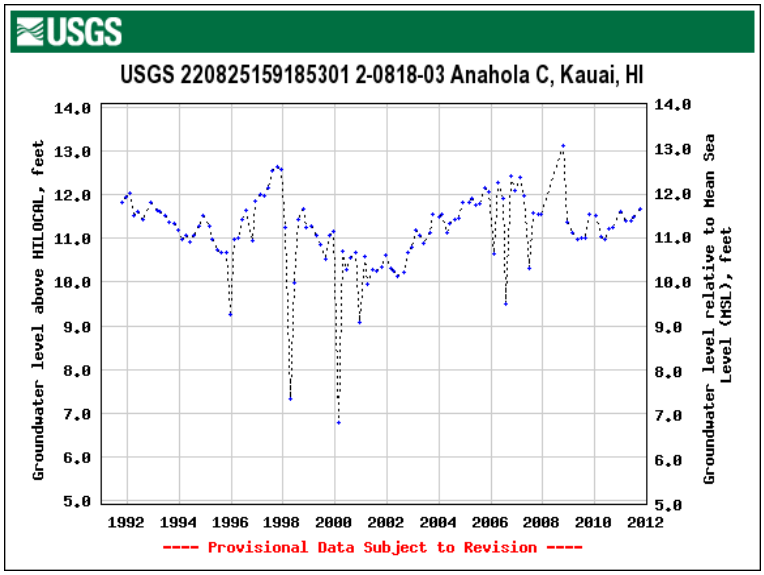
order to properly manage the resource, it has established Water Management Areas. To date, CWRM has not established any groundwater management areas on Kaua'i.

Table 5.4 Anahola Aquifer Classification

Factor	*Upper Formation (20104111)*	*Lower Formation (20104122)*
Development Stage	Currently Used	Currently Used
Utility	Drinking Water	Drinking Water
Salinity (mg/l) Cl^-	Fresh (<250)	Fresh (<250)
Uniqueness	Irreplaceable	Irreplaceable
Vulnerability to Contamination	High	High
Source: Mink and Lau (September 1992)		

The Kaua'i County Department of Water Supply owns and operates three wells (Anahola Wells A, B, and C) that are located a short distance north of the project site. Its 2010 annual report on the quality of the water from the wells showed that there is no contamination. The State of Hawai'i Department of Health maps showing areas where the groundwater is known to be contaminated also indicate that there is no contamination in the Anahola area.[17] The U.S. Geological Survey's monitoring data from the Anahola C well shows that the groundwater levels fluctuate over time, but do not appear to have a significant upward or downward trend (see Figure 5.4).

Figure 5.4 Water Levels in the Anahola C Well: 1992-2011



Note: The well is located at 22°08'14.5" north/ 159°18'43.7" west (NAD83).
Source:http://nwis.waterdata.usgs.gov/usa/nwis/gwlevels/?site_no=220825159185301

[17] See http://hawaii.gov/health/about/admin/health/environmental/water/sdwb/conmaps/pdf/conmaps05.pdf.

5.2.2 PROBABLE IMPACTS: HYDROLOGY

None of the actions associated with the proposed project would require alterations of existing stream channels, wetlands, or other surface water bodies, nor would the actions occur within or near the 100-year flood plain (Zone A). The proposed project will not involve any "critical action" [18] in the 500-year floodplain, and is consistent with the applicable regulations and guidance pertaining to floodplain management. In order to meet the requirements of the County of Kaua'i *Storm Water Runoff System Manual, 2001*, the existing drainage pattern will be maintained and peak storm water flows will not exceed the current discharge to the downstream properties. The following descriptions of the facility-specific measures describe how the proposed project has been designed to ensure that this regulatory requirement is met, and surface water is protected.

5.2.2.1 Effects on Surface Runoff Volumes

Roadways and Substation. The site access roadways and the Anahola Substation would have gravel or other similarly permeable surfaces.[19] The runoff coefficients for such areas are equal to or lower than those for the existing groundcover. Hence, they do not have the potential to increase runoff. In fact, under certain rainfall intensities, they would tend to increase infiltration/recharge relative to the existing conditions.

PV Arrays and Related Equipment. Upon completion, approximately 60 percent of the site consists of the open grassed and/or graveled access areas between the panels. Engineers anticipate that storm water runoff from these areas will be approximately the same as it is now, as the materials which will be placed there are intended to allow water to both infiltrate at the same rate as they do now.

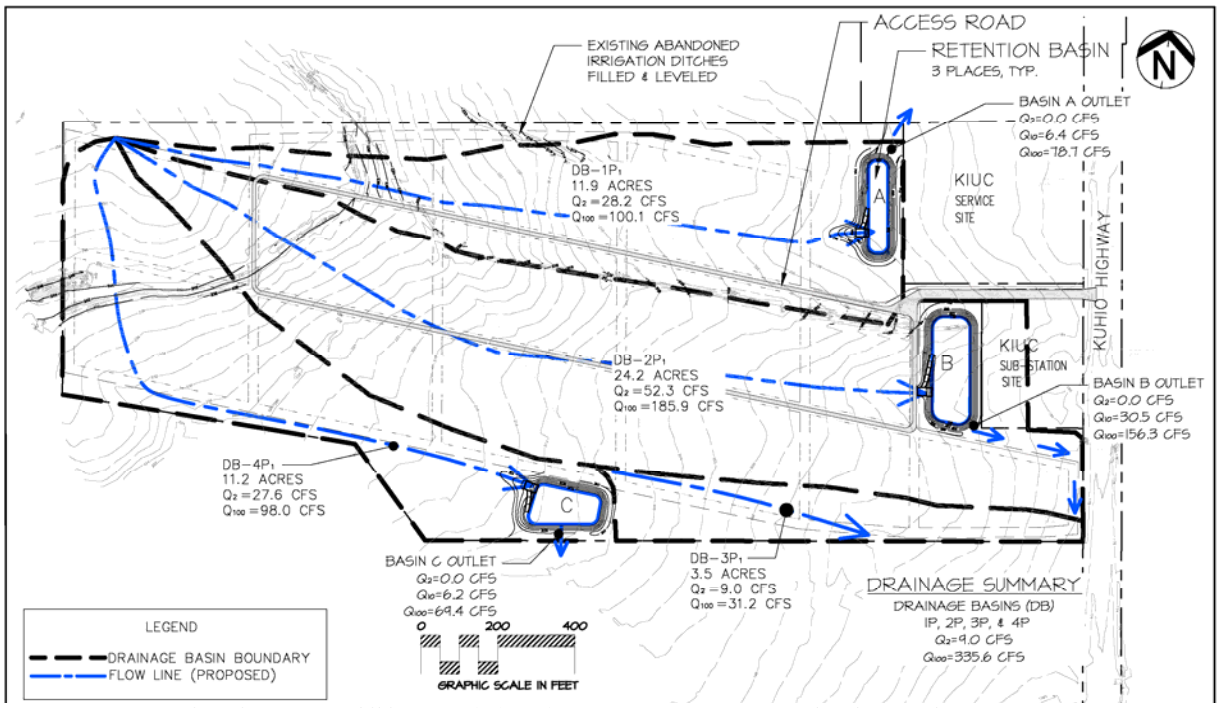
PV arrays and related equipment would cover approximately 40 percent of the site—mostly with the panels themselves—and would have a more substantial effect. Rain falling on impervious glass surfaces of the PV modules will run down the panels, drip off the edges, and fall onto the ground; when it reaches the soil, the water will be more concentrated than it is under existing conditions. As a result of this concentration, a smaller proportion of the water will percolate into the ground than is presently the case and surface runoff will increase. In addition, the inverters and some of the other equipment serving the PV arrays would be mounted on pads which would also introduce new, impermeable surfaces where water previously could percolate into the ground. However, their relatively small size (less than 500 square feet each), limited number (12), and dispersed location means that they will not measurably alter runoff from the 53-acre solar site.

In order to prevent the increase from affecting off-site properties, drainage swales will intercept the runoff and channel most of it into one of three large retention basins. The configuration of these basins is shown in Figure 5.5. The basins will capture runoff from the solar array and are sized to retain all of the runoff resulting from a 24-hour rainfall event with recurrence intervals of less than 10 years (which is estimated as being 12 inches). Runoff from larger, less frequent rainfall events will exceed the storage capacities of the basins and they will start to overflow. Discharges from retention basins resulting from those larger rainfall events (the 10-year and 100-year storms) are shown in Table 5.5.

[18] 24 CFR § 55.2(b)(i) Critical action means any activity for which even a slight chance of flooding would be too great, because such flooding might result in loss of life, injury to persons, or damage to property.

[19] The exceptions to this generalization are the concrete pads that will form the foundations of equipment pads and the BESS units. Because these would occupy a small percentage of the overall surface and would drain directly onto the highly permeable surrounding areas, the general point holds true.

Figure 5.5. Proposed Drainage Plan: PV Array



Source: Honua Engineering, Inc. Exhibit 3, *Anahola Solar Array Drainage* Report dated December 20, 2012.

Table 5.5. Estimated Peak Discharge (cfs) for Design Storms

Drainage Basin	***Peak Discharge by Recurrence Interval***		
	2-year	***10-Year***	***100-year***
DB-1P (11.9 acres)	28.2	*n.a.*	100.1
DB-2P (24.2 acres)	52.3	*n.a.*	185.9
DB-3P (3.5 acres)	9.0	*n.a.*	31.2
DB-4P (11.2 acres)	27.6	*n.a.*	98.0
TOTAL	***117.1***	***n.a.***	***415.2***
Retention Basin A	0	6.4	78.7
Retention Basin B	0	30.5	156.3
Retention Basin C	0	6.2	69.4
DB-3P (3.5 acres)	9.0	12	31.2
TOTAL	***9.0***	***55.1***	***335.6***
Note: n.a. = not available because these were not calculated as part of the drainage analysis. 24-hour rainfall intensities used in calculations were 7" for 2-year; 12 inches for 10-year; and 18" for 100-year storm events.			
Source: Tabulated by Planning Solutions, Inc. from Exhibit 3, Honua Engineering Inc. *Drainage Report* dated December 20, 2012.			

Table 5.6 compares existing and "with PV Array" runoff; it shows that the three retention basins will decrease peak runoff from all of the drainage basins that they serve. Runoff leaving the narrow strip

of land along the southeastern edge of the site (DB-3P as depicted in Figure 5.5) will decrease as well because minor grading will reduce the size of the area that drains off-site (from 5.1 to 3.5 acres).

Table 5.6 Change in Peak Discharge from PV Array Site

	2-year	*10-year*	*100-year*
Total Existing Discharge	80.2	n.a.	364.2
Total Post-Project Discharge	9	n.a.	335.6
Change in Runoff	-71.2	n.a.	-28.6
Note: 24-hour rainfall intensities used in calculations were 7" for 2-year and 18" for 100-year storm events.			
Source: Tabulated by Planning Solutions, Inc. using estimates contained in Honua Engineering Inc. *Preliminary Drainage Analysis Report* dated September 19, 2012.			

Anahola Service Center. The design of the drainage system for the Anahola Service Center site is less advanced than that for the PV arrays. Estimates based on conceptual plans for the facility assume that on-site storage basins will be created along the northeastern side of the site. Assuming the system complies with the County's storm drainage standard mandate not to increase runoff. Runoff following construction of the Service Center and related facilities would be as shown in Table 5.7. This would continue to enter the drainage swale along Kūhiō highway and continue from there along existing flow paths.

Table 5.7 Peak Discharge from Service Center Site

	Peak Discharge (in cfs) by Recurrence Interval		
	2-year	*10-year*	*100-year*
Total Existing Discharge	4.86	n.a.	20.25
Total Post-Project Discharge	26.57	n.a.	56.70
Change in Runoff	+21.71	n.a.	+36.45
Note: 24-hour rainfall intensities used in calculations were 7" for 2-year and 18" for 100-year storm events. Without the retention basin that is part of the Service Center design, 2-year and 100-year runoff volumes would be higher (26.57 cfs and 56.70 cfs, respectively).			
Source: Tabulated by Planning Solutions, Inc. using estimates contained in KIUC transmittals dated December 12, 2012 and January 1, 2013.			

5.2.2.2 Adequacy of Kūhiō Highway Storm Drainage System

While the total volume of water leaving the area will be reduced relative to pre-project conditions, it will reach Kūhiō Highway differently than is now the case. For storms with a recurrence interval of 2 years or less, most of the surface runoff will never reach the highway, instead being captured in one of the retention basins and either percolating into the ground or evaporating into the atmosphere. Only very small amounts falling on areas that cannot be diverted into a retention basin will continue to reach the swale along the *mauka* side of the highway will continue as it does now. As a result, the volume of water in the swales will be substantially lower than at present.

For storms with a recurrence interval greater than 2-years, some overflow from the basins will reach Kūhiō Highway; its total volume will be less than the present total runoff from the site, but the discharge will be more concentrated.

The flows (from northernmost to southernmost) are:

- Overflow from Basin A, which is immediately above the service center site. This will be spread into the area immediately north of the site and will flow overland from there down to the swale along the *mauka* side of the highway.
- Overflow runoff from the Service Center site, which will be discharged from a retention basin along the *makai* side of the 5-acre site into the swale along the *mauka* side of Kūhiō Highway.
- Runoff from the lower portion of the new access road that cannot, because it originates lower on the hillside, be diverted into one of the retention basins. This will be captured and diverted into the swale along the side of the highway.
- Runoff from the substation site, which will be released into the same swale along the *mauka* side of Kūhiō Highway.
- Overflow from Basin B, which will be released through an overflow just to the south of the substation site and will reach the swale along the highway over a relatively narrow front.
- Overflow from Basin C, which will be spread along the gulley immediately south of the site.

Under the most common conditions, very little runoff will reach the existing drainage facilities along Kūhiō Highway, thereby assuring that they will perform satisfactorily. Infrequently, storm runoff reaching the existing highway drainage swale may exceed the capacity at a given point. To the extent that this occurs, some overflow could cross the highway. KIUC's engineers believe that this will be a rare event and that the volume is sufficiently small that it will not damage the highway or interfere substantially with the normal flow of traffic.

5.2.2.3 Effects on Surface Water Quality

Constructing and Maintaining PV Arrays and Related Equipment. While the amount of earthmoving required to erect the PV arrays is relatively small in terms of cubic yards, it involves stripping existing vegetation from approximately 53 acres of land during the site preparation phase of construction, and there is the potential for storm events that occur during the construction period to cause erosion and soil loss.[20, 21] The key to minimizing the adverse water quality effects of this is to limit the area that is exposed at any one time, to quickly re-establish vegetative cover, and to ensure that the cover is permanently maintained. REC Solar and KIUC have prepared a detailed erosion control/vegetation management plan with "Best Management Practices" (BMPs) for the project site that is intended to do that. That plan is reproduced in Appendix C of this report, and the measures that are included in it are expected to be conditions of approval of the NPDES construction Permit (NOI-C) that will be required from the State of Hawai'i Department of Health.

In accordance with that plan, the solar arrays and support equipment will be installed in three phases as a means of limiting the soil area that is exposed at any one time.

[20] This would not be an entirely new experience for the area. On the contrary, during the period of intense sugar cane cultivation, the vegetation was stripped completely bare and the fields ploughed at least once every two years. Nonetheless, the increased sediment in nearshore waters that resulted from these practices was one of the detrimental side effects of the sugar industry, and it is not a model that is to be emulated.

[21] Because of its size (greater than one-acre), construction this project will require coverage for the discharge of storm water under the State of Hawai'i NPDES General Permit program (HAR §11-55, Appendix C).

- Work will begin by grading about half (8.4 of 17.4 acres) the Phase 1 area at the Southeast corner of the site. The majority of the grading for this phase will be to create a pad for the KIUC sub-station site and the excavation of the first of three storm water retention basins on the site. In addition, the primary construction access road to Kūhiō Highway, the interior access drives for the array blocks, the swales to direct runoff to the retention basin, and all the abandoned irrigation ditches will be filled and/or graded. Upon completion of the grading operations the disturbed areas will be hydro-seeded with mixture of rye grass for short term erosion protection and Bermuda grass for long term protection. All vegetation removed from the graded areas will be shredded on-site and used as mulch on the non-graded areas to provide weed control and minimize dust from the installation of the array blocks.
- Once the Phase 1 portion is stabilized, grading operations and revegetation will commence upon the Phase 2 portion of the site following a similar progression as Phase 1.
- Upon stabilization of the graded areas on Phase 2, work will then commence on the final third phase of the PV installation.

Operating and Maintaining the PV Arrays. The planned retention basins will intercept the vast majority of the surface runoff originating on the land where the PV arrays are to be located. Suspended soil particles will settle out and be retained within the basins. As a result, under most conditions the quality of runoff from the area will be substantial better than at present. Even during the rare periods when rainfall is sufficiently intense and prolonged to cause the basins to overflow, larger soil particles will settle out in the basins, with only the smaller particles remaining in the water that spills over the discharge weirs. The weirs themselves are designed to have cross-sectional areas that are sufficient to keep discharge velocity below erosive levels.

In order to maintain the PV modules, workers must ensure that there is sufficient ground cover to prevent excessive erosion while at the same time keeping vegetation from growing so tall that it shades the arrays, thereby reducing their output. To prevent shading, workers will periodically mow the pasture grass between the array modules; this will keep it at a height that is both sufficiently tall to absorb the impact of falling raindrops and retard the lateral movement of surface runoff and sufficiently low to avoid shading the PV panels.

Two factors prevent a similar approach to the area beneath the modules. First and foremost, because the array modules shade the ground beneath them, grass grows poorly, if at all. Even if the grass could be made to grow there, it could not be used because the presence of the vertical supports prevents effective mowing. The contractor is investigating two possible methods of overcoming the challenges this presents; both are described in the project's Vegetation Management Plan (VMP).

- The first is to place a layer of organic mulch beneath the panels that protects the soil from erosion and inhibits weed growth. By maintaining the existing pasture grass throughout the arrays and by covering bare soil areas underneath the modules with regular applications of mulch, the impact on the runoff coefficient will be minimized which is the primary variable that impacts the amount of storm water runoff from the project. A composite runoff curve number was developed for each of the drainage basins that varied slightly depending on the various uses in each drainage basin with a typical value of 75.
- The second is to use a geotextile fabric that inhibits weed growth but still allows water that runs off the panels to infiltrate into the ground. A preliminary analysis of this method is focused on using a fabric that provides a similar composite runoff curve number as mulch.

The PV portion of the project does not require the storage or discharge of hydrocarbons, chemicals, or other potential contaminants. Except for the possibility of a fuel spill during construction, chemical releases from the ongoing operation of the solar farm have virtually no potential to affect water quality adversely.

Constructing, Operating, and Maintaining the Anahola Substation. The retention basin that is planned within the PV Area immediately above the substation will intercept all runoff originating uphill of it. The gravel that will cover the two-acre Substation site is highly resistant to erosion; that, together with landscaped and grassed berm on the eastern edge of the substation site virtually eliminates the potential for the substation site to introduce suspended sediment into the runoff.

None of the exposed equipment at the substation (e.g., transformers, circuit breakers, cabling, etc.) contains hazardous materials or other sources of hazardous pollutants that could enter the runoff. Some hazardous materials are present within the BESS, but they are totally enclosed and here is no potential for them to be picked up by storm water runoff.

Constructing, Operating, and Maintaining the Anahola Service Center. The BMPs that will be employed during construction of the Anahola Service Center will limit the potential for construction activities to adversely affect water quality. These will include the same general measures provided for in the BMP for the PV portion of the project. As construction of the Anahola Service Center involves the disturbance of more than 1 acre of land, it will require NPDES General Permit coverage from the State of Hawai'i Department of Health. Certain uses on the service center site (e.g., storage of solvents, diesel fuel, and motor oil) involve industrial activities that are subject to regulation by the State of Hawai'i Department of Health. In accordance with this requirement, KIUC will incorporate all components of the Anahola Solar Project into its Master Storm Water Pollution Prevention Plan (SWPPP) and take all necessary steps to implement its stipulations.

5.2.2.4 Effects on Groundwater

Recharge. As discussed above, the proposed facilities will result in portions of the project site having more impermeable/less-permeable surfaces than is presently the case. Groundwater recharge beneath those areas will be reduced. However, this will be more than offset by the increased recharge that will occur through the retention basins. Assuming these are well maintained to prevent the buildup of excessive fine sediments, more recharge will occur after the proposed facilities are constructed than is presently the case.

Groundwater Withdrawals. Once in operation, neither the PV array nor the substation will require or lead directly to sustained groundwater withdrawals. However, water will be required during the approximately 9- to 12-month construction period for dust control (~20,000 gallons per day) and to facilitate the grow-in of ground cover (~100,000 per day). In order to meet this need, KIUC plans to create a temporary on-site well. The well would be drilled to a depth of approximately 400 feet, and be equipped with a 20 horsepower, three-phase 460-volt electrical motor supplied by an onsite electrical generator. The well will have an 8-inch casing and a pump capable of providing 150-200 gallons per minute, a flow rate which would be sufficient to meet all of the dust control and irrigation needs. The well will be drilled, cased, pump tested, and permitted to meet all State of Hawai'i and County of Kaua'i well construction standards.

Over the long-term, the only water use requirement for the PV arrays and substation will be water for periodic washing of the PV panels. KIUC and its contractor estimate that this would require an average of no more than a few thousand gallons per day, and only on those days when cleaning was being conducted. As indicated, KIUC would obtain this supply from the stock of demineralized feedwater at the Kapaia Generating Station, and represents only a small fraction of the amount available.

Anahola Service Center. All of the water used at the service center will be obtained from the Kaua'i County Department of Water Anahola System. As discussed in Section 5.10.1 the DWS Anahola water system has adequate supplies for this use.

5.2.2.5 Sanitary Wastewater Disposal

Neither the PV arrays nor the substation will generate sanitary wastewater. Sanitary wastewater generated at the service center will be collected and piped to an on-site treatment and disposal system designed in accordance with the State of Hawaii Department Administrative Rules §11-62 governing wastewater systems.

5.3 CLIMATE/MICRO-CLIMATE

5.3.1 EXISTING CONDITIONS: CLIMATE/MICRO-CLIMATE

Climate encompasses variable factors including temperature, humidity, wind, precipitation, and other meteorological measurements in a given region over time. Climate can be contrasted to weather, which is the present condition of these elements and their variations over shorter periods. A microclimate is a local atmospheric zone where the climate is distinct from the surrounding climate. In the present case the area of concern with respect to microclimatic effects is the area on and immediately adjacent to the 60-acre project site where such things as air temperature, wind speed/direction and humidity could be altered by construction and operation of the proposed facilities.

The Hawaiian Island chain is situated south of the large Eastern Pacific semi-permanent high-pressure cell, the dominant feature affecting air circulation in the region. This high-pressure cell produces very persistent winds over the islands called the northeast trade winds. During the winter months, cold fronts sweep across the north central Pacific Ocean, bringing rain to the Hawaiian Islands and intermittently modifying the trade wind regime. Thunderstorms, which are rare but most frequent in the mountains, also contribute to annual precipitation. There is great climatic variation across the island. Selected temperature and rainfall averages for different towns (arranged according to elevation above sea level) are shown in Table 5.8. The extremes reached in other locations can be much greater. For example, the average annual rainfall atop Mount Waiʻaleʻale (+5,148 msl) is probably about 400 inches per year while at Barking Sands (Polihale), which is less than 20 miles away, average annual precipitation is on the order of 10 inches.

Table 5.8 Average Elevation, Temperature, and Annual Precipitation on Kauaʻi

Station	*Ground Elevation (ft. +msl)*	*Average Temperature (°F)*		*Average Annual Precipitation (inches)*
		Coolest Month	*Warmest Month*	
Kekaha	9	64.5	84.8	20.66
Poʻipū	50	69.3	82.6	34.35
Līhuʻe Airport	103	69.8	81.1	40.81
Kīlauea Town	320	67.1	79.5	67.92
Kōkeʻe	3,600	51.1	67.3	66.26
Source: Dept. of Business, Economic Development, and Tourism *2010 State of Hawaii Data Book*				

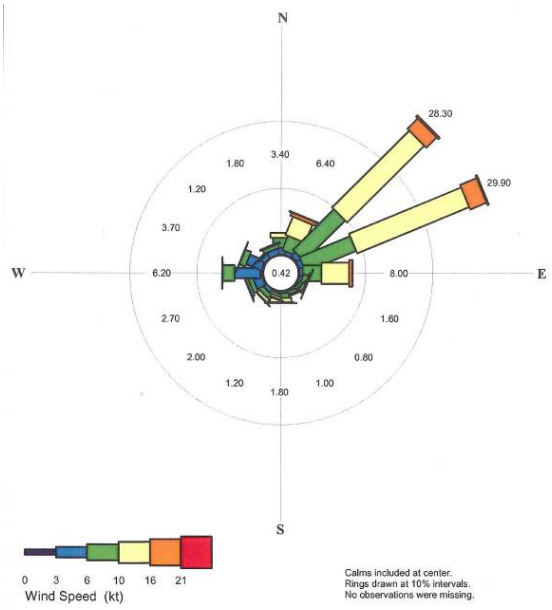
5.3.1.1 Wind

The northeast trade winds are the most important determinant of Kauaʻi's climate. The trade wind zone moves north and south seasonally with the sun, so that it reaches its northernmost position in the summer. Consequently, the trade winds are strongest and most persistent from May through September, when the trades are prevalent 80 to 95 percent of the time. From October through April, Hawaiʻi is located to the north of the heart of the trade winds, and their frequency decreases to about

50 percent (as a monthly average). Kaua‘i’s topography interacts with the winds to produce large variations in conditions from one locality to another. Air blowing inland as part of the trade wind flow is redirected horizontally and vertically by the mountains and valleys. This complex three-dimensional flow of air results in marked wind speed and directional differences from place to place in wind speed, cloudiness, and rainfall.

Figure 5.6 shows a wind rose diagram based on wind data recorded at Līhu‘e Airport between 1950 and 1995. It indicates that the winds there come from the east through northeast approximately two-thirds of the time. No site-specific wind information is available for the project site. However, as its exposure is similar to that of the airport, the wind rose is believed to be reasonably representative of conditions there.

Figure 5.6 Wind Rose: Līhu‘e Airport, 1950-1995



Source: R.M. Towill & Associates

As part of work aimed at updating building codes throughout the State of Hawai‘i, Chock, et al. have prepared “Micro-zoned Design Maps of Topographic Wind Effects and Exposure in the State of Hawaii”. The islandwide wind-exposure map that they prepared for use in amending the building code show that there are no special topographic or other features that would cause winds on the project site to be particularly severe (see Figure 5.7). Chock, et al. recommend using the standard wind design speed (105 miles per hour) in designing structures for the area on which the facilities are proposed.

5.3.1.2 Rainfall

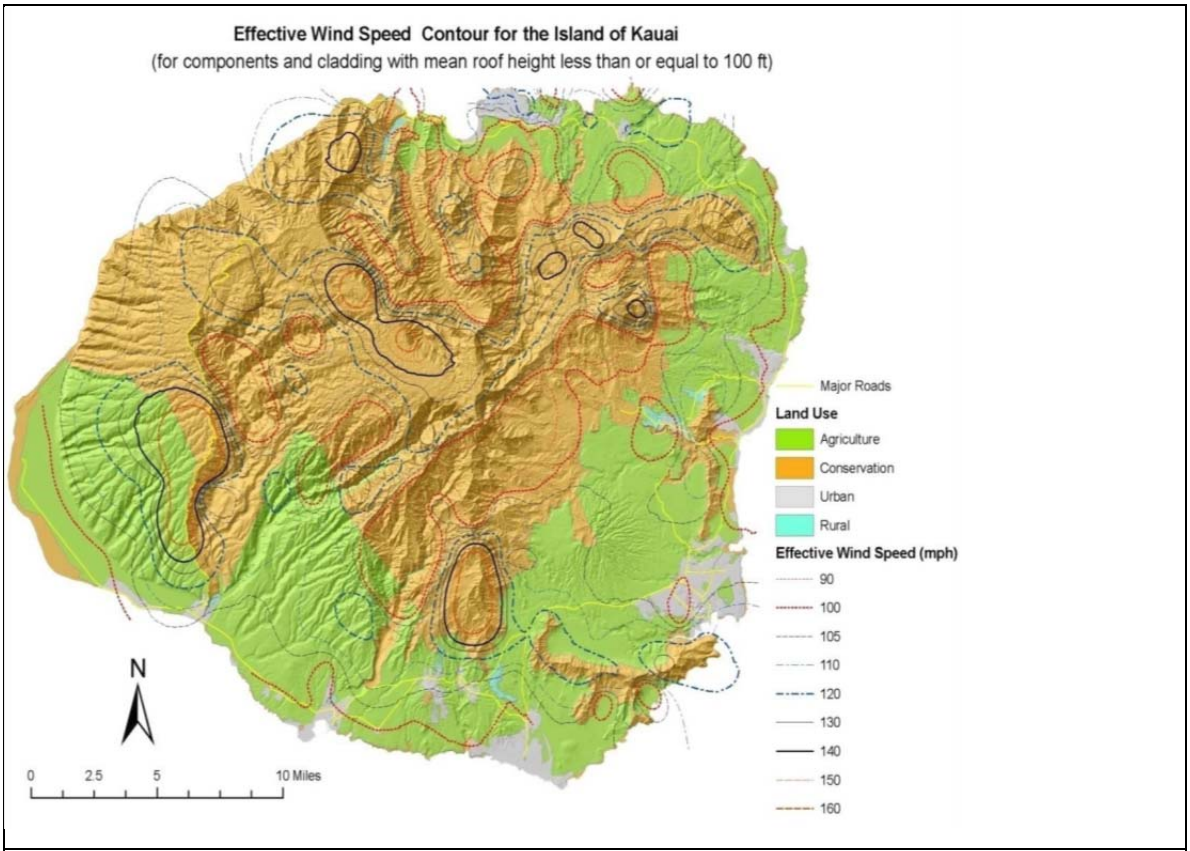
The nearest rain gauging station to the proposed project site is at Anahola (Station 1114), just a few hundred feet to the north of the project site. The average annual precipitation at this location between 1930 and 1995 was just under 50 inches. With average monthly rainfall of 5.9 inches and 6.0 inches, respectively, December and January were the wettest months during that period. With 1.4 inches, June was, on average, the driest month. Average annual rainfall data is summarized in Table 5.9 below.

Table 5.9 Average Annual Rainfall: Anahola Station 1114, 1930-1995.

Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Year*
6.0	4.8	5.7	4.6	3.4	1.7	2.4	2.5	2.1	4.5	5.2	5.9	49.1

Source: http://www.worldclimate.com/cgi-bin/data.pl?ref=N22W159+2200+510145C; ANAHOLA 1114, KAUAI data derived from NCDC Cooperative Stations. 50 complete years between 1930 and 1995.

Figure 5.7 Effective Wind Speed: Island of Kaua‘i.



Source: martinchock.com/_library/documents/papers/hawaiistatebuildingcodewindprovisions.pdf

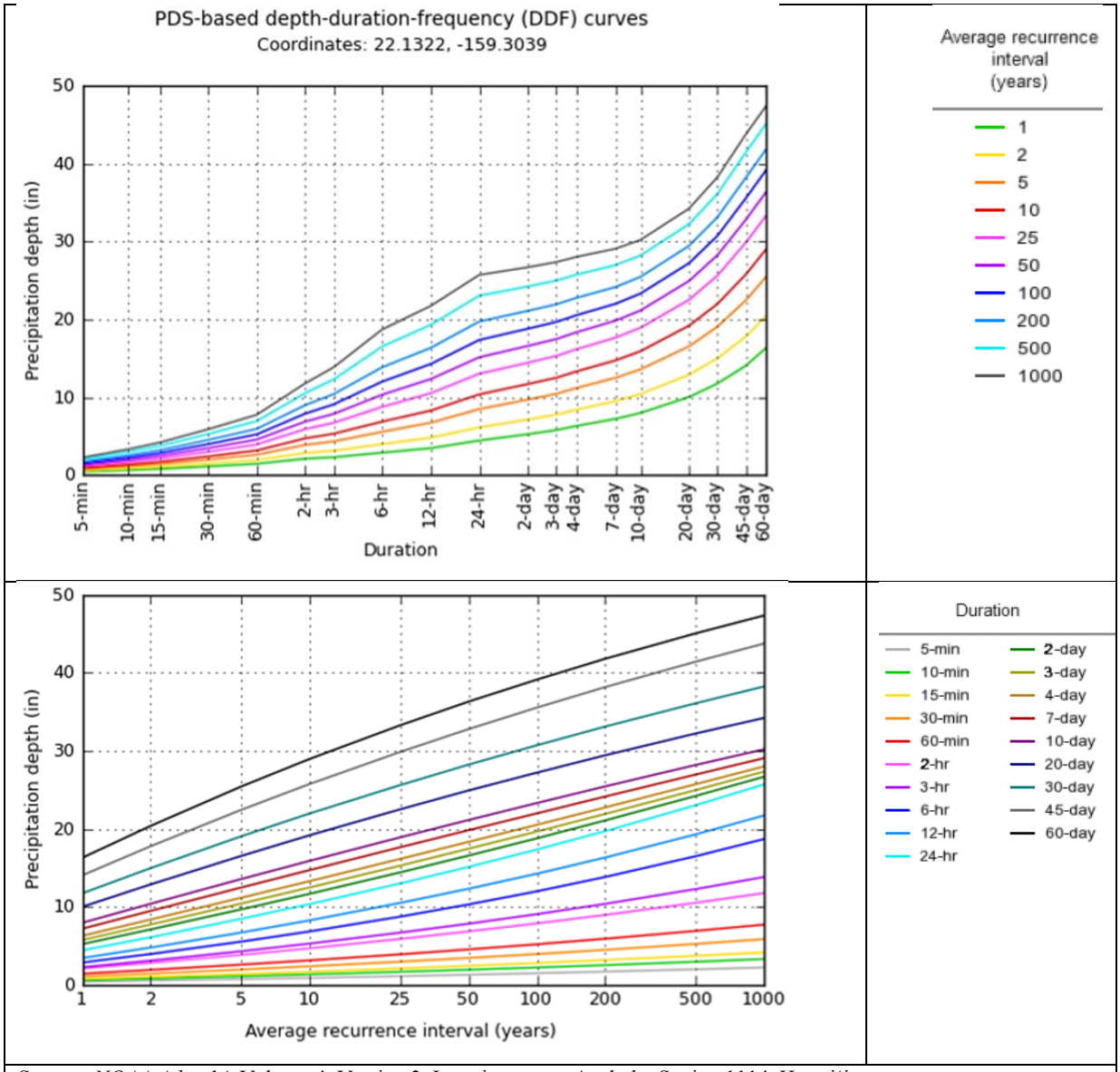
While the average rainfall amounts at Anahola are modest, storms can produce extremely heavy rainfall events. As can be seen in the plots reproduced in Figure 5.8, the 24-hour rainfall with a recurrence interval of 25 years (the lifetime of the project) is about 13 inches. The 100-year/24-hour rainfall event is approximately 18 inches.

5.3.1.3 Temperature

Temperatures in the project site are moderate. Data from the Līhu‘e Airport, which is at a slightly lower elevation but otherwise similar to the Anahola area, is reproduced in Table 5.10. The average temperature there during the coolest month of the year (February) is 71.6°F; during the warmest month of the year (August) it is 79.7°F. The average monthly minimum temperature is lowest in January and February, when it is 65.5°F. The average monthly maximum temperature during the

warmest month (August) is 84.8°F. The highest temperature ever recorded at the station is 91°F; the lowest temperature is 46°F, which occurred on January 14, 1930. [22]

Figure 5.8 Rainfall Depth-Duration Frequency Curves, Anahola, Kaua'i.



Source: *NOAA Atlas 14*, Volume 4, Version 3, Location name: Anahola, Station 1114, Hawai'i.

Table 5.10 Average Temperatures, Līhu'e Airport: 1981-2010.

Temperature (deg F.)	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Year*
Average	71.7	71.6	72.6	74	75.8	78.1	79.2	79.7	79.5	78.1	75.7	73.2	75.8

[22] Interestingly, that extreme high temperature has been recorded six times over the past 90 years, but the most recent occurrence was in 1936 (9/4/1936; 10/4/1930; 10/21/1926; 10/26/1925; 7/4/1918; and 7/2/1918.

Temperature													
Avg. Minimum Temperature	65.5	65.5	67.0	68.8	70.4	73.0	74.1	74.6	74.1	72.9	70.7	67.6	70.4
Avg. Maximum Temperature	78.0	77.8	78.4	79.2	81.2	83.2	84.2	84.8	84.8	83.4	80.8	78.8	81.2
Source: http://www.nws.noaa.gov/climate/xmacis.php?wfo=hnl													

5.3.2 EFFECTS ON CLIMATE

There is increasing agreement among atmospheric scientists that emissions of what have come to be known as "greenhouse gases" from fossil fuel-fired power plants are contributing to a heating of the earth's atmosphere.[23] Generally referred to as climate change, a continuation of this trend has the potential to alter atmospheric circulation and climate worldwide, with a host of consequences. The electricity produced by the proposed PV arrays will allow KIUC to reduce the output and fuel combustion at its existing fossil fuel-fired generating facilities while still meeting the needs of its customers. Since burning oil at power plants produces carbon dioxide, methane, and other greenhouse gases, this will lower KIUC's emissions of those pollutants.

The proposed project will produce an estimated 23,525 megawatt-hours (MWh) of electricity per year. If emissions from KIUC facilities were equivalent to the national average for oil-fired generation of 1,672 pounds of carbon dioxide per MWh[24] and if power from the PV arrays could be substituted one-for-one for the power from the existing oil-fired facilities, the project would reduce CO_2 emissions by 19,669 tons per year. This is far too small to have a measurable positive effect on global warming in and of itself; however, the initiative represents a positive step forward towards meeting renewable energy standards in Hawaii that have been established to reduce the dependence on fossil fuels and reduce CO2 emissions.

5.3.3 EFFECTS ON MICROCLIMATE

None of the activities or work required to construct the proposed project involve substantial heat or moisture emissions or would alter shade/reflectivity in ways that have the potential to affect microclimate. Neither do they entail the erection of tall structures or re-grading of land sufficient to alter wind flow within the project site or surrounding areas to any measurable extent. The substation and service center do not contain or provide significant sources of shade, heat, or moisture sources. Neither do they contain substantial structures that might serve as windbreaks or large masses of material that would serve as heat sinks. Consequently, they do not have the potential to measurably affect the microclimate of the area.

Because PV arrays tend to cover relatively large areas, some have expressed concern about the extent to which they might affect the microclimate in and around the immediate areas in which they are constructed. For reasons discussed below, the Anahola project is not expected to cause a noticeable change in the microclimate beyond the boundaries of the project site.

5.3.3.1 Background

Sunlight that reflects off the surface of a solar panel cannot be used to produce electricity. Consequently, manufacturers go to great lengths to minimize reflection and maximize the amount of solar energy that the panels absorb. The two most common methods of limiting reflection off the panels are to apply an anti-reflective coating to the module and to texture the surface of the modules.

[23] Gases that trap heat in the atmosphere are called greenhouse gases. The primary greenhouse gases are carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), and Fluorinated gases. The first three are emitted when fossil fuels are burned to produce electricity (though there are many other sources of these gases as well).

[24] U.S. Environmental Protection Agency , http://www.epa.gov/cleanenergy/energy-and-you/affect/oil.html

The modules that would be used in the proposed project are constructed using a glass whose surface has an anti-reflective treatment so sunlight striking it is directed towards the silicon photovoltaic cell, limiting reflection.[25]

The sunlight that the panels do absorb is either converted into electricity or raises the temperature of the panels. In order to maximize the efficiency of electricity production, photovoltaic manufacturers design their panels to minimize the latter, striving to keep panels from reaching temperatures greater than 20 degrees F. above that of the surrounding air. (As a point of comparison, automobiles sitting in the sun at a parking lot can reach temperatures more than 40 degrees F. higher than that of the surrounding air.)

Residents living near some much larger solar farms on the Mainland have expressed concern that the presence of the panels would create microclimatic effects on air temperatures in and around the facility. Because of this, KIUC has evaluated the extent to which the proposed Anahola Solar project might increase air temperatures on and immediately around the project site. In the course of these investigations it also reviewed evidence concerning possible effects on soil temperature and soil moisture content within the area where the PV arrays would be constructed. Both factors are relevant to the long-term maintenance of vegetative groundcover in the area.

5.3.3.2 Effect on Air Temperature

Many researchers argue that theory tells us that PV panels are not likely to increase temperature in the area immediately around the proposed solar farm. Specifically, they note that:

- The amount of the sun's heat absorbed by a solar panel is similar to the amount of the sun's heat absorbed by the earth.
- Because solar panels are thin (the glass is approximately 0.12 inches thick), lightweight, and surrounded by airflow (because it's mounted above the ground), they store less heat than the solid earth. The same physical characteristics mean that PV panels dissipate heat more quickly than solid earth does. This means that nighttime temperatures may be slightly lower where they are present.
- The other equipment associated with the arrays (e.g., the inverters) does not generate a significant amount of "waste heat".

In order to understand if temperature effects were likely to be of concern for the Anahola Solar project, KIUC reviewed the results of several recent studies of the phenomena. The results, which confirm that project-related temperature changes will be insignificant, are summarized below.

Lawrence Berkeley National Laboratory Modeling. Computer modeling by researchers at the Lawrence Berkeley National Laboratory (Millstein and Menon, July 1, 2011) examined the extent to which modifications to the surface albedo of the earth through the widespread deployment of cool roofs and pavements (reflective materials) and photovoltaic arrays (low reflection) have the potential to change radiative forcing, surface temperatures, and regional weather patterns.[26] The huge hypothetical solar arrays used in that part of the analysis produce about 8,000 times more power than the proposed Anahola Solar project. Even with such an exaggerated source, the modeled local afternoon temperature increases were less than three-quarters of a degree Fahrenheit. Based on these

[25] One measure of the reflectivity is albedo, the ratio of solar radiation across the visible and invisible light spectrum reflected by a surface. Albedo varies between 0, a surface that reflects no light, and 1, a mirror-like surface that reflects all incoming light. Solar panels with a single anti-reflective coating have a reflectivity of around 0.10 to 0.3. By comparison, sand has an albedo between .15 and .45 and agricultural vegetation has an albedo between .18 and .25. In other words, the solar panels have a lower reflectivity.

[26] The analysis used the Weather Research and Forecasting (WRF) model (a fully coupled regional climate model) to investigate feedbacks between surface albedo changes, surface temperature, precipitation and average cloud cover.

results, it is apparent that the size of the several orders of magnitude smaller array field proposed for Anahola would have no discernible effect on ambient temperature. Millstein and Menon's modeling results indicated that a vast field of solar arrays could have a small effect on local and regional wind, but they indicate that the much smaller-scaled project that is proposed at Anahola would not affect winds in any measurable way.

Tokyo Simulation. Genchi et al. (2003) conducted a simulation of the effects of large-scale PV panel deployment in the urban setting of Tokyo. From their simulation results, they conclude that the impact of large-scale installation of PV panels on microclimate—in particular the building canopy temperature—would be negligible. The much smaller alteration that is proposed at Anahola has even less potential to affect building canopy temperatures.

CVSR Solar PV Project. Donovan (July 6, 2010) assessed the extent to which a large solar project in California's Central Valley (the CVSR Solar PV Project) might change one aspect of the area's microclimate (ambient air temperature under) above and around the solar field). The analysis, which was applicable to PV arrays between 1 and 300 acres in size, compared conditions with and without such an array. In addition to changes in the albedo, there are other factors which could result in heat impacts. Drawing on work done on urban heat islands, Donovan discusses three factors that could lead to an effect from large-scale PV arrays. They are: (*i*) use of materials which absorb more solar radiation, (*ii*) use of massive materials which store more heat and dissipate heat slowly, and (*iii*) waste heat from energy usage, such as appliances, engines, and HVAC, which run on electricity, natural gas, and oil. He then discusses each of these, reaching the following conclusions:

- With regards to factor (*i*), he concluded that while the PV array's slightly lower (relative to natural conditions) albedo (reflectivity) will cause it absorb slightly more heat than a field with no PV, PV panels dissipate heat more quickly than the earth. The fact that this increased heat is being absorbed by the PV panels and not the earth means that there will be no net gain in heat caused by the albedo change.
- With regards to second factor, the amount of heat released during periods when solar insolation is low (e.g., at night) is related to the mass of those materials and the amount of heat absorbed when the sun is shining on them. While PV modules can reach relatively high operating temperatures, they are thin and lightweight (rather than massive) and therefore do not store a large amount of heat. Because of this, they cool to air temperature shortly after the sun sets and do not affect air temperatures thereafter.
- With regards to the third factor, the only heat that would be emitted by equipment at the Anahola Solar Project would be from the inverters that are scattered throughout the PV arrays. Even for the Central Valley PV system that Donovan studied (which included tracking motors and other heat-releasing equipment that would not be present at Anahola), the waste heat was less than 0.21 MWh/acre/day, or about 1% of total solar energy impacting the plant within a day.[27] To put this in perspective, this is about 250 times less per acre than the energy loads imposed by a large urban area and suggests that waste heat from energy loads would not have a significant temperature effect.

In summary, while it is not possible to scale the results of the modeling and calculations that have been done elsewhere linearly to the situation at Anahola, together the theoretical analyses indicate that the 12 MW array that is planned would not have a measurable microclimatic effect.

The preceding discussion is based largely on theory. Some field research has been conducted as well. While the data are still limited, in order to address concerns about possible temperature changes

[27] In comparison, a study of the Urban Heat Island effect in New York City [1] showed that waste heat from energy usage in that city is about 250% of solar energy throughout the year.

associated with large PV arrays, meteorologists working on the Sarnia Solar Power Plant in Ontario, Canada, obtained detailed air temperature data in and around the first (approximately 100-acre) phase of that project. As discussed below, the results of their measurements provide empirical evidence that PV arrays do not have a significant effect on ambient temperatures in nearby areas.

Temperature data at the Sarnia facility was gathered using nine automated weather stations recording 30-minute averages of air temperature, relative humidity, global horizontal insolation[28], wind speed and direction, and barometric pressure. Six of the stations were installed around the Sarnia project property and three stations were installed in nearby corn fields as controls. The sensors were positioned approximately 8 feet above ground, and are accurate to about ±0.5°C (sensor) and ±1 °C (in the data-logger system). One of the stations (SH #2) was approximately 100 feet from the western edge of Block #2 of the operating solar panels. All of the other monitoring stations are located at least 0.6 mile from the nearest operating or installed portion of the power plant.

The influence of module heating was measured by observing time-point by time-point (30 minute average) temperature differences between the various weather stations. The analysis focused on differences between the suspected "hot" station, SH #2 and nearby short-term controls (SH #7, #3, #9) and on differences between the controls themselves (#7, #3, #4, #9). The temperature differences, binned by hour over the period of record, between SH #2 and its two nearest undisturbed neighbors, or controls (SH#3, 0.81 mile to the North and SH#7 1.2 mile to the South) are shown in Table 5.11.

Table 5.11 Air Temperature Difference Measurements Associated With Large PV Arrays

	Hawks #2- #7	***Hawks #2 - #3***	***Hawks #3 - #7***
Mean Difference ± 1 std (all hours of day)	- 0.02 ± 0.5 °C	+ 0.04 ± 0.5 °C	- 0.05 ± 0.6 °C
Maximum Mean Difference (night)	+ 0.26 °C @ 23:00	+ 0.26 °C @ 24:00	+ 0.03 °C@ 10:00
Maximum Mean Difference (day)	- 0.34 °C @ 15:00	- 0.22 °C @ 11:00	- 0.18 °C @ 14:00
Source: *Topaz Solar Farm Final Environmental Impact Report*, Appendix 8B, Sarnia Air Temperature Analysis, Interim Results, March 15, 2010.			

In summary, analysis of the data collected during the first eleven months of operation (April 1, 2009, through February 28, 2010) of the first 20 MW of the First Solar installation (Blocks #1 and #2) showed the following:

- There is no statistically significant mean temperature difference between the monitoring stations.
- Hint of an average diurnal variation of about 0.6 °C between the controls and the single station adjacent to the array, a value within the measurement error of the sensors.
- Only winter measurements available for comparing center-of-array to outside-of array measurements; more data needed to analyze long term trends.
- No measurable effect of wind.

While the interim report notes that additional data are needed to confirm these preliminary results, the preliminary findings provide strong evidence that the presence of large PV arrays does not have a significant effect on air temperature.

[28] Solar radiation is usually measured with an instrument mounted horizontally, so that it sees the whole sky (direct plus diffuse) and such data is termed "global horizontal insolation" (GHI).

5.3.3.3 Effect on Soil Temperature and Soil Moisture Content

While not strictly speaking a "microclimatic effect", changes in soil temperature and soil moisture content are so closely tied to microclimate that they are discussed here. The broad surfaces of the photovoltaic modules will create substantial shade over a substantial portion of the project site. This would lower daytime soil temperatures relative to un-shaded conditions (e.g., in a ploughed field), but it is not clear whether this difference would be (*i*) similar or different from that caused by the presence of shading vegetation (*ii*) or sufficient to affect the soil microenvironment in any substantial way. A search of the literature failed to uncover substantive research on this topic.[29] While periodic washing of the photovoltaic modules may briefly increase surface moisture in localized areas, this will only occur when rainfall is scarce and would not measurably alter the climate or regional microclimate.

5.4 AIR QUALITY

5.4.1 EXISTING CONDITIONS: AIR QUALITY

The U.S. Environmental Protection Agency (EPA) has set national ambient air quality standards (NAAQS) for ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, 2.5-micron and 10-micron particulate matter ($PM_{2.5}$ and PM_{10}), and airborne lead. These ambient air quality standards establish the maximum concentrations of pollution considered acceptable, with an adequate margin of safety, to protect the public health and welfare. The State of Hawai'i Department of Health (DOH) has also set ambient air quality standards for some pollutants; in some cases, these are more stringent than the Federal standards. At present, the State has set standards for five of the six criteria pollutants (excluding $PM_{2.5}$) in addition to hydrogen sulfide (DOH 2005). Hawai'i Administrative Rules (HAR), Title 11, Chapter 59 *Ambient Air Quality Standards* and Chapter 60 *Air Pollution Control* establish these standards. Table 5.12 presents the state and national ambient air quality standards for selected pollutants.

Both State and national air quality standards consist of two parts: (*i*) an allowable concentration of a pollutant and (*ii*) an averaging time over which the concentration is measured. The allowable concentrations are based on the results of studies of the effects of the pollutants on human health, crops, and vegetation, and, in some cases, damage to paint and other materials. The averaging times are based on whether the damage caused by the pollutant is more likely to occur during exposure to a high concentration for a short time (one hour, for instance), or to a lower average concentration over a longer period (e.g., 8 hours, 24 hours, or a year). For some pollutants there is more than one air quality standard, reflecting both its short-term and long-term effects.

The State DOH maintains monitoring stations in those parts of the state where it believes that there is a potential for air quality standards to be exceeded. As there are no significant human fixed sources of air pollutants on Kaua'i and it is far from the Big Island volcanoes whose eruptions have produced natural emissions that have affected air quality on other islands during recent years, the State DOH did not operate any air quality monitoring stations on Kaua'i until recently. In 2010, it established an air monitoring station at Niumalu, Kaua'i to monitor ambient cruise ship emissions; no exceedances of ambient air quality standards have been recorded to date (http://hawaii.gov/health/environmental/environmental/air/cab/cab/cab_notification/notification_pdf/exceedances_2012_10_22.pdf). Because of its location far from significant pollutant sources, ambient air quality at Anahola is almost certainly even better.

[29] However, soil temperature is one of the factors on which the Brookhaven National Laboratory is planning on collecting data (http://www.bnl.gov/energy/files/nserc/BNL_Solar_Research_Overview_and_ NSERC_ Plans_with_Input.pdf).

Table 5.12 State and National Ambient Air Quality Standards

Pollutant	Unit	Averaging Period	NAAQS	SAAQS
CO	ppm	1-hour	35[b]	9
		8-hour	9[b]	4.4
Pb	µg/m^3	Quarterly	1.5[h]	1.5
NO_2	ppb	1-hour	100	None
	ppm	Annual	0.053[c]	0.04
H_2S	ppm	1-hour	None	0.025
PM_{10}	µg/m^3	24-hour	150[d]	150
		Annual	None [e]	50
$PM_{2.5}$	µg/m^3	24-hour block avg.	35	None
		Annual	15[f]	None
O_3	ppm	8-hour rolling avg.	0.075[g]	0.08
SO_2	ppm	3-hour	0.5[a]	0.5
		24-hour	0.14[b]	0.14
		Annual	0.03[c]	0.03

Notes:
a. Federal Secondary Standard.
b. Not to be exceeded more than once per year.
c. Average of all 1-hour values in the year may not exceed the level of the standard.
d. May not be exceeded more than one day per year.
e. EPA revoked the annual PM_{10} standard effective December 17, 2006 due to a lack of evidence linking health problems to long-term exposure. The State still has an annual standard.
f. The 3-year average of 24-hour values must not exceed the level of the standard.
g. The 3-year average of the fourth highest daily maximum value must not exceed the level of the standard.
h. Average of all 24-hour values in any calendar quarter may not exceed the level of the standard.

Source: State of Hawai'i Department of Health (2010)

5.4.2 PROBABLE AIR QUALITY IMPACTS

5.4.2.1 Construction Period

The heavy construction equipment that will be used for this work (e.g., bulldozers, dump trucks, pile drivers, etc.) will be powered by internal combustion engines that emit a variety of air pollutants, all in small quantities and over a relatively limited period of time (several months).[30] None of these equipment emissions will add substantially to existing area sources of these pollutants, which consists principally of vehicles traveling on Kūhiō Highway (one of the island's major roadways). However, heavy construction activities such as those needed for site preparation can result in fugitive dust emissions from earth-moving activities, use of unpaved haul-roads, etc. The amount of grubbing, grading, and vegetation removal that will be required to prepare and maintain the area where the PV

[30] Construction equipment emissions result from the following sources and activities: (*i*) construction equipment engine exhaust; (*ii*) motor vehicle exhaust, brake, and tire wear; (*iii*) entrained dust from material delivery trucks; (*iv*) entrained dust from roadways; (*v*) entrained dust from construction worker vehicles; (*vi*) fugitive dust from bulldozing, grading, and scraping, and from the handling of excavated material, such as depositing material into haul trucks; and (*vii*) fugitive dust from wind erosion of disturbed areas.

modules would be located has the potential to lead to substantial amounts of airborne particulates (dust) if it is not carefully implemented.

Grubbing and grading the photovoltaic solar array site involves the use of large, diesel-fueled construction equipment that is listed. However, the number of pieces of equipment operating at any one time is too low, and their distance from sensitive receptors too great, for combustion emissions, such as NO_x and diesel particulate matter (diesel PM), from this equipment to have a significant effect on air quality. Much more importantly, the soil disturbance caused by grubbing and grading work generates fugitive dust that can have a more substantial (albeit temporary) effect on air quality than emissions from the engines.[31] The potential for adverse effect continues until the replacement vegetation has become established or material is placed over the exposed ground.

Over the long-term, changes in ground cover that lead to the emergence of bare soil areas can lead to an increase in aeolian soil erosion and airborne particulate matter. The vegetation management plan reproduced in Appendix C is intended to ensure that good ground cover is maintained, thereby minimizing the potential for such an occurrence.

Specific information concerning the construction equipment that would be used will not be available until a construction contractor is selected.[32] Consequently, overall construction emissions were estimated using screening emission rates and procedures recommended in the most recent edition of the *Air Quality Handbook: A Guide For Assessing the Air Quality Impacts for Projects Subject to CEQA Review (*San Louis Obispo Air Quality Control District, December 2009). The results of the calculations are shown in Table 5.13.

Table 5.13 Screening Emission Rates for Construction Operations.

Pollutant	***grams/Yds^3 of Material Moved***	***Lbs/ Yds^3 of Material Moved***	***Yds^3 of Material Moved***	***Emissions***
Diesel PM	2.2	0.0049		43 lbs
Carbon Monoxide (CO)	138.0	0.304		2,675lbs
Reactive Organic Gases (ROG)	9.2	0.0203		179 lbs
Oxides of Nitrogen (NOx)	42.4	0.0935		823 lbs
Sulfur Oxides (SOx)	4.6	0.010		88 lbs
Fugitive Dust (PM10)	0.75 tons/acre-mo. of Constr. activity		54 acre-months	40.5 tons
Note: These rates assume an average of 0.27 gallons of diesel fuel is burned for each cubic yard of earth moved.				
Sources: *CEQA Air Quality Handbook, A Guide for Assessing the Air Quality Impacts for Projects Subject to CEQA Review*, December 2009 - April 1996, and EPA-AP 42.				

[31] The piles are installed using hydraulic pile-driving equipment that minimizes earth disturbance and, therefore, the potential for construction dust. The pile-driving equipment and the vehicles delivering the piles, panels, and other materials used to erect the arrays travel slowly and tend not to disturb the soil and produce substantial quantities of airborne particulates.

[32] As discussed elsewhere in this report, water for use during construction may be obtained from a new on-site well. The well pump would be powered by a Generac QuietSource Series 36 kW Generator or equivalent. KIUC calculates that this generator would produce a maximum hourly heat input of slightly over 0.5 MMBtu per hour; because this is less than the one MMBtu per hour standard, it qualifies for an exemption from the requirement to obtain a non-covered source air permit under HAR §11-60.1-62(d)(4).

The emission estimates from Table 5.13 were then used together with the fuel use estimate presented above to assess whether or not mitigation might be appropriate.[33] Table 5.13 shows the approximate level of construction activity that would require mitigation for each pollutant of concern and compares these with the estimated emission from the proposed project. The results indicate that special mitigation is not needed for the construction phase of the proposed project except in the case of particulate matter (PM_{10}). In the case of that pollutant, the fact that such a relatively large area will be disturbed by grubbing and/or grading puts the proposed project over the 4.0-acre threshold.[34]

Table 5.14 Level of Construction Activity Where Mitigation May be Appropriate.

Pollutant of Concern	*Thresholds (1)*		*Amount of Material Moved*		*Threshold Exceeded?*
	Tons/Qtr	*Lbs/Day*	*Cu. Yds/Qtr*	*Cu. Yds/Day*	
Reactive Organic Gases	2.5	185	247,000	9,100	No
	6.0	185	593,000	9,100	No
NOx	2.5	185	53,500	2,000	No
	6.0	185	129,000	2,000	No
PM10	2.5	n/a	Any project with a grading area greater than 4.0 acres of continuously worked area will exceed the 2.5 ton PM10 quarterly threshold.		**YES**
Note: Thresholds were approximated using the screening level emission rates from Table 5.13. Daily emission thresholds are based upon the level of daily emissions that may result in a short-term exceedance of the ozone standard.					
Source: Planning Solutions, Inc.					

Minimization Measures. As part of its contract with REC, KIUC is requiring the contractor to implement the following standard minimization measures, as well as whatever additional measures may be required by the grading and grubbing permit that the contractor must obtain from the County of Kaua‘i.

- Maintain all construction equipment in proper tune according to manufacturer’s specifications.
- Fuel all off-road and portable diesel powered equipment, including but not limited to bulldozers, graders, cranes, loaders, scrapers, backhoes, generator sets, compressors, auxiliary power units, with motor vehicle diesel fuel.
- Maximize to the extent feasible, the use of diesel construction equipment meeting the latest certification standard for off-road heavy-duty diesel engines.
- Minimize the extent disturbed area where possible.
- Use water trucks or sprinkler systems in sufficient quantities to minimize the amount of airborne dust leaving the site.
- Cover or continuously wet dirt stockpile areas containing more than 100 cubic yards of material.

[33] Guidance from San Louis Obispo, California. Because it is a “non-attainment area” with respect to national and State ambient air-quality standards, the emission limits there are quite restrictive and, therefore, provide a conservative benchmark against which to judge the Anahola project.

[34] Readers should note that the California threshold is not a regulatory one in Hawai‘i. It does, however, provide a means of judging the extent to which project-related activity deserves attention when developing detailed construction plans and developing pollution control measures.

- Implement permanent dust control measures identified in the project landscape plans as soon as possible following completion of any soil disturbing activities.
- Stabilized all disturbed soil areas not subject to revegetation, paving, or development using approved chemical soil binders, jute netting, or other methods.
- Pave all roadways, driveways, sidewalks, as soon as possible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used.
- Limit vehicle speed for all construction vehicles moving on any unpaved surface at the construction site to 15 mph or less.
- Cover all trucks hauling dirt, sand, soil, or other loose materials.

5.4.2.2 Operation and Maintenance Activities

None of the equipment associated with the PV arrays and substation (e.g., inverters and control equipment, transformers, switches, etc.) emit air pollutants of any kind. Consequently, once the PV facilities are installed and the substation constructed, very little would occur that has the potential to affect air quality, so long as the land in and around the PV arrays is maintained in accordance with an effective vegetation management plan (included in full in Appendix C).

Some emissions will result from vehicles traveling to and from the service center, but as it is being installed in large part to shorten average travel times by KIUC service trucks and by members needing help, these are likely to be equal to or less than those that would occur if the new facilities were not constructed. In summary, when looked at cumulatively and over the long term, operations and maintenance of this project does not have the potential to harm air quality in the area.

The proposed project's beneficial effect will extend beyond the Anahola area. The electricity that the photovoltaic arrays would produce will allow KIUC to reduce the amount of electricity that it must generate using fossil fuels. This will allow a nearly proportionate decrease in the amount of pollutants emitted as a result of the combustion of fossil fuels elsewhere on the island.

Table 5.15 shows the pounds of each regulated pollutant that were emitted for each megawatt-hour of power that was generated at KIUC's two fossil-fuel-fired power plants in 2010. Present estimates are that the 12 MW capacity Anahola Sola Project will produce 23,693 megawatt hours in the first year of operation. This means that if fossil-fuel-fired generation was decreased by the same proportion at all the existing generating units, the proposed project would reduce KIUC's annual emissions by the amounts shown in Table 5.16. If the replacement could be slanted disproportionately towards replacing power generated at the older, Port Allen facility, the reduction in emissions would be proportionately larger.

Table 5.15. Air Pollutant Emissions in Pounds per Megawatt Hour from Fossil Fuel Use: 2010

Unit	*Power Generated (MWh)*	*Emissions, in pounds/MWh*					
		NO_x	*SO_2*	*CO*	*VOC*	*PM^{10}*	*CO_{2e}*
Port Allen Generating Station	204,744	15.9	0.4	2.8	0.8	1.0	1,591
Kapaia Power Station	219,626	0.41	0.01	0.09	0.01	0.07	1,276
Total All Units	***424,369***	***7.9***	***0.2***	***1.4***	***0.4***	***0.5***	***1,428.3***
Source: Kaua'i Island Utility Cooperative.							

Table 5.16. Emission Reductions: Anahola Solar Project.

Power Plant Whose Generation is Replaced	*Power Generated (MWh)*	*Emissions, (in pounds)*					
		NO_x	*SO_2*	*CO*	*VOC*	*PM^{10}*	*CO_{2e}*
Port Allen Generating Station	11,431	181,754	4,572	32,007	9,145	11,431	18,186,862
Kapaia Power Station	12,262	5,027	123	1,104	123	858	15,646,270
Total All Units	***23,693***	186,782	4,695	33,111	9,267	12,289	33,833,132

Source: Kaua'i Island Utility Cooperative.

The emission reductions at Port Allen and Kapaia, which are respectively approximately 25 and 13 miles away, will have no measurable effect on air quality in Anahola, due to their distance. It will, however, have a beneficial effect on pollutant levels near Port Allen in the south of the island and Kapaia on the east side.

While PV systems do not have any air pollutant emissions during normal operation, it is possible for emissions to occur if they are ignited, (e.g., by a wildfire). The panels themselves are not flammable; however a potential fire could begin if nearby vegetative material were to ignite, as is possible in a brush fire. So long as the vegetation beneath and around the solar array is kept well-trimmed (as is provided for in the vegetation management plan), the potential for this to occur is very low. If a sufficiently intense and prolonged fire were to occur, metals used in some types of PV panels could vaporize and escape into the atmosphere. However, because these materials (such as Cadmium, Selenium, or Tellurium) are either not present, or are present in only minute quantities, in the panels that KIUC will use, the danger from the fire itself would keep fire-fighters and others far enough away to avoid significant exposure to any of the toxins.

5.4.2.3 Decommissioning

Air quality effects of activities associated with decommissioning are negligible. Neither removing the panels from the mountings nor extracting the foundation posts from the ground disturbs soil will produce substantial quantities of dust. Emissions from the equipment used to perform the work are also very small. Some airborne particulate can be expected if the foundations for the electrical equipment (inverters) and/or conduit are removed.

5.5 BIOTA

5.5.1 EXISTING CONDITIONS

On January 16, 2012, Rana Biological Consulting, Inc. conducted a biological survey of the site (see Appendix B). The reconnaissance-level survey was intended to: (*i*) identify the botanical, avian, or mammalian species present on the site and; (*ii*) to assess the likelihood that species that have been listed as threatened or endangered or proposed for listing under either the federal or State of Hawai'i endangered species laws are present on the Anahola Solar site.[35] The applicable federal regulations are contained in the Endangered Species Act of 1973; 7 U.S.C. § 136, 16 U.S.C. § 1531 et seq. At the state level, Hawai'i Revised Statutes Chapter 195D govern the treatment of threatened and endangered species. The survey results are summarized below.

[35] There is no federally delineated Critical Habitat for any species present on or adjacent to the project site.

5.5.1.1 Flora Species

The vegetation at the project site is dominated by Guinea grass (*Panicum maximum*) with varying amounts of Christmas berry (*Schinus terebinthifolius*) and (in places) dense patches of lantana (*Lantana camara*). Individual Java plum (*Syzygium cuminii*) trees are dotted across the landscape. A total of 67 species of vascular plants was identified from the survey area; of these only three are native species. Of the total number of species recorded, 64 (95.5%) are naturalized or ornamental species. Two of three native species recorded - yellow wood sorrel (*Oxalis corniculata*), and *pōpolo* (*Solanum americanum*) - are Polynesian introductions and the third, *ʻuhaloa* (*Waltheria indica*) is an indigenous species. All three of these species are common on the island of Kauaʻi, although all were rare or occasional on this site.

5.5.1.2 Mammalian Species

With the exception of the federally-listed endangered *ʻōpeʻapeʻa* or Hawaiian hoary bat (*Lasiurus cinereus semotus*), all terrestrial mammals currently found on the island of Kauaʻi are alien species, and most are ubiquitous. The three terrestrial mammalian species found on the site were three horses (*Equss c. caballus*) tethered to stakes; one pig (*Sus s. scrofa*) seen in the upper reaches of the site; and several dogs (*Canis f. familiaris*) heard barking from areas adjacent to the site. Additionally, scat, tracks and sign (hair and other biological material) of horses, dogs, and pigs were encountered at several locations within the project site.

The findings of the mammalian survey are consistent with the location of the property and the habitat currently present on the site. No Hawaiian hoary bats were recorded overflying the site. Hawaiian hoary bats are widely distributed in the lowland areas on the island of Kauaʻi, and have been documented in and around almost all areas that still have some dense vegetation (Tomich, 1986; USFWS 1998, David, 2011).

Although no rodents were detected during the course of the January 2012 survey, it is virtually certain one or more of the four established alien muridae found on Kauaʻi, including roof rat (*Rattus r. rattus*), Norway rat (*Rattus norvegicus*), European house mouse (*Mus musculus domesticus*), and Polynesian rats (*Rattus exulans hawaiiensis*) use various resources found within the general project site. All of these introduced rodents are deleterious to native ecosystems and the native faunal species dependent on them.

5.5.1.3 Avian Species

The avian diversity and densities were as to be expected given the location of the property and the habitat presently on the site. Three species, including Nutmeg Mannikin (*Lonchura punctulata*), Zebra Dove (*Geopelia striata*) and Chestnut Munia (*Lonchura atricapilla*) accounted for 60 percent of all birds recorded during station counts.[36] The most commonly recorded species was Nutmeg Mannikin, which accounted for slightly more than 28 percent of the total number of individual birds recorded. An average of 62 individual birds was recorded per station count; a number that is quite high for point counts in this area on the island of Kauaʻi.

5.5.1.4 Aquatic Biota

Because there are no aquatic habitats (e.g., streams, ponds, wetlands, etc.) present on the project site, no aquatic biota are present.

[36] Station counts for avian surveys are consecutive counts in which a trained observer records all the birds seen and heard from a given point, or "station" for a set period of time. In the case of the survey conducted of the Anahola site, six minute point counts were made at each of 8 avian point count stations. Point counts were concentrated during the early morning hours, the peak of daily bird activity.

5.5.2 PROBABLE IMPACTS ON BIOTA

5.5.2.1 Impact on Flora

The grubbing, grading, and other vegetation removal that REC Solar and KIUC would carry out during construction of the solar array and substation would remove the great majority of the existing vegetation on the site. However, (as noted in Section 5.5.1.1 and elaborated on in Appendix B) only three of the sixty-seven species present are native, and only one of those, *'uhaloa* (*Waltheria indica*) is indigenous. All three of the native species are common on the island of Kaua'i, albeit rare or occasional on the project site. The absence of any rare or endangered plant species means that the grubbing, grading, and vegetation removal activities associated with the project do not constitute a significant adverse effect.

In order for the PV panels to continue to perform satisfactorily, KIUC must ensure that vegetation does not overgrow the PV panels, preventing solar radiation from reaching them. KIUC has developed the Vegetation Management Plan (VMP) reproduced in Appendix C to facilitate this. The key objectives of the plan are to: (*i*) ensure full solar access to solar array; (*ii*) ensure full access to solar equipment for maintenance and repair purposes; (*iii*) minimize on-site erosion and sediment transport; (*iv*) reduce airborne dust particles; (*v*) increase water infiltration; (*vi*) minimize the frequency of maintenance cycles (vegetation management); and (*vii*) minimize the need for herbicidal control measures.

The VMP is designed to eliminate/discourage the growth of vegetation that might adversely affect the performance of the solar arrays (which it refers to as "target vegetation) and to encourage the growth of vegetation that will help stabilize the soil on the site over the long term (which it refers to as "non-target vegetation).

- Vegetation targeted for removal or control includes all tree or shrub species as well as grass species that exceed 18-inches in height. Examples include, but are not limited to African Tulip, Christmas Berry, Guinea Grass, Haole Koa, Java Plum and Lantana. It also calls for eradication of climbing vines (such as Cat's-claw Vine, Trumpet Vine, and Wood Rose Vine) that may adversely affect the efficient operation of the solar array.
- Non-target vegetation includes herbaceous growth that matures at less than 18" in height, unless it is categorized as a climbing vine, and accepts periodic mowing. Examples include, but are not limited to Bermuda grass, Rye Grass, Hilo Grass, Kikuyu grass, St. Augustine Grass, and Wide-leaved carpet grass.

The ultimate goal is to eliminate tall growing grasses, woody trees and shrubs and other noxious weed species such as climbing vines and allowing desirable vegetation to remain.

The VMP is premised on the belief that if managed properly, non-target vegetation will become self-sustaining over time and require less maintenance (including less dependence upon herbicides). It entails the use of a variety of tools, including mowing and string trimming, hand removal of target species in difficult to access areas, mulch cover, weed barrier fabric, selective use of herbicides, and revegetation with low growing plant species. Mechanical and herbicidal controls work together to support the establishment and viability of naturally occurring and introduced low-growing vegetation. A combination of hand cutting, mowing, string trimming, selective pruning, selective foliar treatment, low volume basal treatments, mulching, weed barrier fabric, stump removal and cut stump treatments will be the primary methods of vegetation control. Treatment methods used will vary depending on the target species composition and density, site access, and topography.

In addition, portions of the site, outside of the photovoltaic solar array, will be landscaped using an assortment of native shrubs and trees (see Figure 2.8 and Figure 2.9). As a result of this effort, some portions of the project site will have a much higher proportion of native species ground cover than is presently the case and will prohibit the establishment of alien or invasive species.

5.5.2.2 Impact on Mammals

The change in habitat that will accompany establishment of the proposed solar array and substation will decrease the habitat available for the alien mammals (i.e., *any* mammal other than the Hawaiian hoary bat) that are now present on the site. It is likely that the number of individuals will decrease accordingly. It is not possible to quantify the decrease, either with respect to overall biomass or with respect to a possible shift in the species makeup. However, as all of the ground-dwelling species are introduced alien species, the change is not significant.

The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), was not seen during the course of the survey, but they are widely distributed in the lowland areas on the island of Kaua'i. Operation of the proposed solar array does not entail any activities that have the potential to affect the species. For the most part, the same is true of construction-related construction activities. However, because it would entail clearance of some woody vegetation that could be used by roosting bats with pups and because such animals cannot always move safely of their roosts are disturbed, the contractor will refrain from clearing woody vegetation taller than 15 feet between June 1 and September 15, as called for under the terms of KIUC's system-wide Habitat Conservation Plan formulated in cooperation with the U.S. Fish and Wildlife Service. This will eliminate the potential for adverse effect on this species.

5.5.2.3 Impact on Avian Fauna

The proposed PV facilities are unlit and low to the ground. They are not in an area suitable for ground-nesting seabirds. No nighttime construction work that requires lighting is envisioned. Consequently, they do not have the potential to adversely affect seabirds that overfly the site.

The extent to which the proposed project could affect other bird species that may nest, feed, or loaf in the area is a function of which of the revegetation alternatives that KIUC is considering it selects. Ones that depend largely or entirely on geotextile fabrics will provide little habitat suitable for the avian species that are present. Other options are superior in this regard. However, regardless of the option that is selected, the project is likely to have fewer birds present than is true at the present time.

5.5.2.4 Impact on Aquatic Fauna

The absence of physical contact between the proposed project and the nearest streams in the area, together with the distance from the ocean, means that the proposed project does not have the potential to directly affect aquatic resources. The retention basins that are being constructed as part of the project will retain all runoff produced by storms with a recurrence interval of less than 10 years, and they are designed to keep peak storm water runoff below existing volumes for 24-hour rainfall events up to those with a recurrence interval of 100 years. KIUC will require the contractor to use best management practices as necessary during construction to prevent contaminants such as sediment, petroleum products, and debris from leaving the area via storm water runoff. It will also require the contractor to attempt to schedule any excavation work for periods of minimal rainfall and to place permanent erosion control measures on any land denuded of vegetation as quickly as possible. In view of the foregoing, the proposed project is unlikely to have any indirect effect on aquatic species.

5.5.2.5 Consultation with U.S. Fish and Wildlife Service

KIUC used the results of these surveys as the basis of its consultation with the U.S. Fish and Wildlife Service, seeking its concurrence with its consultant's finding that the proposed Anahola Solar Facility and Service Center would not adversely affect the federally threatened Newell's shearwater (*Puffinus auricularis newelii*), endangered Hawaiian petrel (*Pterodroma sandwichensis*), and a candidate for listing, the band-rumped storm-petrel (*Oceanodroma castro*), (collectively referred to as Hawaiian seabirds), and the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*). The Service's February 11, 2013, response letter (reference 2013-I-0113) concurred that so long as KIUC did not clear woody vegetation suitable for bat roosting between June 1 and September 15; the proposed project may affect, but is not likely to adversely affect these species.

5.6 NOISE

In order to ensure that it would be able to avoid and/or mitigate adverse noise effects, KIUC commissioned an in-depth acoustic study for the proposed project. The study forecast the future noise levels and potential noise impacts associated with construction and operation of the proposed facilities, including project-related traffic. The full report is reproduced in Appendix G.

5.6.1 NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY

The noise descriptor currently used by federal agencies to assess environmental noise is the Day-Night Average Sound Level (DNL or Ldn).[37] This descriptor incorporates a 24-hour average of instantaneous A-Weighted sound levels as read on a standard Sound Level Meter. Additionally, sound levels which occur during the nighttime hours of 10:00 PM to 7:00 AM are increased by 10 decibels (dB) prior to computing the 24-hour average by the DNL descriptor. Because of the averaging used, DNL values in urbanized areas typically range between 50 and 75 DNL. In comparison, the typical range of intermittent noise events may have maximum Sound Level Meter readings between 75 and 105 dBA.[38]

The maximum A-Weighted sound level occurring while a noise source such as a heavy truck or aircraft is moving past a listener (i.e., the maximum sound level from a "single event") is referred to as the "Lmax value". The mathematical product (or integral) of the instantaneous sound level times the duration of the event is known as the "Sound Exposure Level", or Lse, which is analogous to the energy of the time-varying sound levels associated with a single event.

Table 5.17, categorizes the various DNL levels of outdoor noise exposure with severity classifications. According to *the Guidelines for Considering Noise in Land Use Planning and Control* published by the Federal Interagency Committee on Urban Noise (June, 1980) a consensus has developed among federal agencies whereby residential housing development is considered acceptable in areas where exterior noise does not exceed 65 DNL. This value of 65 DNL is used as a federal regulatory threshold for determining the necessity for special noise abatement measures when applications for federal funding assistance are made. For the purposes of determining an acceptable level of exterior noise for residences, federal agencies have determined that an exterior noise level of 65 DNL or lower is considered acceptable. These federal agencies include the Federal Aviation Administration, Department of Defense, Federal Housing Administration, Housing and Urban Development, and Veterans Administration. For air-conditioned office, commercial, industrial, and other non-noise sensitive land uses, exterior noise levels as high as 70 to 75 DNL are generally considered acceptable. When the spaces are naturally ventilated a lower threshold of 65 DNL is typically applied.

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[37] The DNL values represent the average noise during a typical day of the year. DNL exposure levels of 55 or less are typical of quiet rural or suburban areas. DNL exposure levels of 55 to 65 are typical of urbanized areas with medium to high levels of activity and street traffic. DNL exposure levels above 65 are representative of densely developed urban areas and areas fronting high volume roadways.

[38] Definitions of two important technical terms used in the discussion are as follows:

- A-Weighted Sound Level (dBA). The sound level, in decibels, read from a standard sound-level meter using the "A-weighting network". The human ear is not equally sensitive in all octave bands. The A-weighting network discriminates against the lower frequencies according to a relationship approximating the auditory sensitivity of the human ear at moderate sound levels.
- Decibel (dB). This is the unit that is used to measure the volume of a sound.[38] The decibel scale is logarithmic, which means that the combined sound level of 10 sources, each producing 70 dB will be 80 dB, not 700 dB. It also means that reducing the sound level from 100 dB to 97 dB requires a 50 percent reduction in the sound energy, not a 3 percent reduction. Perceptually, a source that is 10 dB louder than another source sounds about twice as loud. Most people find it difficult to perceive a change of less than 3 dB.

Table 5.17. Exterior Noise Exposure Classification (Residential Land Use)

Noise Exposure Class	*Day-Night Sound Level*	*Equivalent Sound Level*	*Federal Standard*
Minimal Exposure	Not Exceeding 55 DNL	Not Exceeding 55 Leq	Unconditionally Acceptable
Moderate Exposure	Above 55 DNL but not Above 65 DNL	Above 55 Leq but not Above 65 Leq	Acceptable
Significant Exposure	Above 65 DNL but not Above 75 DNL	Above 65 Leq but not Above 75 Leq	Normally Unacceptable
Notes: (1) Federal Housing Administration, Veterans Administration, Department of Defense, and Department of Transportation. (2) FHWA uses the Leq instead of the Ldn descriptor. For planning purposes, both are equivalent if: (a) heavy trucks do not exceed 10 percent of total traffic flow in vehicles per 24 hours, and (b) traffic between 10:00 PM and 7:00 AM does not exceed 15 percent of average daily traffic flow in vehicles per 24 hours. The noise mitigation threshold used by FHWA for residences is 67 Leq.			
Source: Y. Ebisu and Associates, December 2012, Table 1.			

As a general rule:

- Rural areas and areas which are removed from high volume roadways have noise levels of 55 DNL or less.
- Urbanized areas with moderate exposure to traffic noise generally have DNL levels in the 55 to 65 DNL range.
- Residences which front major roadways can be exposed to levels of 65 DNL or more, while interior lots that are shielded from the street by intervening structures are usually exposed to 3 to 10 DNL lower noise levels than the front lots.

The State of Hawai‘i Department of Health (SDOH) regulates the noise levels from fixed machinery by imposing maximum allowable sound levels at the property boundaries for various zoning categories as shown in Table 5.18. Because of the Agricultural Zoning of the parcel within which the proposed facilities are located, the allowable noise levels from fixed machinery at or beyond the project site boundaries is 70 dBA during the daytime and nighttime periods. Noise produced by portable or movable equipment (such as trucks, front end loaders, fork lifts, etc.) are not subject to the 70 dBA limit under DOH noise regulations.

Table 5.18 Hawai‘i Administrative Rules §11-46 Noise Limits

Zoning District	*Noise Limit (in dBA)*	
	Daytime (7:00 a.m. to 10:00 p.m.)	***Nighttime (10:00 p.m. to 7:00 a.m.)***
Class A: Areas equivalent to lands zoned residential, conservation, preservation, public space, open space, or similar type	55	45
Class B: All areas equivalent to lands zoned for multi-family dwellings, apartment, business, commercial, hotel, resort, or similar type.	60	50
Class C: All areas equivalent to lands zoned agriculture, country, industrial, or similar type.	70	70
Source: Hawai‘i Administrative Rules §11-46 “Community Noise Control”		

Hawai‘i Administrative Rules §11-46 regulates construction noise levels above these limits using a curfew system whereby noisy construction activities are not normally permitted during the nighttime periods, on Sundays, and on holidays. Construction activities (which could typically exceed the limits established for fixed machinery) are normally allowed during the normal daytime work hours on weekdays and on Saturdays using a system involving the issuance of construction noise permit.

5.6.2 NOISE IMPACT ASSESSMENT METHODOLOGY

Computer noise modeling was used to forecast the noise levels associated with Anahola Solar Project activities at the closest noise sensitive receptors to the north. The noisiest activities are expected to occur during construction, with operations of the facilities being much quieter. In the case of the solar array and the substation, noise from the operation of the electrical equipment will be so low as to be inconsequential. The service center and baseyard activities (e.g., equipment and vehicle storage and maintenance), and the vehicular traffic associated with them, are somewhat noisier, and were the focus of the analysis. Given the fact that the baseyard activities are not new but are instead being relocated from the existing Kapa‘a Baseyard made it possible to use measurements made at that facility as a basis for modeling the noise levels of the noisy equipment expected to be most frequently used at the Service Center Site. The noise from these equipment and operations at the proposed facility and from motor vehicles traveling along the primary access road to the proposed facility were evaluated. Risks of adverse noise impacts from future baseyard operations at the Service Center Site, traffic, and short term construction noise were determined, and possible noise mitigation measures were provided as applicable.

Traffic noise measurements were obtained along Kūhiō Highway to validate the traffic noise model, and to describe background ambient noise levels during low and high volume traffic conditions. The U.S. Federal Highway Administration Traffic Noise Model (TNM) Version 2.5 was used to calculate existing and future traffic noise levels, with the traffic noise measurements used to validate the reasonableness of the traffic noise predictions provided by the TNM. As described in detail in Appendix G, the measurements show that the model results are quite accurate.

Based on the measurements of the trucks at the KIUC Kāpa‘a Baseyard, noise level predictions were made at the noise sensitive receptors closest to the service center/baseyard facility. The noise modeling was performed using inverse square law for hemispherical spreading of a sound from a source at or near the ground, with inclusion of molecular absorption and anomalous excess attenuation effects.

Traffic on Kūhiō Highway is the primary background noise source in the area. KIUC estimates of project-related traffic were used in TNM Version 2.5 to estimate project-related effects on traffic noise.

5.6.3 EXISTING NOISE LEVELS

Traffic on Kūhiō Highway controls the background noise levels at noise sensitive receptors closest to the proposed project. Existing peak-hour traffic noise levels along Kūhiō Highway are estimated to range from 69 to 71 Leq(h) at 50-foot distance from the centerline. Existing background ambient noise levels on the eastern boundary of the site are relatively high at 69 to 71 Leq(h), or DNL, because the project site abuts the Kūhiō Highway Right-of-Way. Kūhiō Highway is also adjacent to the first row of existing residences within the Hawaiian Homes Anahola Subdivision north of the project. For this reason, and particularly during the normal working hours, background ambient noise levels at the closest noise sensitive receptors which front Kūhiō Highway are relatively high. This existing traffic noise will tend to mask noise originating from facilities related to the Anahola Solar project.

Existing traffic (and background) noise levels decline with increasing distance from Kūhiō Highway; from 65 Leq(h) at 90 from the highway centerline; to 58 Leq(h) at 200 from the highway centerline; to 49 Leq(h) at 500 from the highway centerline; and to 42 Leq(h) at 1,000 feet from the highway centerline. At distances in excess of 500 feet from Kūhiō Highway, other background noise sources (e.g., barking dogs, foliage moving in the wind, birds, distant surf, local motor vehicle traffic, and human activities) begin to control the background noise levels. At those locations, measured background noise levels are well below the 65 DNL FHA/HUD noise standards, and typically below the "Minimal Exposure, Unconditionally Acceptable" level shown in Table 5.17.

Table 5.19. Existing Sound Levels

Location	*Time of Day*	*Measured Leq (dB)*
50 feet from centerline of Kūhiō Highway	7:53 a.m. to 8:53 a.m.	68.7
	4:01 p.m. to 5:01 p.m.	70.8
At Southern end of Kawelo Street	9:51 a.m. to 10:51 a.m.	43.0
	7:24 p.m. to 8:24 p.m.	41.7
At southern end of Kaponohu Road	10:59 a.m. to 11:59 a.m.	46.5
	6:16 p.m. to 7:16 p.m.	47.1
	8:28 p.m. to 9:00 p.m.	45.8
Source: Y. Ebisu & Associates, Table 3 in Noise Report.		

5.6.4 PROBABLE NOISE IMPACTS

5.6.4.1 Construction Noise

Construction noise levels are anticipated to range between 32 to 65 dBA at the closest residences during the entire project construction period. Table 5.20 presents the results of calculations of the predicted noise levels at locations within the closest Anahola residential areas resulting from construction activities at the two closest portions of the Anahola Solar project. The construction activities are expected to be noisier and more continuous than those associated with post construction activities at the KIUC Service Center. The louder construction equipment (pile driver, earth moving equipment, and back-up alarms) are also expected to be audible at all locations on the project site.

Table 5.20. Construction Noise Levels at Noise Sensitive Receptors

Noise Source	*Sound Level at 50 feet (dBA)*	*Predicted Noise Level at Receptor (dBA)*	
		From Work on Northeast Part of Site	*From Work on Center Part of Site*
Vibratory Pile Driver	94.2	59 to 64	57 to 65
Grading / Earthwork	88.9	57 to 61	55 to 62
Front-End Loader/ Backhoe	84.9	53 to 57	51 to 58
Crane	79.5	49 to 52	47 to 53
Dump Truck	88.3	56 to 60	54 to 61
Noisy forklift	76.9	45 to 49	44 to 50
Loud Beeper Back-Up Alarm	91.0	59 to 64	57 to 65
Note: Work on the northeast part of the site is ~880-890 feet from noise-sensitive receptors. Work in the center portion of the site is ~790 to 990 feet from noise-sensitive receptors.			
Source: Y. Ebisu & Associates Noise Report, Tables 7 and 8.			

The average noise level at the closest Anahola residences resulting from construction activities will probably exceed 55 DNL, but be less than 65 DNL during a work day. The implementation of State DOH construction noise permit procedures will require that noisy construction activities do not occur during the nighttime, Sundays, and holidays. These permit procedures, which are routinely applied to noisy construction activities, are intended to minimize adverse noise impacts at residences. Because construction noise is expected to be audible at the closest residences, and may annoy some residents, KIUC's contractor has indicated that it will apply for a construction noise permit.

5.6.4.2 Operations and Maintenance

Solar Array. Once constructed, the photovoltaic panels, mounting racks, pull boxes, and electrical interconnections will make little or no noise. The only noise emission from the photovoltaic equipment and associated electronics would be from the cooling fans inside each of the AE Solaron 500 kW inverters, and a low hum from the transformers located at each equipment pad. Tests of identical inverters at other locations indicated that the inverter produces 65.4 dB(A) at a distance of approximately 10 feet (3 m).[39] This will not be audible off the project site.

Transformers emit a continuous 120 Hz hum with harmonics when connected to 60 Hz circuits. The fundamental frequency is the "hum" that annoys people primarily because of its continuous nature. The sound emissions from the step-up transformers that will serve each of the twelve 1-Megawatt PV modules will vary depending on the exact model selected, but the sound emissions will comply with the NEMA TR-1 Sound Emission Standard for Transformers,[40] which means they will be no more than 58 and 67 dB(A) at 2 meters. This will not be audible off the project site.

Motor vehicles will travel the drive aisles between the photovoltaic panels as part of regular operations and maintenance activities. Given the presence of Kūhiō Highway only a short distance away, the occasional presence of a few vehicles is not significant. Neither will the operation of the type or equipment needed to properly maintain vegetation under and around the PV panels.

Substation. Operation of the control building, transformers, circuit switchers, and other electrical components which make up the substation generally do not generate substantial levels of noise. Some equipment, such as transformers, is sufficiently loud (e.g., up to 68 dBA at 2 meters) to require attenuation. However, the 1,000+-foot distance between these and the nearest noise-sensitive uses and the presence or relatively high levels of masking background noise from highway traffic means that they will not be audible in noise sensitive areas. The type of BESS unit that KIUC has selected does not require the use of noisy air-handling equipment for cooling that some applications use. That, together with its distance from noise-sensitive receptors and the background highway traffic noise means that operational noise from these will not significantly impact surrounding properties or land-uses.

Service Center. Table 5.21 presents the predicted noise levels at noise-sensitive residential areas resulting from various operations at the baseyard.[41] These receptors are ~1,025 to 1,050 feet from the source. Noise sources other than the KIUC Line Trucks, such as delivery tractor/trailer trucks with their noisier forklifts, were included in the tables, since these vehicles may intermittently visit the baseyard. Background ambient noise levels at the receptors during the quieter periods were typically

[39] Tests were conducted by Advanced Energy, Inc. per Acoustic Emissions Standard IEC/EN 61010-1.

[40] NEMA is the National Electrical Manufacturers Association.

[41] The lower range of the predicted noise levels are more likely to occur during the daytime period (due to upward refraction of the sound rays from the sources and/or excess ground attenuation effects), while the higher noise levels are more likely to occur during the nighttime or overcast periods (due to the negligible excess ground attenuation effects). In addition to these sound propagation effects, the background ambient noise levels at the receptor locations are typically lower during the nighttime and early morning periods, so the risks of the baseyard noise sources being audible at the noise sensitive receptor locations are greater during the nighttime and early morning periods than during the normal daytime working periods.

between 35 and 40 dBA, which means that the relatively quiet KIUC Line Trucks should be able to operate on a regular basis during the daytime or nighttime periods with low risk of causing noise complaints at the closest Anahola residential subdivision, as long as their beeper type back-up alarms are replace with broadband noise back-up alarms. Because visits to the KIUC Baseyard by the louder tractor trailer vehicles and loading/unloading equipment should not occur on frequent or regular basis, and when they do would occur during normal business hours, they are not likely to draw complaints. Exceedances of the 55 DNL or 65 DNL noise impact thresholds should not occur at the closest residences with or without the replacement of the Line Truck's back-up alarms. Risks of adverse noise impacts from the proposed KIUC Service Center and baseyard operations are considered to be very low.

Table 5.21. Forecast Noise from Various Baseyard Activities

Noise Source	*Sound Level at 50 feet (dBA)*	*Predicted Noise Level at Receptor*
Steady Noise from Line Truck Idling	64.8	31 to 36 dBA
Average Noise from Operating Line Truck	67.8	36 to 40 dBA
Line Truck Beeper Type Back-Up Alarm	69.0	34 to 40 dBA
Line Truck Broadband Back-Up Alarm	68.6	33 to 39 dBA
Line Truck Air Brake Release	80.4	39 to 45 dBA
Banging Noise During Loading/Unloading	89.5	56 to 61 dBA
Noisy Tractor/Trailer Truck	85.2	52 to 57 dBA
Noisy Forklift	76.9	43 to 47 dBA
Tractor/Trailer Truck Back-Up Alarm	87.5	52 to 58 dBA
Note: Noise-sensitive receptors located 1,028 to 1,056 feet from source.		
Source: Y. Ebisu & Associates Noise Report, Tables 5 and 6.		

Nighttime activities at the proposed baseyard will probably occur due to the deployment of material and personnel during emergency trouble calls. The adverse effect of such activities could be further minimized by using the quietest available equipment for this purpose, and replace the beeper type back-up alarms with broadband noise back-up alarms. The broadband noise back-up alarms (with the same sound level as the beeper alarms of 69 dBA at 50 feet), should perform their required safety purpose but be inaudible at the closest noise sensitive receptors.

Project-Related Highway Noise. Vehicles associated with the proposed project will increase traffic volumes on Kūhiō Highway by at most 20 vehicles per hour. The addition of these to the baseline traffic volumes (900 to 1,100 vehicles per hour) will increase total traffic noise levels by less than 0.1 dB, which will be very difficult to measure. The increases in noise levels attributable to the Anahola Solar Project traffic will not be significant.

5.7 ARCHAEOLOGICAL, HISTORICAL, & CULTURAL RESOURCES

The National Historic Preservation Act (NHPA) Section 106, and the Advisory Council on Historic Preservation's implementing regulations, 36 CFR Part 800 require federal agencies to take into account the effects of a proposed project (the undertaking) on historic properties. In order to determine the "finding of effect", the federal agency must consult with the State Historic Preservation Officer, Indian Tribes and Native Hawaiian Organizations, and other interested parties.

At the state level, Hawai‘i Revised Statutes § 343 and its implementing regulation HAR § 11-200-12 mandate that agencies consider whether a project involves an irrevocable commitment to loss or destruction of any natural or cultural resource in assessing the significance of a project's impacts. Here cultural resources are defined both as resources relevant to ongoing cultural practices as well as historic or pre-historic properties with cultural significance. Chapter 6E, Hawaii Revised Statutes, is the comparable State law governing Historic preservation. It is implemented through a number of Hawai‘i State regulations; these include, but are not limited to, Hawai‘i Administrative Rules (HAR) §13-197, §13-198, and §13-300.

5.7.1 EXISTING CONDITIONS

The Anahola Solar Project is located in the Kamalomalo‘o *ahupua'a*, a narrow strip of land in the Puna district of Kaua‘i. The project site encompasses a 60-acre portion of a much larger 422-acre parcel (TMK: (4) 4-7-004:002), just south of Anahola Village on land owned by the DHHL. Kamalomalo‘o *ahupua'a* includes about 1.5 miles of open coastline, from the outlet of Kamalomalo‘o stream in the south to Lae Līpoa Point at its boundary with the neighboring Anahola *ahupua'a*. This *ahupua'a* consists of 2,366 acres of total area.

In order to assess the presence and nature of any archaeological or historic properties on the project site, T. S. Dye & Colleagues, Archaeologists, Inc. conducted an Archaeological Inventory Survey (AIS) of the project site. Their complete report is included as an appendix to this document (see Appendix A). Because of the extensive grubbing and grading which is necessary to prepare the project sites for the photovoltaic array, substation, service center, and access drive the archaeologists defined the entire 60 acres as the area of potential effect (APE). The AIS consisted of: (*i*) background research on the existing body of available archaeological and historical information pertaining to the project site; (*ii*) excavation of ten test trenches distributed throughout the area with the potential to be affected by the proposed project[42]; and (*iii*) subsequent stratigraphic testing of analysis and identification of selected features.[43]

In addition to the AIS, and pursuant to the requirements of Hawai‘i Revised Statutes § 343, KIUC commissioned Native Kaua‘i, LLC to perform a Cultural Impact Assessment (CIA) in order to collect information regarding the cultural context and ongoing cultural practices in the vicinity of the project site which may be directly or indirectly impacted by the proposed project. The purpose of the CIA is neither to support nor oppose the proposed project, but to produce a document which can be used to identify and protect valuable traditions and practices of Native Hawaiian civilization. The complete CIA is included as Appendix F of this document.

5.7.1.1 Archaeological and Historic Resources

Background information was gathered prior to fieldwork as a means of predicting the types and distribution of historic properties that might be present within the project site. This information is also useful for understanding and evaluating the significance of historic properties. Documents and materials from the State Historic Preservation Division (SHPD) library, the SHPD Geographic Information Systems (GIS) database, the survey office of the State of Hawai‘i's Department of Accounting and General Services, the Hawai‘i State Library, and the library of T. S. Dye & Colleagues, Archaeologists.

[42] Subsurface exploration consisted of backhoe excavation and systematic description of ten test trenches placed throughout the area with the potential to be effected by the proposed project, to determine the presence of subsurface archaeological or historical properties.

[43] All archaeological field recording, sampling, and laboratory methods used in the conduct of the AIS were standard operating procedures used by T. S. Dye & Colleagues, Archaeologists, Inc. designed to report the observational basis of statements made in their AIS report.

Traditional and Early Historic Land Use. According to Wichman's *Kaua'i: Ancient Place-Names and Their Stories* (1998) the name Kamalomalo'o can be translated as "the dry loincloth." It is said to be named thus due to an ancient practice:

> *In olden days, when an ali'i came ashore from a canoe voyage or surfing, his bodyguards threw their spears at him. It was a mark of chiefly strength that he could dodge or catch every spear. After this, he was ceremoniously given a dry malo (a piece of tapa . . . , the principal clothing for men).*

Kamalomalo'o *ahupua'a* is, as noted above, just south of Anahola *ahupua'a*, and is the northernmost *ahupua'a* in the Puna *moku*, or district. Anahola is said to be named (Wichman, 1998), "after a *mo'o*, a lizard *kupua* that appeared on land as a man and in the sea as a merman." Wichman goes on to describe a *heiau* which once existed in Kamalomalo'o *ahupua'a* was described this way:

> *Māhu-nā-pu'u-one, "vapor that rises from the sand dunes," was a heiau where humans were sacrificed. It was built in the late 1600s by Kawelomahamahai'a to celebrate the birth of his twin grandsons who were the owners of the dreaded kapu moe (prostration taboo).*

Handy and Handy's *Native Planters in Old Hawaii: Their Life, Lore, and Environment* (1972) includes the following description of Kamalomalo'o, Anahola, and Keālia.

> *The last ahupua'a on this, the ko'olau (east and northeast) coast, is Anahola. Here is the largest river in the Ko'olau District. There are old abandoned terraces along its banks far upstream. There are old lo'i from two to four miles inland along Anahola River and its tributary Ka'alua Stream, and below their point of juncture there are many lo'i on flats along the river banks as it meanders through its wide gulch. The delta is three-fourths mile wide, and this was all terraced…*
>
> *Two small ahupua'a, Kamalomaloo (Dry Kamalo) and Kealia are rather dry, with small streams and gulches and only a few lo'i areas. Where Keālia and Kapa'a Streams join inland there are wide flats that were terraced. Seaward there were formerly many terraced areas. There are clumps of coconut and mango trees where formerly were kuleana with their lo'i. Inland there were a number of small streams which doubtless once had small lo'i developments.*

Prior to 1840, all land in Hawai'i was owned by the king and his chiefs; the Constitution of the Kingdom stated that while the land belonged to him it was not his personal property but was held in trust for collective management by his government. As foreigners settled in the islands some began to dispute the king's ownership of all lands. This led to the establishment in 1845 of the Board of Commissioners to Quiet Land Titles, known as the Land Commission. By decision of the king and his chiefs, the king was given his own property and the remainder was divided equally among the government, the chiefs, and the tenants as Land Commission Awards (LCA). This was the most important event in the distribution of land in Hawai'i and is known as the Great *Māhele*. Many LCAs were granted during the *Māhele* in the neighboring *ahupua'a* of Anahola, generally clustered around Anahola River and near the coast. There were no claims in Kamalomalo'o.

Historic Land Use. Kaua'i is known as "the Garden Isle" because of its abundant rainfall and the resulting lush vegetation.[44] The runoff provided plentiful water for irrigation, making Kauai an

[44] Wai'ale'ale, which is translated as "rippling water" or "overflowing water", reaches an elevation of 5,080 ft. and has a mean annual rainfall that was at one time estimated to be 476 inches. In recent years, its running 30-year average annual rainfall total has been decreasing almost steadily, from 406 inches in 1997 to just below 384 inches in 2010. For more

attractive and profitable place for sugarcane cultivation. Industrial sugarcane agriculture on Kaua'i began in 1835 with the establishment of the Kōloa plantation. Kōloa Plantation is known as the first sugar plantation in the Kingdom of Hawai'i. In east Kaua'i, Lihue Plantation was founded in 1849 and was only the second sugar plantation in the Kingdom; this plantation brought much of the land in the region into sugarcane cultivation and created the water irrigation system that supported those fields. This ditch system was so effective that "…by 1931, some 79 percent of the 6712 acres of Lihue Plantation's cane land was irrigated by gravity flow and average water production was 82 mgd [millions of gallons per day]" (Wilcox, 1996). A system of railroads helped to transport cane stalks to the mill for processing; a tax map dated November 1936 shows these railroad tracks running through the Anahola Solar Project site (see Appendix A).

The project site is also found on a 1926 field map of Makee Sugar Company, which was founded in 1877 by Captain James Makee and several others, including King Kalākaua, who owned a quarter-interest. Lihue Plantation Co. absorbed the Makee Sugar Co. in 1933.

> *By the time Lihue Plantation acquired Makee, it had 7200 acres in cane with another 2200 acres planted by independent planters, primarily homesteaders. It had a well-developed water collection and delivery system, too, which delivered an average of some 30 mgd [millions of gallons per day] and included Anahola, Kaneha and Kapaa ditches.*

Lihue Plantation Co. eventually became part of Amfac, and Amfac Sugar Kaua'i remained in operation until 2000. At some point in the relatively recent past, the project site fell out of use for commercial sugarcane cultivation.

Previous Archaeological Work. Prior to the work conducted for this project, there have been no known archaeological studies for the project site. The nearest areas which have been the subject of archaeological survey work are in the nearby areas of Kumukumu and Keālia. In 2006, Scientific Consultant Services, Inc. (SCS) conducted an archaeological survey of a 2,008-acre parcel located in Kumukumu and Keālia *ahupua'a*, the two *ahupua'a* south of Kamalomalo'o. The organization and results of that survey are provided in detail in the AIS for this project, included in Appendix A.

The nearest documented human burial to the project site was found at Donkey Beach, which is approximately 1.2 miles southeast of the Anahola Solar Project site. This burial was inadvertently exposed in 1992; the orientation of the bones indicated it was a primary burial. Because the burial was vulnerable to beach erosion, it was excavated and brought to the Office of Hawaiian Affairs (OHA) Kaua'i branch.

In 1999, an archaeological inventory survey was conducted by Perzinsky et al. of a 300-acre parcel in Keālia, which lies just southeast of the Anahola Solar project site. Three sites were identified in this survey, including a complex of plantation-era features (Site 50-30-08-789); a complex of World War II-era features (Site 50-30-08-790), and prehistoric burials at the south end of Donkey Beach which are likely prehistoric- and/or early historic-era native Hawaiian in origin (Site 50-30-08-1899). In general, the majority of sites discovered during previous archaeological work in the region were remnants of the plantation era because use of the area for commercial sugarcane cultivation had such a significant impact on the land. However, while there were no feature remnants that predated the plantation era, the burials potentially do predate plantation agriculture.

Field Survey. The archaeological inventory survey carried out for the Anahola solar project was conducted with backhoe excavation of ten test trenches distributed throughout the project site with systematic documentation of the findings to determine if any subsurface archaeological or historic

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information, see the National Oceanic and Atmospheric Administration's National Weather Service website: www.weather.gov

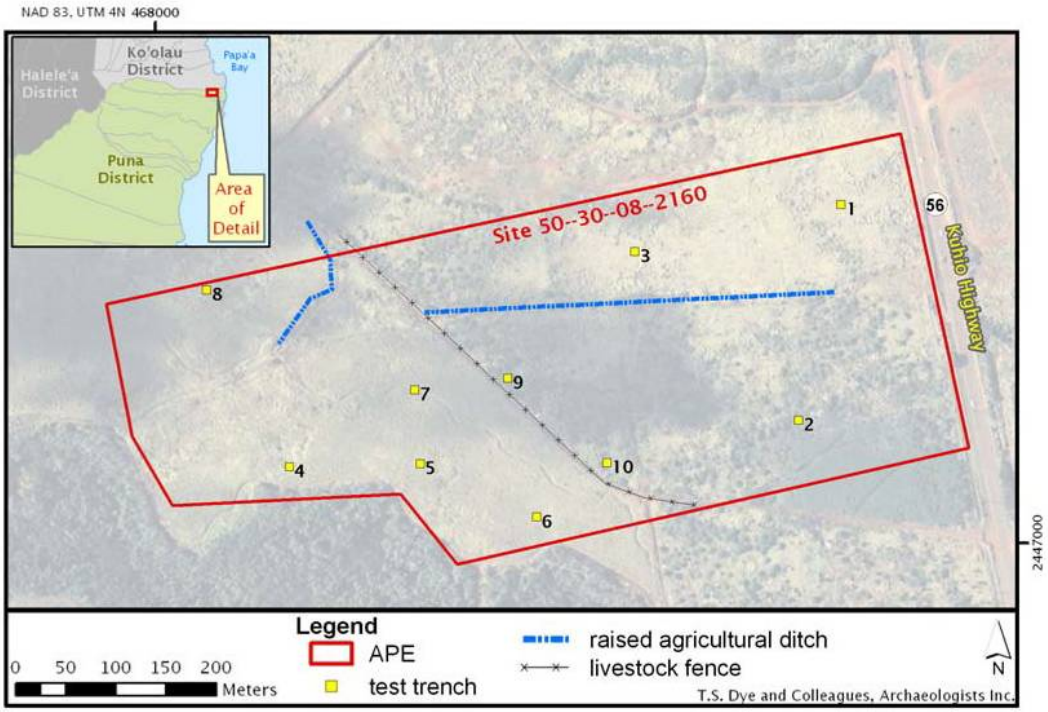
properties were present (see Figure 5.9). In some portions of the site vegetation and other obstacles limited access, but efforts were made to ensure a broad coverage of the entire project site. All trenches were excavated with a backhoe and were between 13 and 22 feet in length, 2 and 4 feet in width, and 4 and 8 feet in depth. The maximum depth of the test trenches was determined by the identification of what soil scientists term the *C Horizon*. The *C Horizon* is the soil strata at which the local bedrock material deteriorates into its mineral components. Excavation to this depth ensures that no buried ground surfaces would be present below the base of excavation.

The ten trenches excavated throughout the project site revealed a profile consistent with natural sediment, including deteriorating bedrock and paleosol, overlain with two layers of agricultural soil This pattern was present throughout the project site. The soil has been significantly reworked during historic sugarcane agriculture. If buried archeological materials were present, they would have been substantially altered or destroyed by plowing for industrial scale agriculture. No buried materials of any kind were observed at any of the test trenches.

The sugarcane fields and the raised agricultural ditches which were built to serve them have been assigned the State Inventory of Historic Site (SIHP) No. 50-30-08-2160, and are believed to be related to historic-era industrial agriculture known to have been conducted on this site between the mid-nineteenth and mid-twentieth centuries.. . The ditches are 5-6 meters wide, 330 and 400 meters long, and constructed of earthen linear mound embankments with discontinuous dry laid basalt cobbles. The ditches contained evidence of modern disturbance through the presence of metal and plastic piping and concrete masonry. Both of the ditch features are visible on current aerial photography. . It is possible that this feature has some relationship to Site No. 50-80-08-789, a complex of plantation-era infrastructure *makai* of Kūhiō Highway, approximately 4,000 feet southeast of the project site. Historic maps of this region also show a section of train tracks intersecting the project site (see Section 5.7.1). No trace of the railroad tracks which once crossed this area were found during field observation.[45] Given the extent of land alteration during the era of sugarcane agriculture in northeastern Kauaʻi, it is likely that all traces of a former rail line would be removed by subsequent field preparation.

[45] Registered Map No. 2282 "Anahola-Kamalomalo, Kauaʻi" dated 1904, depicts the Anahola Solar Project site as containing Fields 13 and 14 of the Makee Sugar Company. This map shows railroad tracks entering the project site from the east and forking, with one track running from the southeast corner of the project site heading northwest, and the other track traversing the southwestern portion of the project site (see Appendix A, Figure 3).

Figure 5.9. Test Trench Locations.



Source: T.S. Dye & Colleagues, Archaeologists Inc.

5.7.1.2 Cultural Resources

Traditional Native Hawaiian practices, and the resources upon which these practices depended, primarily related to subsistence, medicinal, religious, and cultural purposes. Examples of these traditional cultural practices and resources include fishing, gathering seaweed, and collecting plants for the practice of traditional medicine. The purpose of these traditional practices went beyond personal enrichment, allowing Native Hawaiians to meet their responsibility to the community, such as feeding people or healing the sick. While it is the responsibility of Native Hawaiians to conduct these traditional practices, government agencies and private developers also have a responsibility under State law to assess the impacts of their actions, whether direct or indirect, on traditional cultural practices and resources. Per the requirements of Hawai‘i Revised Statutes §343, KIUC commissioned Native Kaua‘i, LLC to perform a Cultural Impact Assessment (CIA) in order to collect information regarding the cultural context and ongoing cultural practices in the vicinity of the project site which could be directly or indirectly impacted by the proposed project. The complete CIA is included as Appendix F of this document.

In addition to conducting background research and discussing the project’s potential impacts in a cultural context, one of the most critical aspects of a CIA is consulting with Native Hawaiian *kūpuna*, Hawaiian cultural organizations, cultural practitioners, and other knowledgeable members of the community who can supply information about traditional Hawaiian sites, resources, and practices on and around the project. Representatives of Native Kaua‘i, LLC met with *kūpuna* and *mākua*, elders and parents, of Kamalomalo‘o and Anahola *ahupua’a*, seeking out individuals with knowledge, ties, and experience in this region in order to gather information and insight regarding past and present customary practices, traditions, and place names with the potential to be affected by the proposed solar array, substation, and service center.

In total, Native Kauaʻi, LLC interviewed a total of 17 Native Hawaiians in course of preparing their CIA. The majority of interviewees are residents of Anahola, living on Hawaiian Homestead lands; two individuals lived outside of Anahola. Interviewees included elders, parents, educators, community activists, and cultural practitioners, and several fell into two or more of those categories. All are of Native Hawaiian ancestry with personal ties and connection to the Anahola area. In the course of these interviews care was taken to observe a sense of propriety, including patience, humility, and respect for the subjects which reflects Native Hawaiian custom. The interviews were conducted in informal individual and small group settings which were comfortable for the participants. Table 5.22 below identifies the persons who provided interviews for the CIA.

Table 5.22. Persons Interviewed for the CIA

No.	*Name*	*Community Position*	*Place of Residence*
1.	Mr. Valentine "Val" Ako	*Kūpuna*, Cultural Practitioner	Wailua, Kauaʻi
2.	Mr. Frank Cummings	Homesteader, Cultural Practitioner	Anahola, Kauaʻi
3.	Mr. John Pia	Homesteader, Cultural Practitioner	Anahola, Kauaʻi
4.	Mr. John Kaʻohelauliʻi	Homesteader, Cultural Practitioner	Anahola, Kauaʻi
5.	Mr. Kawika Cutcher	Homesteader, Cultural Practitioner	Anahola, Kauaʻi
6.	Mrs. Healani Trembath	*Kūpuna*, Cultural Practitioner	Huleʻia, Kauaʻi
7.	Mrs. Leonora Kelekoma	Homesteader, *Kūpuna*, & Cultural Practitioner	Anahola, Kauaʻi
8.	Ms. Jodi Omo	Homesteader, Cultural Practitioner	Anahola, Kauaʻi
9.	Mr. Chono Fernandez	Homesteader, Cultural Practitioner	Anahola, Kauaʻi
10.	Mrs. Diana Lovell O'Reilly	Homesteader, *Kūpuna*	Anahola, Kauaʻi
11.	Mrs. Carol Manoʻi	*Kūpuna*	Anahola, Kauaʻi
12.	Ms. Esther "Essie" Kaleialoha Williams	Homesteader	Anahola, Kauaʻi
13.	Mr. Llewelyn Woodward	Homesteader, Cultural Practitioner	Anahola, Kauaʻi
14.	Mr. Kamealoha Smith	Educator	Anahola, Kauaʻi
15.	Mr. Leroy Kaʻona	Educator, Homestead ʻOhana	Anahola, Kauaʻi
16.	Mr. Kawika Winter	National Tropical Botancial Garden Limahuli Garden & Preserve	Hāʻena, Kauaʻi
17.	Mr. David "Kawika" Viets	Kauaʻi Native Plant Society	Anahola, Kauaʻi
Note: Mr. Kawika Winter and Mr. Kawika Viets were interviewed because of their knowledge of native plants and their relationship to the traditions of the Anahola region.			
Source: Native Kauaʻi, LLC (2012)			

5.7.2 PROBABLE IMPACTS

5.7.2.1 Effects on Archaeological and Historic Resources

Site No. 50-30-08-2160 was evaluated according to Criterion D; the AIS recommended significant for its information content.[46] The AIS further recommended that all pertinent information related to the report had been recorded on historic maps and within the narrative of the report, and therefore no additional archeological work would need to be completed for the undertaking. RUS submitted provided a detailed description of the proposed action, a copy of the AIS, and the proposed determinations of eligibility and finding of effect in October 2012 to the Hawaiʻi SHPO and the

[46] Hawaiʻi Administrative Rules §13-275-6, Criterion D indicates significance due to a site having yielded, or being likely to yield, information important for research on prehistory or history.

native Hawaiian organizations listed in Table 5.23, which were identified based on the U.S. Department of the Interior Office of Native Hawaiian Relations Native Hawaiian Organization (NHO) Notification List. RUS did not receive any responses to the circulation of the AIS from the NHO's, but did consult further with the Hawai'i SHPO. The SHPO responded to RUS's October 2012 submittal on November 20, 2012, finding the AIS inadequate and offering comments, questions, and suggested additions to the AIS. After engaging in consultation with the SHPO via teleconference in December 2012 and January 2013, the AIS was revised and resubmitted to the SHPO on March 4, 2013. The revised AIS is included as Appendix A. The SHPO responded on March 25, and concurred with a finding of no adverse effect to historic properties. All written correspondence is included in Appendix D.

Table 5.23. Native Hawaiian Organizations Consulted

Ms. Lorraine Rapoza, President, Anahola Hawaiian Homes Association, P.O. Box 646, Anahola, HI 96703
Mr. Soulee LKO Stroud, President, Association of Hawaiian Civic Clubs, P.O. Box 1135, Honolulu, HI 96807
Ms. Blossom Feiteira, President, Association of Hawaiians for Homestead Lands, 1050 Queen Street, Suite 200, Honolulu, Hawai`i 96814
Ms. Robin Danner, President, Council for Native Hawaiian, Advancement, 1050 Queen Street, Suite 200, Honolulu, HI 96814
Ms. Jobie Masagatani, Chair Designate, Department of Hawaiian Homelands, P.O. Box 1879, Honolulu, HI 96805
Mr. Henry Gomes, President, Hawai'i Maoli, P.O. Box 1135, Honolulu, HI 96807
Hokualele Canoe Club, P.O. Box 169, Anahola, HI 96703
Ms. Kaipo Kincaid, Executive Director, Hui Kāko'o 'Āina Ho'opulapula, 767 Kailua Road #212, Kailua, HI 96734
Kanu I Ka Pono New Century Public Charter School, P.O. Box 12, Anahola, Hawai'i, 96703-0012
Mr. Austin Nakoa, Chairman, Native Hawaiian Economic Alliance, 1050 Queen Street, Suite 200, Honolulu, HI 96814
Dr. Kamana'opono M. Crabbe Ph.D., Chief Executive Officer, Office of Hawaiian Affairs, 711 Kapi'olani Boulevard, Suite 500, Honolulu, HI 96813
Mr. Kimo Kaloi, Director, Office of Hawaiian Relations, U.S. Department of the Interior, 1849 C Street, NW (MS 3543), Washington, D.C. 20240
Ms. Liberta Hussey-Albao, President, Queen Deborah Kapule Hawaiian Civic Club, P.O. Box 164, Kapa'a, Kaua'i, HI 96746
Mr. Kamaki Kanahele, Chairman, Sovereign Councils of the Hawaiian, Homelands Assembly, P.O. Box 2881, Waianae, HI 96792
Mr. Melvin Soong, President, The I Mua Group, 422 Iliaina Street, Kailua, HI 96734
Mr. William J. Aila, Jr., SHPO & Chairperson, Department of Land and Natural Resources, State of Hawai'i 1151 Punchbowl Street, Rm. 130, Honolulu, HI 96813

5.7.2.2 Cultural Resources

As noted both above and in the attached CIA, the available evidence indicates that there are no cultural resources or current cultural practices extant on or near the project site. As noted in Section 5.7.1.1, there is one historical property, a remnant irrigation ditch, present on the project site (SIHP Site No. 50-30-08-2160) which has been examined and found not to have any cultural significance.

None of the *kūpuna*, cultural practitioners, botanists, and other informants interviewed in the process of assembling the CIA for the project could identify any cultural properties or practices present on the project site. The lack of such evidence that the affected areas are used for traditional cultural uses, and the fact that the proposed project would not limit members of the Native Hawaiian community from accessing cultural resources which could be present in adjacent areas leads to the conclusion that there would be no adverse impact.

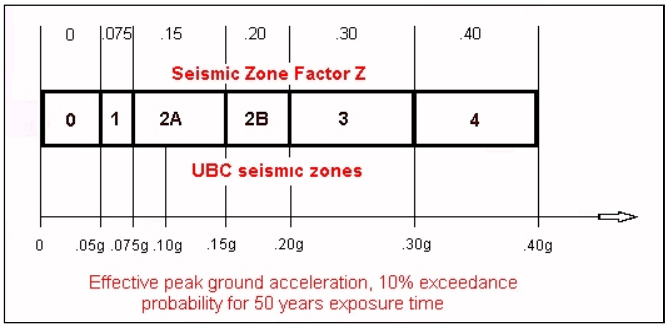
RUS submitted the CIA with the October 2012 correspondence discussed in above to the SHPO and the all of the native Hawaiian organizations listed in Table 5.23. RUS did not receive any comments from the SHPO or NHOs on the content within the CIA. While KIUC believes that the likelihood of new information regarding cultural properties or practices in the area is low, mitigation to address this potential for discovery of undocumented cultural properties includes, but is not limited to: (*i*) the immediate cessation of all work in the area; and (*ii*) notification of the State Historic preservation Division to assess impacts. Once constructed, the proposed facilities would not have the potential to harm cultural properties or practices in any way. Neither will ongoing operations limit or otherwise adversely impact traditional and customary practices.

5.8 NATURAL HAZARDS

5.8.1 SUSCEPTIBILITY TO SEISMIC DAMAGE

Most earthquakes which occur in the State are localized around the island of Hawaii, and most are too small to be detected except by highly sensitive instrument. The most powerful earthquake in Hawaii on record, reported by the U.S. Geological Survey (http://pubs.usgs.gov/gip/hazards/earthquakes.html) was recorded in 1868. This earthquake occurred beneath the Kaʻu district on the southeast flank of Maunaloa, on the island of Hawaiʻi. It had an estimated magnitude of between 7.5 and 8.1 and caused damage across all of Hawaiʻi Island. However, even this powerful earthquake, which was felt on far away Kauaʻi, did not cause any damage there.

Engineers, seismologists, architects, and planners have devised a system of classifying seismic hazards based on the expected strength of ground shaking and the probability of the shaking actually occurring within a specified time. The diagram below depicts this system of classification:

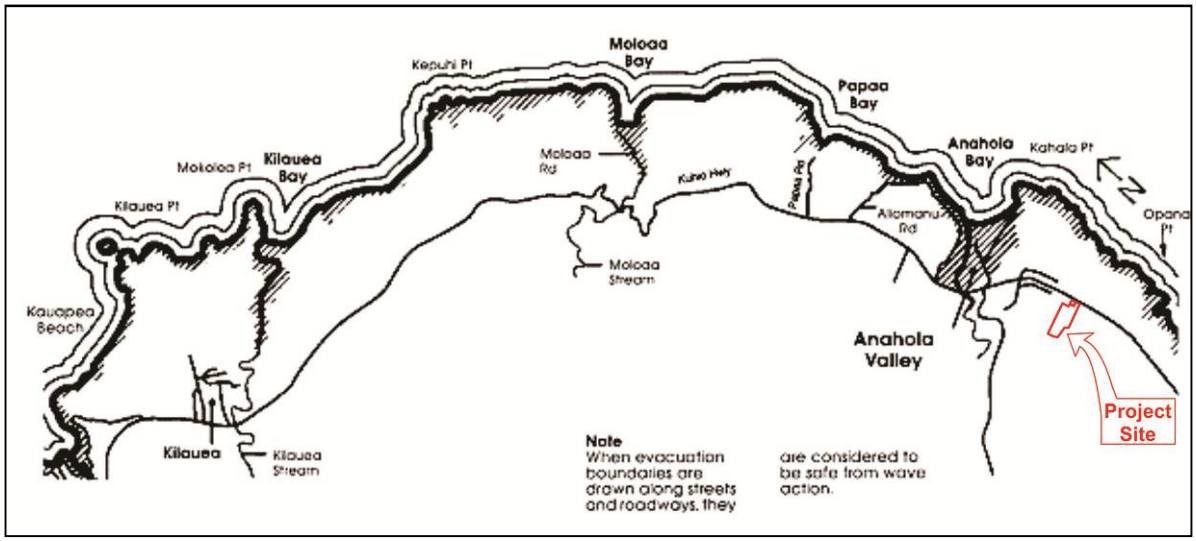


The results are included in the Uniform Building Code (UBC) seismic provisions. The UBC contains six seismic zones, ranging from 0 (no chance of severe ground shaking) to 4 (10 percent chance of severe shaking in a 50-year interval). For the purposes of structural design, the entire island of Kauaʻi is classified as Zone 1, a very low risk of severe ground shaking (USGS 1997). KIUC will construct all structures associated with the proposed solar facility and substation in compliance with the Uniform Building Codes for Zone 1.

5.8.2 VOLCANIC & TSUNAMI HAZARDS

There are no active volcanoes on the island of Kaua'i and the proposed project site is not in a region that the U.S. Geological Survey (1997b) has designated as subject to volcanic hazards. According to the Civil Defense Tsunami Evacuation Map for this portion of the County of Kaua'i (see Figure 5.10), the tsunami evacuation zone is well *makai* of Kūhiō Highway, whereas the entire project site is *mauka* of the highway. Thus, no portion of the project is within the tsunami evacuation zone and would not be susceptible to inundation in the event of a tsunami.

Figure 5.10 Tsunami Evacuation Map 2: Kauapea Beach to Anahola Bay



Source: Civil Defense Tsunami Evacuation Zone maps for the County of Kauai (http://tsunami.pdc.org/hazards/tsunami/kauai/Kauai02.gif)

5.8.3 SUSCEPTIBILITY TO HURRICANE DAMAGE

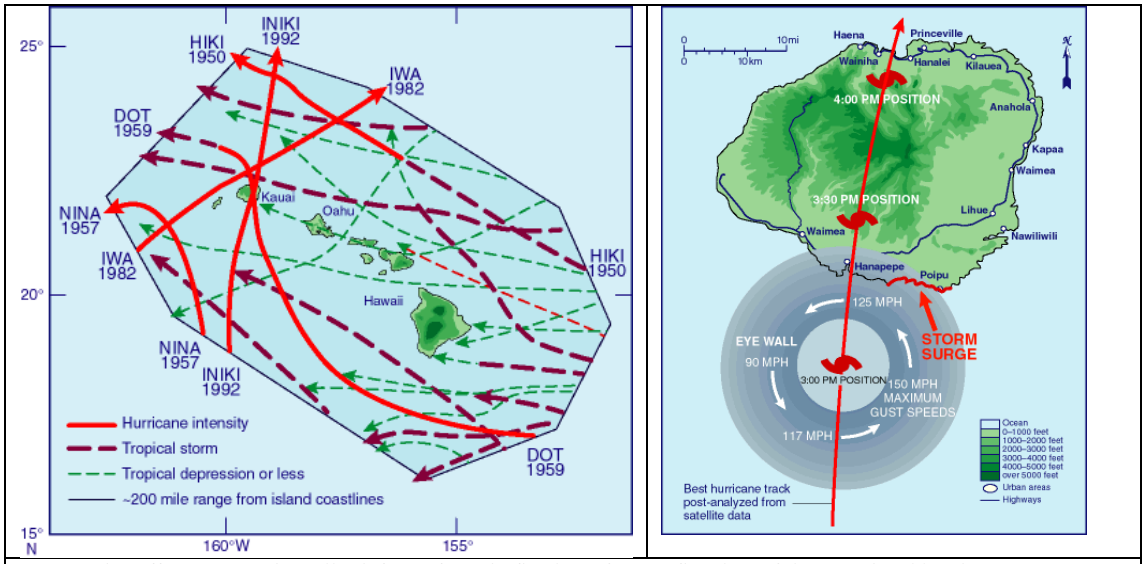
Two different factors must be considered in evaluating a facility's susceptibility to hurricane damage. The first is the likely track and magnitude of the storm themselves. The second is the robustness of the facility. Both are discussed below.

Hurricane season in the Hawaiian Islands begins in June and lasts through November. During the last 50 years, many hurricanes and tropical storms have come close to the Hawaiian Islands), but only three hurricanes have had direct impact. In all three cases, Kaua'i was the hardest hit (see Figure 5.11 and Table 5.24. The two most recent hurricanes, 'Iwa which struck the island on November 23, 1982 and 'Iniki which hit a decade later on September 11, 1992, have been by far the most devastating. Electrical power was knocked out island-wide, and it was many months before Kauai Electric (KIUC's predecessor electrical utility) was able to restore full service to North Shore communities.

Hurricane 'Iniki, which struck in September of 1992, was by far the most destructive storm to strike Hawai'i in recorded history, with widespread wind and water damage exceeding $2.2 billion. In August of 1959, losses in Hurricane Dot were about $6 million. In November of 1982, Hurricane 'Iwa caused over $250 million in damages, and in 1992 Hurricane 'Iniki caused damages totaling $1.9 billion, by far the most expensive natural disaster to affect the State of Hawai'i. For both the 1982 and 1992 hurricanes, the majority of the damage was suffered on the island of Kaua'i.

In considering the effect of hurricane forces on the photovoltaic modules and mounts, two potential sources of failure were considered: applied pressure loads generate by extremely high winds, and impact from foreign objects which may become airborne in a hurricane environment. The distinction is important because they represent very different potential sources of failure.

Figure 5.11 Tracks of Major Hurricanes Affecting the State of Hawai'i (1950-2012)



Source: http://www.soest.hawaii.edu/MET/Faculty/businger/ poster/hurricane/Fig2_tracks.gif and Fig4_kauai_track.gif

Table 5.24 Major Hurricanes Affecting the State of Hawai'i: 1950-2010

Name	*Date*	*Maximum Recorded Winds Ashore (mph)*		*Category*	*Deaths*
		Sustained	*Peak Gusts*		
Hiki	Aug. 15-17, 1950	68	NA	1	1
Nina	Dec. 1-2, 1957	NA	92	1	1
Dot	Aug. 6, 1959	81	103	2	-
'Iwa	Nov. 23, 1982	65	117	3	1
'Iniki	Sept. 11, 1992	92	143	4	8

*Note: Category is based on the Saffir-Simpson Hurricane Scale:
Category 1 – Wind speed of 74-95 mph, minimal damage.
Category 2 – Wind speed of 96-110 mph, moderate damage.
Category 3 – Wind speed of 111-130 mph, extensive damage.
Category 4 – Wind speed of 131-155 mph, extreme damage.
Category 5 – Wind speed of >155 mph, catastrophic damage.

Source: *State of Hawaii Data Book 2010*

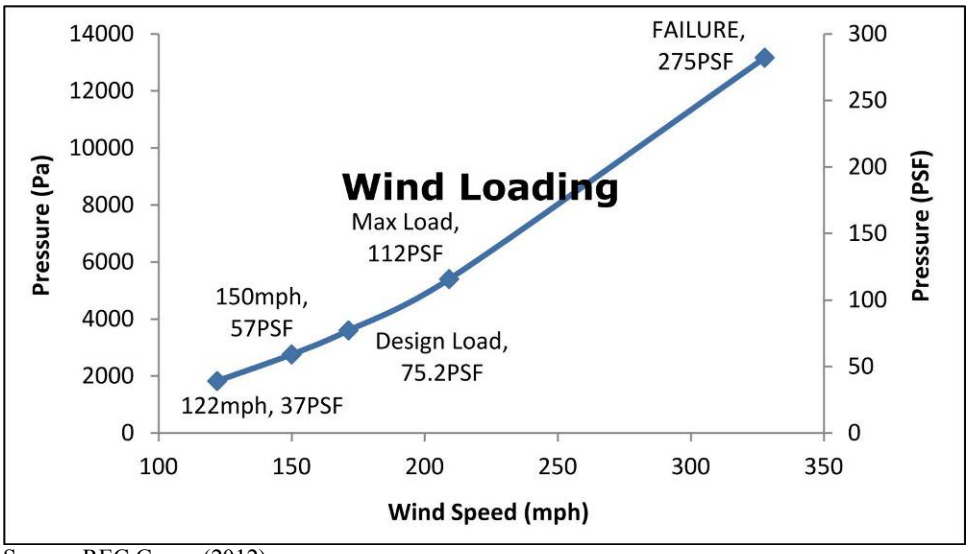
Impact Damage. An object striking a photovoltaic module is a concentrated load whereas high winds apply a distributed pressure (load). The modules to be used for the solar array are guaranteed against

impacts up to 122 miles per hour. Above this speed, it becomes unrealistic to expect that the module glass will survive impacts from flying objects at speeds far above this rating.

Wind Load Damage. With respect to wind loads:

- The module manufacturer, REC Group, has tested the module to significantly higher pressure load than the 37 lbs./ft.^{2} which corresponds to the 122 mph rating.
- As seen in the graph reproduced in Figure 5.12, the ultimate load a module may support before failure is 275 pounds per square foot.

Figure 5.12 REC Group Module Wind Speed Test Results



Source: REC Group (2012)

- Based on the American Society of Civil Engineers (ASCE) Section 7 standards for building wind loading, a wind speed of 150 mph could generate an applied pressure of 57 pounds per square foot on the module. This is well below both the design and maximum loads listed by the manufacturer.
- In addition, both the mounting racks and the driven piles which support the photovoltaic modules will be designed to support the 105 mph wind speed required by Kaua‘i County Code. While they will eventually fail when wind speeds greatly exceed that limit, it will not be a catastrophic failure. Instead, the structural elements will distort, but hold fast.

In view of these findings, it appears likely that while an extremely powerful hurricane (Category 4 and higher on the Saffir-Simpson Hurricane Scale) could damage the solar array, it is unlikely to uproot the equipment and allow it to become airborne. Hence, it does not represent a measurable threat to adjacent uses.

5.9 SCENIC & AESTHETIC RESOURCES

This section discusses the effect that construction and operation of the proposed facilities would have on visual resources. It begins with a summary of the methodology that was used in the assessment. That discussion includes a listing of the project components that would actually be visible. This is followed by a description of existing conditions. The section concludes with a discussion of the effect that the project would have on views from key vantage points with and without landscape screening.

5.9.1 VISUAL IMPACT ASSESSMENT METHODOLOGY

The extent to which project-related visual change would be perceived as "adverse" depends upon many factors, including (but not necessarily limited to) the location of the viewer and the activity which the viewer is involved in at the time. For example, individuals passing the facilities while on a daytime scenic drive along Kūhiō Highway will not have the same expectations or experience as individuals doing the same thing during a nighttime commute trip. Similarly, an Anahola resident looking toward the arrays daily from the living room of their nearby home will have a different attitude toward/experience with the facilities than will an individual who catches a glimpse of the panels from a distant hillside.

In order to determine which viewpoints deserved detailed attention, we undertook the following tasks:

- *Gathered information*. Site visits, analysis of photographs, examination of Google Maps and ESRI® aerial and satellite photography, and community outreach meetings were all used to gather information about the existing visual environment, land use plans and controls, and the potential impacts of the project. This process helped determine areas from which the site is visible, who the potential viewers might be, and the nature of these existing views.
- *Created a Geographic Information System (GIS) database.* A library of geographic information was collected for the analysis, including USGS 1:24,000 base maps, aerial/satellite images, and other geographic and land use data. This information came from public and private sources such as the State of Hawai'i, the County of Kaua'i, and the project contractors.
- *Assembled a computer model of the terrain.* Once the GIS system was populated with information regarding the project and the surrounding environment, planners created a three-dimensional electronic model using topographic information downloaded from the USGS National Elevation Dataset (URL: http://seamless.usgs.gov/website/seamless/ viewer.html).
- *Added a height value to major pieces of equipment and structures identified on the site plan*. Planners incorporated each project components with the potential for substantial visual effect was incorporated in the model. Also incorporated was the height of the average observer, 6.5 feet, somewhat higher than the average person stands to allow for persons in higher vehicles.
- *Mapped areas from which one or more project components could be seen if there is no screening*. This was accomplished using ArcView® Spatial Analysis Extension software together with the terrain model and information on the project components described above.[47] The software then creates a digital raster with each pixel representing 10,000 square feet of area.[48]
- *Graphically depicted and tabulating the model results*. The ESRI® software produced maps showing areas from which the proposed project could not be seen, could be partially seen, or would be fully visible.
- *Site Visit and Photography*. Having identified critical vantage points and viewer-populations, the final step in forming the visual impact analysis involved visiting the project site and the surrounding viewpoints, determining areas of visibility, and building a baseline of photographs documenting existing views of the project.

Because of their small size, low-lying nature, or underground installation, some of the proposed structures and equipment (e.g., electrical pads, underground conduits, and access roads) would be

[47] The facility could also be visible from some locations offshore or above Kaua'i, (i.e., from boats or aircraft). These were not mapped because the locations would not be static.

[48] The process was also used to determine the extent to which the visibility of project components could be reduced if a visual screen (presumably vegetation) was created around the edges of the project site. Two different screening heights were simulated: (*i*) 8 feet—the approximate height of the perimeter security fence, approximating a shrubbery screen; and (*ii*) 15 feet which approximates the height of rapidly established trees.

barely visible or not-visible from most public vantage points. Due to their greater height, bulk, or lateral extent, other components will be more visible. The analysis in Section 5.9.3 is limited to the following project components.

Photovoltaic Array. Each individual module is very modest in size; when fastened to its mounting structure it stands approximately 9 feet off the ground at its highest point (see Figure 2.3 and Figure 2.5). However, together the twelve 1-MW groupings (each of which has 4,900 PV panels) will contain a total of 59,000 modules and cover approximately 30 acres, and this massing means that if it were not partially screened, it could have substantial visual weight. Two inverters and twelve transformers will be mounted on a poured concrete pad that adjoins each one-MW block. The metal cabinets containing the electrical equipment will be painted a muted green (or earth-toned) shade which reduces reflectivity, but the electrical equipment and dedicated concrete pads will still be visible from some vantage points.

Substation. The substation has approximately 300 feet of frontage along Kūhiō Highway. As this portion of Kūhiō Highway is heavily travelled (approximately 12,500 vehicles per day at the time of the most recent traffic count) the substation will be visible to many passers-by.[49] In addition to its proximity to the highway, the substation will have overhead wires linking it to the existing 12 kV and 69 kV power along the highway. These wires will be supported by an A-frame riser approximately 45 feet in height. Other structures within the substation (e.g., H-frames, transformers, a BESS, and prefabricated control building), will range from 15 to 25 feet in height; the substation will also be enclosed by a security fence. Unless screened with landscape plantings, the substation would have a distinctly industrial character and will be in the foreground for the majority of persons passing along the highway.

Service Center. The Service Center site has approximately 510 feet of frontage along Kūhiō Highway and is the project component that is closest to the existing homes in Anahola. While it consists of single-story structures, the need for the service bays on the *mauka* side of the main structure to accommodate bucket trucks require that portion of the building to be approximately 27 feet high. This is taller than any of the other structures in the area except for the second floor that has been added to one of the single-family homes in Anahola immediately to the north. Without landscape screening, this component of the project could stand out.

5.9.2 EXISTING CONDITIONS

The northeast portion of the island of Kaua‘i is renowned for its scenic beauty. In recognition of this, the Kaua‘i County General Plan designates some portions of Kūhiō Highway that pass through the area, including the portion of the highway that runs along the eastern boundary of the project site, as a Scenic Roadway Corridor.[50]

The general visual character of the project site has been heavily modified from what existed prior to the start of intensive human habitation and use. The vegetation is dominated by guinea grass with varying amounts of Christmas berry and, in some areas, dense patches of lantana with Java plum trees dotting the site. The site is crossed by unpaved roads (mostly former field and haul roads from the sugar plantation era) and rudimentary paths.

[49] This comes from the most recent available traffic count, conducted at Station B73005601278 on Kūhiō Highway between ‘Ioane Road and Hokualele Road, on November 30, 2010.

[50] The Kauai County General Plan designates Scenic Roadway Corridors to conserve open space, scenic features, and views within and along Kauai’s most heavily traveled routes. The intent of this policy is to establish basic principles for roadway design and land use within these scenic corridors, and to provide a basis for County action to establish programs and regulations to implement them. Scenic Roadway Corridors are intended to provide design guidance but are not to restrict the principal land uses of urban areas.

Because of the size of the property and the undulating nature of the terrain, only portions of the 60-acre site are visible from any single ground-level vantage point. By far the greatest numbers of people near the site are traveling in vehicles on Kūhiō Highway, and roadside vegetation in the foreground obscures much of the project site from that vantage point. For viewers looking south from Anahola Village, the view is of the northern edge of the site, where the guinea grass and Christmas berry in the foreground prevent clear views of the substation site. The photographs reproduced in Figure 5.13 through Figure 5.15 depict views of the project site from Kūhiō Highway. Figure 5.16 depicts the project site as seen from existing residences in Anahola Village immediate north of the project site. Additional information on existing views is presented as part of the impact discussion in Section 5.9.3.

Figure 5.13. Views Near the Intersection of Kūhiō Highway and ʻIoane Road

View toward the project site from alongside Anahola Market Place ~75 feet south of the intersection of Kūhiō Highway and ʻIoane Road.

View toward the project site from the entrance to the parking lot of the AHHA Resource Center.

View towards the project site from the outlet of ʻIoane Road onto Kūhiō Highway, AHHA buildings in the foreground.

View towards project site from the mauka edge of the Anahola Marketplace parking area.

Source: All photos by Planning Solutions, Inc. (May 15, 2012).

Figure 5.14 Views Toward the Project Site from Kūhiō Highway Travelling North

View towards project site, travelling north along Kūhiō Highway, ~675 feet south of the southernmost edge of the property.

View towards project site from an elevated portion of Kūhiō Highway ~1 mile south of the project site. Travelling north, this is the last rise prior to the project site, which is not visible from this location.

View travelling north along Kūhiō Highway from the intersection with Kamole Road towards the project site. The project site is not visible from this location.

View towards the project site (~2.5 miles away) from Mailihuna Road, just mauka of Kūhiō Highway, below Kapa'a High School athletic field. The project site is not visible from this viewpoint.

Source: All photos by Planning Solutions, Inc. (May 15, 2012).

Figure 5.15 Views Toward Property from Kūhiō Highway Adjacent to the Project Site

View across Kūhiō Highway towards the southeastern corner of the project site.

View from makai edge of Kūhiō Highway towards the project site, directly across from proposed substation location.

View across Kūhiō Highway towards the proposed Service Center site.

View from Kūhiō Highway across the proposed Service Center site, ~300 feet from northeastern corner of the project site.

Source: All photos by Planning Solutions, Inc. (May 15, 2012).

Figure 5.16 contains photos of the site from the homes and businesses of Anahola Village, including Anahola Homesteads. Because site visits and photography confirm that there are no clear views of the project site from Anahola Village north of ʻIoane Road, the discussion focuses on the southernmost portion of Anahola in the vicinity of ʻIoane Road and closest to the project site.

Figure 5.16 Views Toward Project Site from Anahola Village

View towards the eastern portion of the project site from the southern edge of Anahola Village.

View towards project site from 'Ioane Road at intersection with Kapūnohu Street.

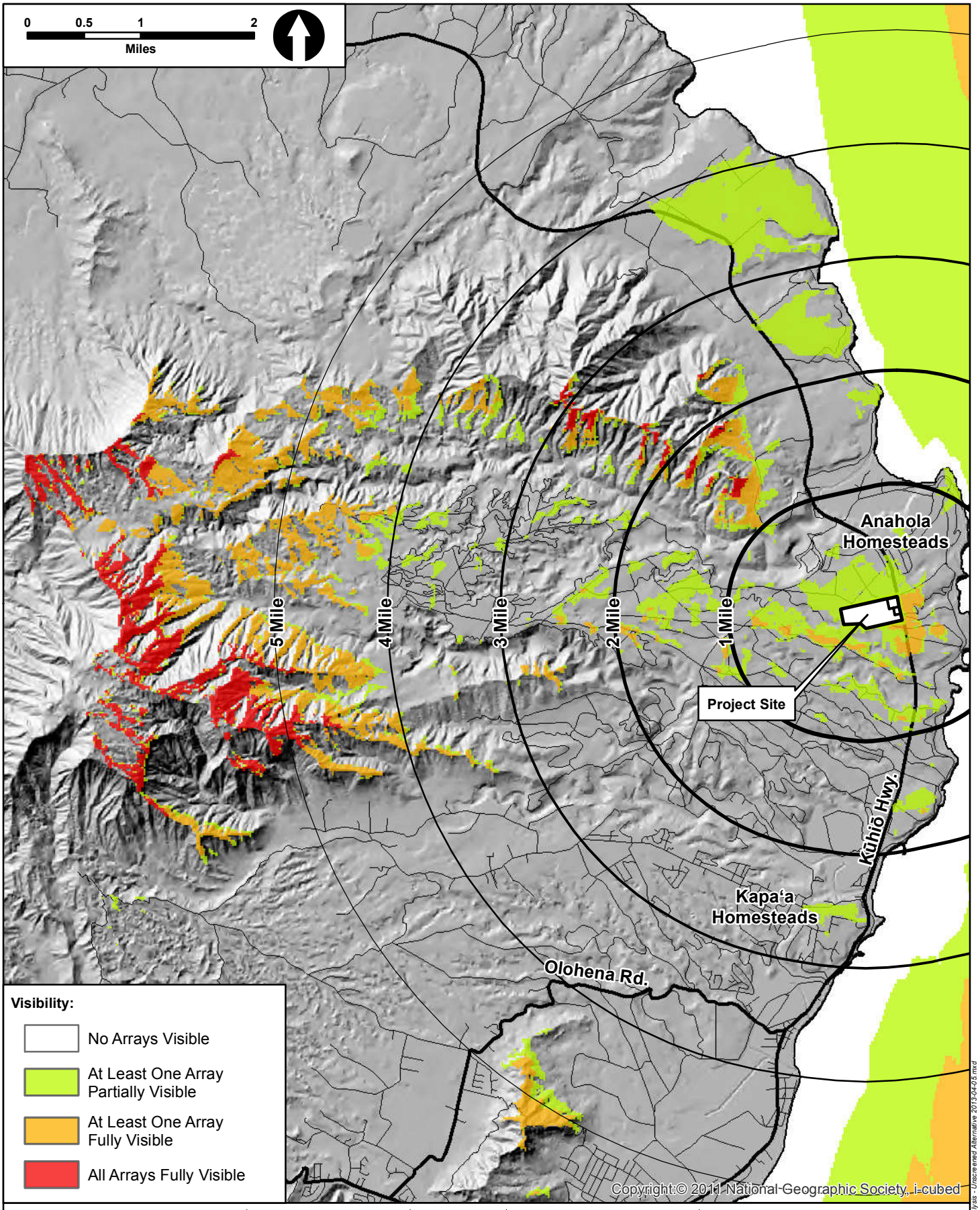
View towards project site from intersection of 'Ioane Road and Kawelo Street.

View towards project site from Kapūnohu Street.

Source: All photos by Planning Solutions, Inc. (May 15, 2012).

5.9.3 PROBABLE VISUAL IMPACTS

The computerized viewshed analysis described in Section 5.9.1 identified areas from which portions of the proposed facilities might be visible under several different circumstances. Figure 5.17 shows the areas from which an unscreened facility might be seen. Figure 5.18 and Figure 5.19 show the visibility of a facility with an 8-foot and 15-foot screen, respectively. Figure 5.20 summarizes the difference between the 8-foot and 15-foot screening alternatives. Together, the graphics provide insights into the extent to which visual screens might be effective in reducing their visibility.



Prepared For: Kaua'i Island Utility Cooperative

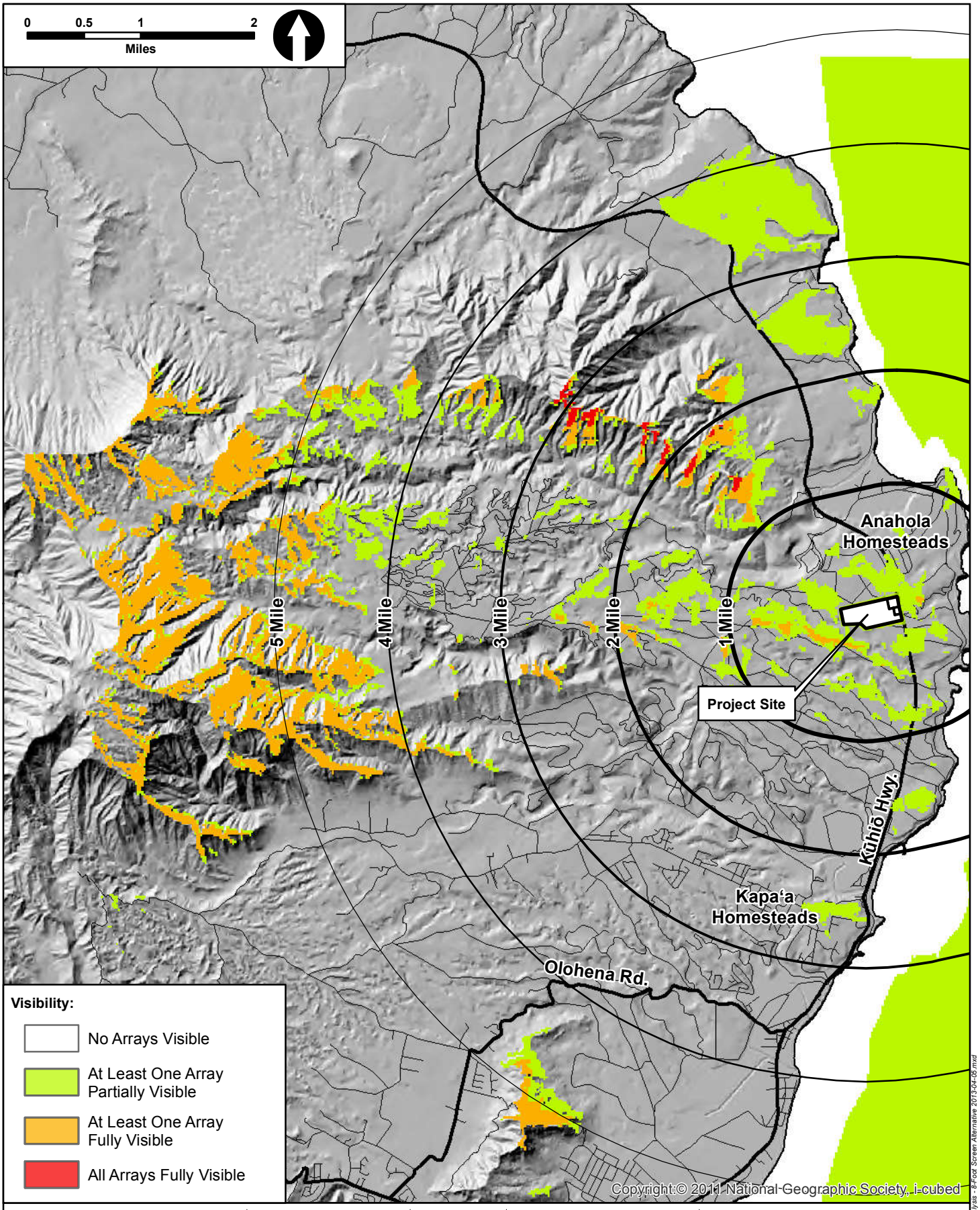
Prepared By: Planning Solutions

Source: PSI

Project: Anahola Solar Project

Figure 5.17:
Viewshed Analysis: Unscreened Alternative

Figure 5-17 Viewshed Analysis - Unscreened Alternative 2013-04-05.mxd



Prepared For: Kaua'i Island Utility Cooperative

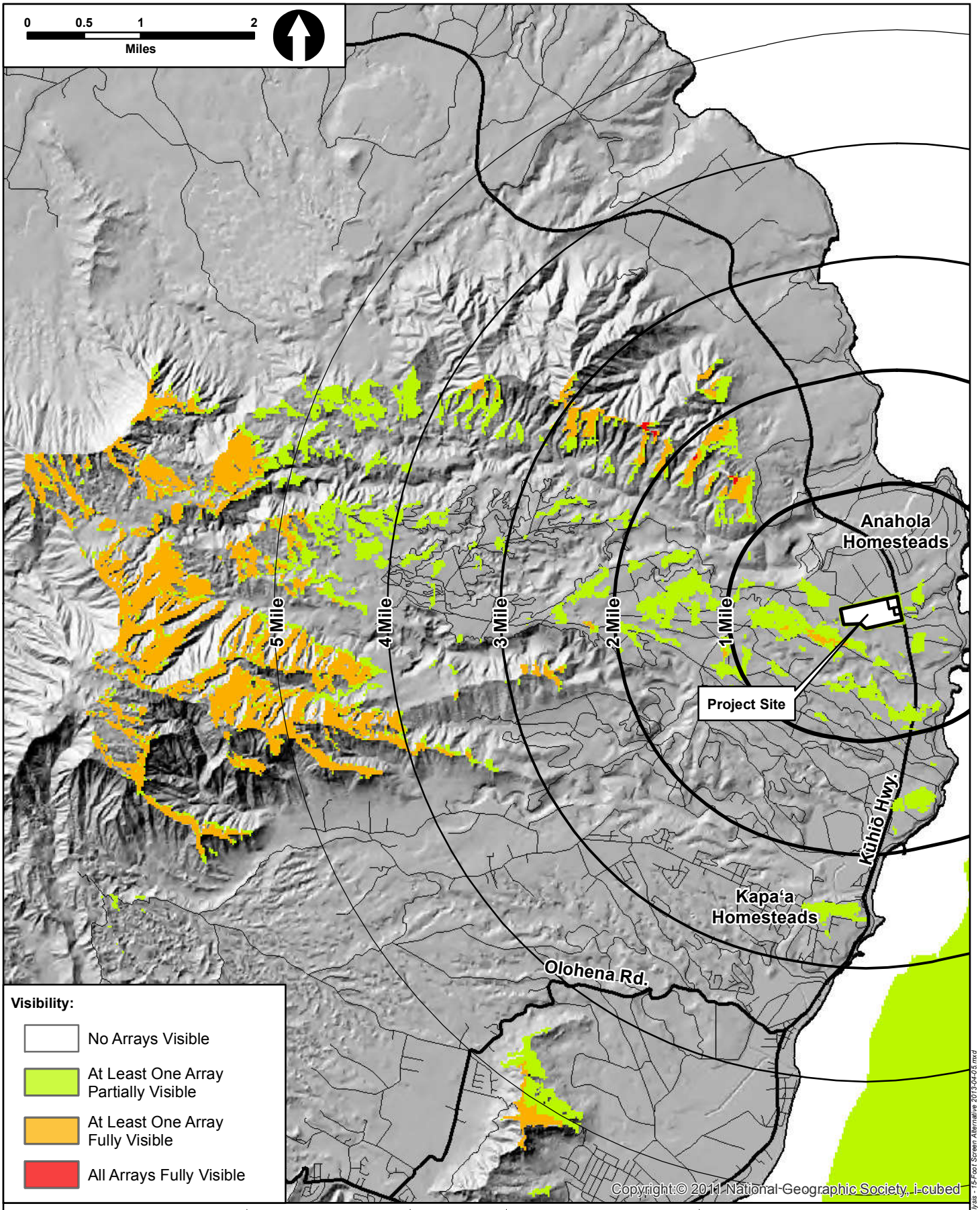
Prepared By: Planning Solutions

Source: PSI

Project: Anahola Solar Project

Figure 5.18: Viewshed Analysis: With 8-Foot Screen

Figure 5-18 Viewshed Analysis - 8-Foot Screen Alternative 2013-04-05.mxd



Prepared For: Kaua'i Island Utility Cooperative

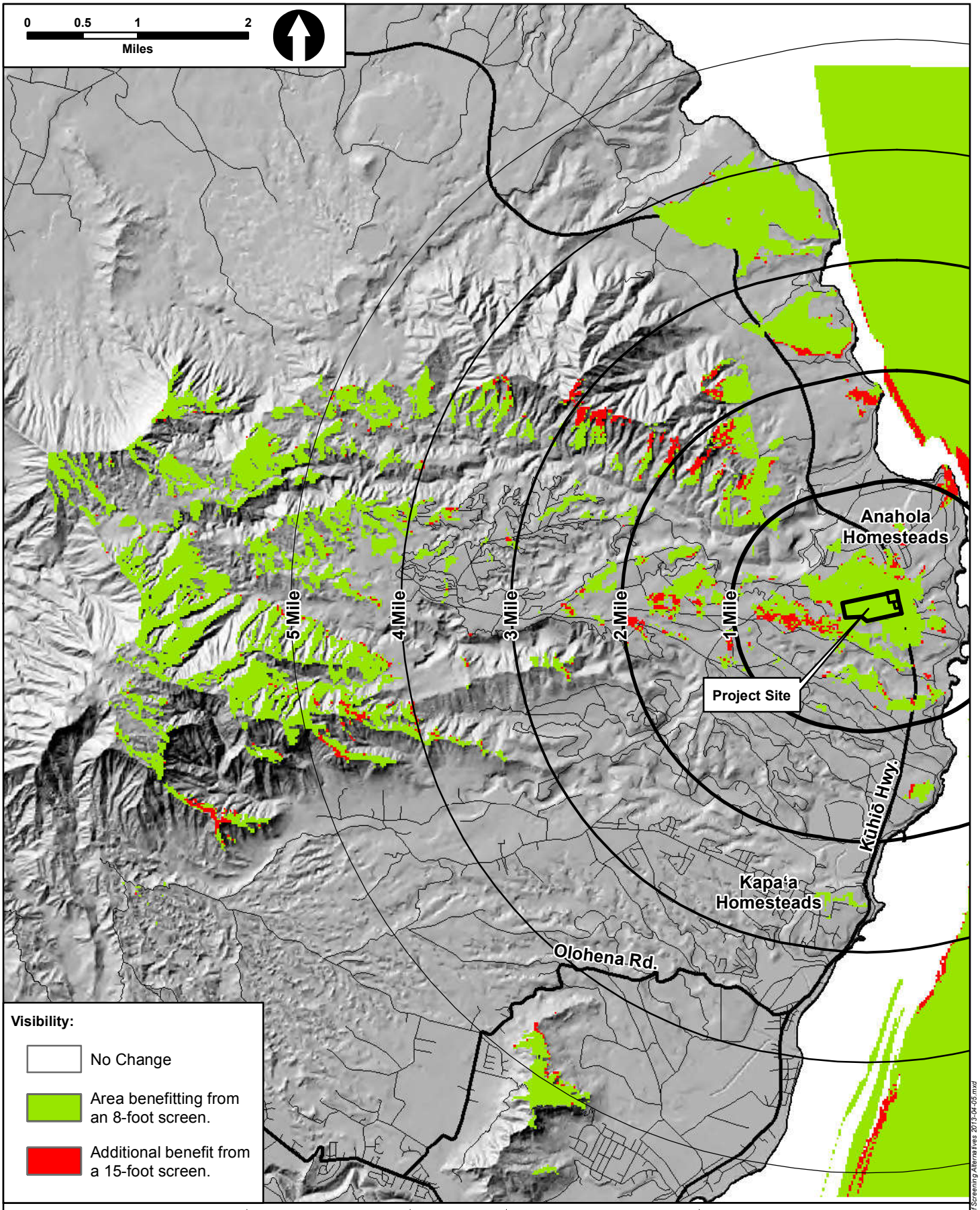
Prepared By: Planning Solutions

Source: PSI

Project: Anahola Solar Project

Figure 5.19:
Viewshed Analysis: With 15-Foot Screen

Figure 5-19 Viewshed Analysis - 15-Foot Screen Alternative 2013-04-03.mxd



Prepared For:	Prepared By:	Source:	Project:	Figure 5.20:
Kauaʻi Island Utility Cooperative	PLANNING SOLUTIONS	PSI	Anahola Solar Project	**Comparison of Screening Alternatives**

Figure 5-20 Comparison of Screening Alternatives 2013-04-05.mxd

KIUC planners and staff presented the maps and other information concerning the appearance of the project at a meeting with representatives of the Anahola Hawaiian Homestead Association. The purpose of the meeting, which was held at the AHHA Community Resource Center in Anahola, was to discuss community concerns regarding the appearance and visual impact of the project components, planned future land-use in the areas around the project, and other relevant information. Following that discussion, a planner visited many of the areas which appeared to have the potential for visual impacts, documented existing views from them, and assessed site visibility constraints that were not apparent from the computer analysis. The following subsections discuss the potential visual impacts with reference to specific viewpoints on the island.

The site visits showed that the computer simulations often exaggerated the level of visibility. Because of their reliance on digital elevation data, the simulations do not account for all aspects of topography; neither do the account for vegetation which can obscure line-of-sight. Many of the areas from which the simulations suggested the project site might be visible did not, when visited, prove to provide a view of any portion of it. In many cases it was trees and other vegetation (which the topographic model did not account for) which obstructed the line-of-sight. In other instances, the data used in the topographic model was too coarse to account for minor variations in ground elevation that significantly affected the visibility.

The remainder of this section discusses potential effects from the three viewpoints deemed to be both representative and important: (*i*) vehicles north of the project site that are southbound on Kūhiō Highway; (*ii*) vehicles south of the project site northbound on Kūhiō Highway; and (*iii*) views from vehicles driving past (i.e., adjacent to) the project site.

5.9.3.1 Effect on View Looking Southward toward the Project Site

Presently, as drivers and passengers travel south along Kūhiō Highway from the direction of Moloa‘a (and northern Kaua‘i in general), the project site first becomes visible in the vicinity of ‘Ioane Road in Anahola Village. From this viewpoint, the homes and businesses of Anahola, including the Anahola Marketplace and the AHHA Community Resource Center, are in the foreground with the project site visible in the background on the *mauka* side of the highway.

While viewshed analysis had suggested that the project site would be visible further north, photographs document that prior to that the structures and vegetation in the foreground obscure all views of the site from Kūhiō Highway north of ‘Ioane Road. Viewed from alongside Kūhiō Highway (see Figure 5.15), the site appears to be totally overgrown; the guinea grass, Christmas berry, and Java plum in the closer portions of the project site block views across the area and make site boundaries indeterminate. In general, the site is too overgrown to allow individual features to be distinguished, although there is a mound alongside the eastern edge of the project site which can be ascertained. The utility poles and lines running along Kūhiō Highway dominate the foreground. From certain angles, Mount Wai‘ale‘ale and Mount Kalalea are visible in the distant background across the site.

Once the project is constructed, drivers travelling this route will see, in addition to the existing Anahola Marketplace, KIUC’s new Anahola Service Center in the foreground, with some portion of the substation behind it along the highway corridor.[51] Where now the view is of guinea grass and other invasive plants, in the future it will be of trees, shrubs, and other native plants that are part of KIUC’s proposed landscaping. This proposed vegetative screen will soften the visual presence of the new service center, with its access drive and customer parking area along the highway. It would do

[51] All three Anahola solar project components (i.e., the service center, the substation, and the photovoltaic array) will be surrounded by security fencing. The base case assume that this will be traditional open mesh and will neither block views of the facilities behind or be obscured by landscape vegetation that is installed as part of the proposed Anahola Solar Project.

the same for the substation. The landscaping and structures that would be constructed on the service center and the substation areas and along the portion of the solar array site fronting the highway south of the substation will obscure direct views of the relatively lower solar arrays that lie behind them from this vantage point.

Installation of an 8-foot tall screen would substantially reduce the area from which the PV arrays could be seen. The areas that would benefit most from this are in Anahola. Raising the height of the visual barrier provides little additional benefit.

5.9.3.2 Effect on Views Looking Northward toward the Project Site

Because there is little development in the area south of the project site, the key vantage point in that area is Kūhiō Highway, which carries many thousands of people every day. The location of the project on a gentle rise between two natural drainage channels suggested that drivers travelling northward along Kūhiō Highway begin to catch glimpses of the project site in the vicinity of Mailihuna Road and further north, near Kumukumu, Kamole Road, and elsewhere. A follow-up visit to the area showed that the site is not visible to drivers travelling north on the highway until approximately 800 feet before the southeastern corner of the 60-acre project site, as their vehicles travel up the gentle slope south of the site. Prior to that point, the grade and existing vegetation block clear views of the site.

As drivers travel up the gentle slope toward the project site, the first views of the proposed facilities will be of the photovoltaic array in the foreground, the substation in the middle-distance, and the access road and Service Center in the background. The current view of the Anahola Marketplace will be obscured by the larger visual presence of the service center. Landscape screening installed as part of the substation and service center components of the proposed project can provide an effective visual screen for those facilities. It is not possible to achieve the same degree of screening by installing landscaping around the much more extensive solar arrays.

Based on the information now available, KIUC does not believe that such screens will be needed. However, should experience with the actual development indicate that the view of project facilities from certain vantage points is too obtrusive, KIUC will develop and implement plans for enhancing the visual screens in such areas.

5.9.3.3 Effect on Views from Kūhiō Highway Adjacent to the Project Site

Regardless of whether persons looking at the project site from this viewpoint are travelling southbound or northbound on Kūhiō Highway, the views of the project site are lateral. As shown in Figure 5.15, the views are of the nearest guinea grass, Christmas berry, and other vegetation which grows unmanaged in the foreground. From the eye level of people in cars, buses, and trucks traveling on Kūhiō Highway (~8 feet above ground level or less), the remainder of the project site is not visible behind this vegetative screen. In the very near foreground, the poles and utility lines which run along the neatly trimmed highway right-of-way are clearly visible, with Mount Wai‘ale‘ale and Kalalea in the distance. The overall appearance of this former agricultural land is rural and unimproved.

Construction of the proposed facilities will substantially alter the views from this portion of the highway. Landscape vegetation composed largely of native shrubs and trees will stand in front of an 8-foot-high security fence. Depending upon their density (which will vary from place to place, these will either hide or soften the appearance of the facilities that stand behind.

While extensive, the solar arrays and related facilities are low. Hence, the screening will be most complete for those. The solar panels themselves are south-facing at a low angle (approximately 20 degrees from horizontal); consequently, to the extent that they can be seen at all, the view of them will be sidelong. In the limited areas where the line-of-sight is not blocked by vegetation, the racks upon which the panels are mounted will be visible under the nearer installations, as will some of the

pad-mounted electrical equipment which serves the closer arrays. Because the land slopes very gently, many of the panels in the background will be at least partially blocked by the closer modules.

There will be a break in the landscaping between the service center and the substation where the new access driveway is located, and one or more acceleration/deceleration lanes in the highway corridor itself will also announce the presence of the facility. The substation on the southern side of the access road will be visible principally to occupants of southbound vehicles. Certain factors will work to make this substation one of the more visually intrusive elements of the project; these include the industrial visual character of the electrical equipment, the higher profile of the metal structures, the need to keep screening vegetation away from the electrical connections, and its presence in the foreground along the highway.

The Service Center complex will be most visible from northbound vehicles as they approach the access road/highway intersection. The appearance of the service center building and the surrounding parking and baseyard will be softened, but not completely hidden, by the presence of landscaping running along the highway corridor outside of the security fence. The size of the service center building means that it will tend to draw the gaze toward it; it also means that the structure and associated landscaping will tend to hide much of the solar panel complex that lies behind it.

5.10 PUBLIC INFRASTRUCTURE

5.10.1 WATER SUPPLY

5.10.1.1 Existing Conditions

There is no potable water supply available to the project site at the present time. However, the County of Kaua‘i Department of Water (DOW)[52] operates the Anahola Water System which services the homes on DHHL Anahola land just to the north of the project site. The Anahola water system includes three wells (Anahola Well A [90-A], and Anahola Well B and Anahola Well C). All of the water is chlorinated and pumped into the distribution system or stored in two tanks, one with a capacity of 500,000 gallons and other with a capacity of 150,000 gallons. As indicated by the results of results of tests conducted in 2011 that are reproduced in Table 5.25, the quality of the water from the three wells is very good and requires no treatment except for disinfection.[53]

5.10.1.2 Probable Effects

Because they are unmanned, neither the PV arrays nor the substation require potable water; crews will bring their own drinking water to the site when they need it. The Service Center, on the other hand, will be the base of operations for between 15 and 20 KIUC staff members, and members of the public will visit it as well. Most of these visits will be for the purpose of dealing with the small customer service staff that KIUC expects to base there. However, KIUC’s policy of making the meeting room available to community organizations when it is not needed for the cooperative’s business means that small groups of community members will use the facility as well.

[52] DOW is a semi-autonomous agency responsible for the management, control, and operation of the island’s municipal water system.

[53] DOW tests the water for many potential chemical regulated contaminants, each with a maximum contaminant level (MCL) and a maximum contaminant level goal; and unregulated contaminants, which don’t have maximum contaminant levels. Included among the contaminants for which it tests are coliform bacteria and heavy metals (lead and copper).

Table 5.25. Potable Water Test Results: Anahola Water System – 2011.

Substance	*Highest Level Allowed (MCL)*	*EPA MCLG*	*Highest Level Detected*	*Detection Range*	*Date*	*Violation*	*Source of Contaminant*
Inorganic Contaminants							
Chromium (ppb)	100	100	6	-	2011	No	Erosion of natural deposits
Nitrate (ppm)	10	10	0.4	-	2011	No	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Organic Contaminants							
Haloacetic Acids (HAA)	60	NA	1.1	-	2010	No	By-product of drinking water chlorination
Lead and Copper Rule Compliance							
Substance	Action Level	MCLG	Highest Level Detected	# of Sites Sampled	# of Sites Found Above the AL Source of Contaminant		
Lead (ppb)	15	0	11	10	0		Corrosion of household plumbing systems
Copper (ppm)	1.3	1.3	0.08	10	0		Corrosion of household plumbing systems

Source: Water Quality Report Covering the period of January 1, 2011 to December 31, 2011. Kaua'i Department of Water Anahola Water System.

KIUC's civil engineers estimate that potable water use at the baseyard and service center will average approximately 1,200 gallons per day. In consultation with the Kaua'i Department of Water Supply, they have determined that this water should come from the three wells that serve the existing Anahola system. Accomplishing this will require the installation of approximately 3,000 feet of 12-inch diameter line. The pipeline extension would begin at the intersection of Kalalea Road and Kūhiō Highway and run within the highway right-of-way as far as the northern boundary of the parcel that KIUC is proposing to lease. From there, KIUC would install one or more smaller pipes to serve the various uses within the proposed facility. The new line has a greater capacity than is needed for KIUC's project alone, but would provide sufficient additional capacity to serve the future development that the Department of Hawaiian Home Lands has planned for its property in the area.

The Department of Water has indicated to KIUC that the existing well has sufficient excess capacity to accommodate the projected Service Center water use. With the pipeline extension that KIUC would provide, the system will be adequate to meet the project's needs.

5.10.2 SANITARY WASTEWATER COLLECTION AND DISPOSAL

5.10.2.1 Existing Conditions

There is no sanitary sewer system in this part of the island. Instead, wastewater is treated by each owner using individual wastewater treatment systems. At the present time, the County of Kaua'i Wastewater Management Division does not envision extending service to Anahola.[54]

5.10.2.2 Probable Impacts.

Neither the PV array nor the substation will generate any sanitary wastewater. Civil engineers estimate that persons at the proposed base yard and service center will generate an average of 400 gallons of sanitary wastewater per day. In order to dispose of the sanitary wastewater that would be generated by people at the baseyard and service center, KIUC will construct on onsite individual wastewater treatment and disposal system (see Figure 2.11). It envisions that the treatment will be provided by septic system filter and that the treated effluent will be disposed of in an adjacent leach field just north of the service center. The system would be designed, constructed, and operated in accordance with the provisions off Hawai'i Administrative Rules §11-62.

§11-62-31.1 establishes general requirements for individual wastewater systems. It provides that individual wastewater systems may be used as a temporary on-site means of wastewater disposal for non-residential uses in lieu of wastewater treatment works when: (*i*) there are 10,000 square feet of usable land area for each individual wastewater system; (*ii*) the total wastewater flow is not more than 15,000 gallons per day; (*iii*) the lot is at least 10,000 square feet; and (*iv*) the total wastewater flow into each individual wastewater system does not exceed one thousand gallons per day. KIUC is able to comply with all of these provisions.

5.10.3 ELECTRICITY AND TELECOMMUNICATIONS

5.10.3.1 Existing Conditions

KIUC power lines extend along the *makai* side of the service center site, and by the time these facilities are under construction the new substation will be in service. Telecommunications lines are also located within the highway right-of-way fronting the project site.

5.10.3.2 Probable Effects

There is more than sufficient available electrical generating capacity in KIUC's system to accommodate the loads that the proposed facilities would impose even if they were all new loads (i.e., were not loads that were already on the system). In this instance, nearly all of the energy-consuming activities that would take place at the Anahola service center and baseyard are already connected to KIUC's transmission and distribution grid and are, therefore, drawing power from the generating system. Hence, the proposed project primarily entails the relocation of existing loads rather than the imposition of entirely new ones. In view of the fact that the electrical fixtures that are installed at the new site are likely to be more energy-efficient than the older ones that are presently in use, it is even possible that the baseyard and service center may consume less power than had the activities remained at their present locations elsewhere on the island.

Telecommunications service to the service center will require only a few circuits. The existing lines that pass the site have adequate excess capacity to provide the needed service.

[54] See the Final *Wastewater Rate Study and Long-Term Financial Analysis Report* prepared for the County by R.W. Beck in September 2010.

5.10.4 EMERGENCY SERVICES AND SCHOOLS

5.10.4.1 Existing Conditions

The project site is served by the Hanalei and new Keālia Fire Stations, and the Hanalei and Līhu'e Police Stations, operated by the Kaua'i County Fire Department and the Kauai County Police Department, respectively. The area is served by the Anahola campus of Kamehameha Preschool, Kanuikapono Public Charter School of Kauai, Kapa'a Elementary School, Kapa'a Middle School, and Kapa'a High School. There is no hospital in Anahola; the nearest medical facilities are the Kaua'i Medical Clinic in Kīlauea and Wilcox Memorial Hospital in Līhu'e.

5.10.4.2 Probable Impacts to Police, Emergency Medical Services, and Schools

The entire PV array, substation, and service center will be enclosed with a security fence, with the exception of the public access portion of the service. The security fencing minimizes the risk of unauthorized entries or theft of materials from within the facility. The only personnel allowed within the substation are trained electrical workers (KIUC personnel and contractors) experienced working around electrical equipment.

None of the proposed facilities will place any additional demands on the existing police, emergency medical services, or on any of the public or private schools in the area. The only anticipated impact of the proposed project is to improve the reliability of electrical service to the region's public infrastructure. Prior to commencement of construction activities, the Police Department, Emergency Medical Services, and the Kaua'i Fire Department (KFD) will be notified of the construction schedule and apprised of emergency vehicle access routes to use during the construction process. The contractor will be required to provide ample clearance for emergency vehicles at all times. The proposed project does not involve any activities that would permanently alter the need for, availability, or ability to provide, emergency services.

5.10.4.3 Probable Impacts to Emergency Fire Services

For reasons summarized below, the proposed project will not significantly impede or burden emergency firefighting services in the Anahola area. Each of the project elements are treated separately below.

Substation. All of the facilities are distributed within the substation on non-flammable material (principally gravel). Most of the equipment is non-flammable, and only a few pieces of equipment (e.g., the BESS units) contain material that can burn. The BESS units are modular and are separated from one another sufficiently to keep a fire in one from spreading to another; moreover, each container is equipped with its own dedicated fire suppression system. In addition, the BESS units will be equipped with a self-contained fire suppression system using Novec™ 1230 fluid vapor. This fire suppression system is designed to prevent situations such as the August 2, 2012 fire which destroyed a BESS at a wind farm in Kahuku, on O'ahu. No landscaping will be placed within the fence line, further reducing the risk of fire.

PV Array. The *NFPA 1 Fire Code Handbook* §11.12.3 provides fire prevention guidance for ground-mounted photovoltaic system installations. The handbook requires a cleared area 10-feet wide around the PV array, and a non-combustible base installed under and around the photovoltaic installations. KIUC has met with the Kaua'i Fire Department and shared its plans for the facility with them. Its design for the PV array will be consistent with the requirements of KFD and the Uniform Fire Code.

The PV equipment is largely free of flammable material. Some such materials are present within the PV array area are in very small quantities, but frequent inspections, site security, and vegetation management are intended to keep the risk of fire at a minimum.

Service Center. The service center and attached baseyard will be constructed largely of non-combustible materials and conform to all requirements of the Uniform Fire Code. In order to assure

the safety of individuals and operations at the service center, the building will be equipped with an integral sprinkler system in the five truck bays, fire alarms, and fire extinguishers. The latter will be located at regular intervals throughout the building, including all office areas and the internal truck bays. The water for the sprinkler system will be provided by the new pipeline extension (see Section 5.10.1) which will connect this facility to the existing Anahola Water System operated by the DOW.

5.10.5 SOLID WASTE MANAGEMENT

5.10.5.1 Existing Conditions

The Kauaʻi County Department of Public Works Solid Waste Division (SWD) is responsible for the collection and disposal of residential and Subtitle "D" commercial solid waste at the Kekaha Phase II Land Fill which is the primary solid waste disposal site on the island[55]. The nearest Refuse Transfer Station is in Līhuʻe, adjacent to the airport; the nearest green waste diversion site is in Hanalei, and the nearest recycling redemption center is in Kapaʻa. According to Kauaʻi County's *Integrated Solid Waste Management Plan* (R.W. Beck, September, 2009), the Kekaha Landfill was projected to reach capacity in January, 2009 (approximately) unless an expansion was completed. Consequently, the Kekaha Landfill Phase II Lateral Expansion was constructed with an additional 1.55 million cubic yards of capacity. This Phase II Lateral Expansion will continue to accept solid waste through 2013.

5.10.5.2 Probable Impacts

Construction of the proposed project will not generate significant demolition waste as there are currently no structures on the project site which will be cleared away as part of the construction process. The proposed project will not produce significant solid waste once it is operational, with the exception of green waste from vegetation control activities. Were the project to be decommissioned, most of the solar array could be reused or recycled as postconsumer product.

During both the construction and the operational phases of the project, the principal source of solid waste (as noted above) is green waste produced grubbing and maintaining the land around and under the solar arrays. Green waste produced from these activities will be transferred by the contractor to Moloaʻa Heart & Soul Organics, a County of Kauaʻi permitted composting center located at 6220 Koʻolau Road, Kīlauea, Kauaʻi. Any metal construction waste will be recycled at Puhi Metals Recycling Center, located at 3951 Puhi Road in Līhuʻe. Cardboard packing materials used for shipping of photovoltaic modules, racks, and electrical equipment will be transported by the contractor to Garden Isle Disposal, also located in Līhuʻe at 2666 Niumalu Road. These materials will either be transported to their destinations by the contractor or by an approved sub-contractor such as Garden Isle Disposal.

5.11 HAZARDOUS MATERIALS

5.11.1 EXISTING CONDITIONS

As part of its planning for the Anahola Solar Project, KIUC commissioned HAZTECH Environmental Services, Inc. (HAZTECH) to conduct a Phase I Environmental Site Assessment of the property in accordance with ASTM E1527-05, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*.[56] The purpose of the investigation was

[55] Subtitle D of the Resource Conservation and Recovery Act (RCRA) addresses non-hazardous solid wastes, including certain hazardous wastes which are exempted from the Subtitle C regulations such as: hazardous wastes from households and from conditionally exempt small quantity generators. Subtitle D also includes garbage (milk containers, coffee grounds), non-recycled household appliances, the residue from incinerated automobile tires, refuse such as metal scrap, wall board and empty containers, and sludge from industrial and municipal waste water and water treatment plants and from pollution control facilities.

[56] Phase 1 Site Assessments do not include any sampling activities or analysis of suspect soil or other materials.

to determine the likelihood that hazardous materials are present on the property and, if so, whether the quantities and types of materials present are such that they require remediation.

As part of its assessment work, HAZTECH:

Physically inspected the property for visual evidence of prospective environmental concerns including existing or potential soil and groundwater contamination, as substantiated by soil, asphalt, concrete staining or discoloration, stressed vegetation; hydraulic equipment that may contain polychlorinated biphenyls (PCBs); indications of waste dumping or burial, pits, ponds, or lagoons; containers of hazardous substances or petroleum products; and underground and aboveground storage tanks.

Examined historical aerial photos, historical topographic maps, and Sanborne maps for evidence of prior land use that could have led to recognized environmental conditions.

Evaluated information available on general geology and topography of the subject property, local groundwater conditions and proximity to ecologically sensitive receptors, such as streams, that might be impacted by recognized environmental conditions and environmental issues.

HAZTECH confirmed that the property is currently being used as pastoral lands for horses and that the fences that are evident around and throughout portions of the property are a function of that use. The investigation also determined that the gully that is present and runs from West to East through the property is in the location of a historical cane road. It noted that the surrounding areas consist of undeveloped, residential, and pastoral properties. Based on its visual observations and a check of the available environmental databases, it concluded that there were no signs of recognized environmental conditions. Its search of the database records, indicated that no sites of interest have been reported within a 1 mile radius of the site. However, 14 "orphan sites" (sites without accurate mapping details) have been identified by the radius report. These sites identified in one or more of the concerned databases are believed to be within the search radius but conflicting information has excluded them from this report.

HAZTECH's assessment for the property revealed the following:

As would be expected in former agricultural fields such as these, various types of solid waste are scattered throughout the property.

This waste includes scrap metal debris, car parts, an abandoned boat, a car battery, household appliances, PVC pipes, an empty 5-gallon plastic bucket, and a number of rusted, empty, steel 55-gallon drums. These findings are a recognized environmental condition because the chemicals in the abandoned waste could adversely impact the property.

Based on its analysis, HAZTECH recommended topsoil removal to depths of 6 to 12 inches followed by verification sampling for contaminants at the locations where these were found. Based on the interviews it conducted during its study, HAZTECH concluded that fertilizers, pesticides, and herbicides were likely to have been used at the site historically and identified this as a recognized environmental concern due to the possibility of soil contamination from these chemicals. It did not recommend any specific remedial measures for this.

5.11.2 PROBABLE IMPACTS

5.11.2.1 Solar Array

All equipment to be installed as part of the photovoltaic array and associated electronics are dry-type, solid state equipment and will not pose a threat of hazardous waste with three notable exceptions: (*i*) the methyl-alcohol/water mixture used as coolant within the AE Solaron 500 kW inverters; (*ii*) the mineral-oil filled transformers installed at each equipment pad; and (*iii*) the diesel fuel used by the vibratory pile driver and other construction vehicles.

The inverter cooling system uses a 5-gallon closed-loop cooling system; the coolant in the inverters and the mineral oil in the transformers could only be spilled if physical damage occurred to the units. The diesel used by the combustion-engine construction equipment will be stored in a closed tank on the same platform as the fuel pump or a fuel truck. As with the other two sources of hazardous materials noted above, only physical damage to the tank or pump could result in a release of diesel. The storage, maintenance, and fuel of vehicles will be in compliance with all NPDES regulations and best management practices.

At completed installations of photovoltaic systems for power generation, the potential for chemical releases appears to be small since chemicals are present in sealed PV modules. Releases from these are likely to occur only due to fires or other unusual accidents, which are extremely rare. Importantly, cadmium which could be a potential concern with thin-film technologies is not present in the cells that are proposed at Anahola. Other chemicals that have inhalation toxicity factors are present only during the manufacturing process. Leaching of metals from the installed modules is not likely to be a concern, as documented in a study by Steinberger (1998).

Manufacture of PV Modules and Other Equipment. To a very great extent, two of the three major components of the proposed project are what might be termed "installation projects". In other words, the bulk of the work associated with their implementation has to do with the manufacture of equipment and only a smaller proportion is related to the work that would be done on the project site. Because of the disproportionate amount of off-site activity that the proposed project would support, KIUC briefly examined the kinds of impacts that this would entail. The evaluation was not meant as a substitute for the environmental review that would occur at the point(s) of manufacture. Rather it was intended as a cross-check to ensure that KIUC-funded activities would not unintentionally lead to significant adverse consequences elsewhere.

Polycrystalline Silicon. The panels that will be installed for the Anahola PV project are composed of polycrystalline silicon. This material is composed of many smaller silicon grains of varied crystallographic orientation. It can be synthesized easily by allowing liquid silicon to cool using a seed crystal of the desired crystal structure. The abundance, stability, and low toxicity of silicon, combined with the low cost of polysilicon relative to single crystals makes this variety of material attractive for photovoltaic production (Platzer, Michaela D., June 13, 2012). Manufacture of a crystalline silicon system involves several stages:

Polysilicon Manufacturing. Polysilicon, based on sand, is used to make the semiconductors used in PV panels. Silicon dioxide consisting of either quartzite gravel or crushed quartz is placed into an electric arc furnace and a carbon arc is then applied to release the oxygen. The products are carbon dioxide and 99-percent pure molten silicon. This is then purified even further using physical processes (generally referred to as the "floating zone" technique).

Wafer Manufacturing. Manufacturers use traditional semiconductor manufacturing equipment, to shape polysilicon into ingots and then slice the ingots into thin wafers. They then cut, clean, and coat the wafers according to the specifications of the system manufacturers.

Cell Manufacturing. Solar cells are the basic building blocks of a PV system. They are made by cutting wafers into the desired dimensions and shapes and then attaching very thin copper leads so the cell can be linked to other cells. Metals such as palladium/silver, nickel, or copper are vacuum-evaporated through a photoresist, silkscreened, or merely deposited on the exposed portion of cells that have been partially covered with wax. After the contacts are in place, thin strips (most often tin-coated copper) are placed between cells.

Module Manufacturing. Modules, which normally weigh 34 to 62 pounds, are created by mounting 60 to 72 cells on a plastic backing within a frame, usually made of aluminum. The module is covered by solar glass to protect against the elements and to maximize the efficiency with which the unit coverts sunlight into power. Pure silicon is relatively shiny (it can reflect can reflect up to

35 percent of the sunlight), so an anti-reflective coating is put on the silicon wafer; most commonly titanium dioxide and silicon oxide.

Materials Used in the Production of Polycrystalline Silicon Solar Cells. The production of photovoltaic devices involves the use of a variety of chemicals and materials. The amounts and types of chemicals used will vary depending upon the type of cell being produced. There is also some variability among the different photovoltaic companies with respect to the chemicals used for manufacturing the same type of photovoltaic cells. Table 5.26 provides a general list of chemicals and materials used in the production of Polycrystalline Silicon Cells solar cells. It was obtained from a 2004 report published by the Public Interest Energy Research Program (PIER) titled *Potential Health and Environmental Impacts Associated with the Manufacture and Use of Photovoltaic Cells*. While the report provides an excellent discussion of the topic, it is based on information that is now nearly a decade old, which is a long time in an industry that is evolving as rapidly as PV wafer manufacturing. Hence, the materials used in the manufacture of the cells used in the Anahola project may differ from this.

Table 5.26 Chemicals and Materials Used in the Production of Polycrystalline Silicon Cells

Aluminum	Phosphine
Ammonia	Phosphorus trichloride
Arsine	Silicon
Boron trichloride	Silicon dioxide
Copper catalyst	Silane
Diborane	Silicon trioxide
Ethyl acetate	Silicon tetrachloride
Ethyl vinyl acetate	Silver
Hydrochloric acid	Sodium hydroxide
Hydrogen	Stannic chloride
Hydrogen fluoride	Sulfuric acid
Hydrogen peroxide	Tantalum pentoxide
Ion amine catalyst	Titanium
Isopropyl alcohol	Titanium dioxide
Nitric acid	Trichlorosilane
Nitrogen	
Source: EPRI and California Energy Commission. (August 2004). *Potential Health and Environmental Impacts Associated with the Manufacture and Use of Photovoltaic Cells*.	

A variety of acids or corrosive liquids (e.g., hydrochloric acid, sulfuric acid, nitric acid, and hydrogen fluoride) are used in fairly large quantities during the manufacturing process, primarily for the cleaning of wafers or to remove impurities from raw semiconductor materials.[57] Solvents including 1,1,1-trichloroethane and acetone are also used in large quantities in the various cleaning steps conducted during the production processes. Etching compounds such as sodium hydroxide can also be used in relatively large quantities. A number of these chemicals are classified as hazardous by the Federal Department of Transportation.

[57] The amount of a given chemical used will vary depending upon numerous factors including the type of cell being produced, the amount of material processing required, and the amount of wafer cleaning required. The manufacturing processes are constantly evolving and changing, and this makes it impossible to provide a definitive list.

Toxicity of Materials Used in the Manufacture of PV Modules. Based on a review of the chemical information reported in the U.S. EPA's Toxics Release Inventory System (TRIS) database for six photovoltaic companies producing solar cells, EPRI and California Energy Commission. (August 2004) reported that it appeared that most of the chemicals used by the U.S. manufacturing companies it studied are not released in reportable quantities. Similar information is not available for PV modules manufactured in China, which is the source of the panels being used for the Anahola project.

Human Health Risk Associated with Manufacture of PV Modules. Tetratech's comprehensive analysis of the possible effects of PV manufacturing included an extensive discussion of potential human health risks. While noting that the potential for human exposure to these materials can occur during the manufacturing process, from the leaching of cracked or broken modules, or from the combustion of modules, the greatest risks are related to manufacturing, rather than installation, of these devices.

Accidental Release of Toxic Gases. Short-term exposures to highly toxic substances used in the photovoltaic industry could occur as a result of the accidental release of toxic gases (e.g., silane, arsine, phosphine, hydrogen sulfide, and hydrogen selenide). These can present health risks to both workers and the general public. Such releases are likely to be contained within the manufacturing plant, placing plant workers at the highest risk for exposure. However, persons living in the vicinity of the plant may be at risk from a catastrophic release of toxic gases (e.g., a large explosion at the manufacturing facility). No catastrophic releases of toxic gases from photovoltaic manufacturing facilities are known to have occurred, and the likelihood of such a catastrophic release is believed to be extremely small.

Long-Term Exposure. The exposure to low levels of toxic materials used by the photovoltaic industry over long periods of time may present potential health risks to both workers and the general public. In production facilities, workers may be directly exposed to hazardous compounds through the air they breathe, from ingestion by hand to mouth contact, or from absorption through the skin; the general public may be exposed to low levels of chemicals through indirect pathways such as the contamination of public drinking water from the improper disposal or treatment of plant effluent (Fthenakis and Moskowitz, 2000).

End-of-Life Issues. The U.S. regulatory framework for solar PV end-of-life is based on the federal Resource Conservation and Recovery Act (RCRA) and state policies like California's HWCL.[58] If PV components are determined to be hazardous waste, RCRA could be used to regulate their handling, recycling, reuse, storage, treatment, and disposal. Decommissioned solar panels are currently considered hazardous waste if they do not meet the U.S. Environmental Protection Agency's (EPA) Toxicity Characteristic Leaching Procedure (TCLP) standards and, therefore, have the potential to leach into the groundwater near waste disposal sites. The TCLP test is required for all new solar panels that enter the U.S. market.[59]

[58] The European Union has notably stricter standards regarding hazardous wastes of this sort, and a number of environmental organizations and American trade groups believe that these provide superior end-of-life protection and should be adopted. E.U.'s RoHS (Restriction of Certain Hazardous Substances), for example, requires that electronics sold on the E.U. market not contain lead, mercury, cadmium, chromium, polybrominated biphenyls (PBBs), or brominated diphenylethers (PBDEs). Based on the known toxicity of many PV materials and the unstudied toxicity of many others, some recommend that the U.S. follow the E.U.'s lead in restricting sales of solar panels that contain materials shown to pose a danger to human health or the environment. Similarly, they recommend that the U.S. should follow the E.U.'s example and apply the so-called "precautionary principle," restricting sales of products containing materials that have not been proven to be safe.

[59] California's Hazardous Waste Control Law and regulations in several other states provide even stricter hazardous waste designations than the federal government, but the panels that are being used at Anahola have not been rated for that purpose.

5.11.2.2 Substation

Very small amount of hazardous materials are present in equipment within the substation. The design of the proposed facilities provides proper storage for these, and KIUC will operate it in accordance with all applicable regulations and guidelines. Consequently, no adverse effects are anticipated.

5.11.2.3 Service Center

In support of the activities planned for the service center, KIUC will store moderate quantities of hydraulic fluid, transformer oil, motor oil, creosote from utility poles, cleansers, solvents, and diesel fuel on site. All of these materials will be properly contained in accordance with applicable regulations and best practices. No adverse impacts are anticipated.

5.12 TRANSPORTATION FACILITIES

5.12.1 EXISTING CONDITIONS

5.12.1.1 Airports and Harbors

Līhu'e Airport. Līhu'e Airport, the only public use airport on the island of Kaua'i, is located approximately 12 miles south of the project site. It is owned and operated by the State of Hawai'i Department of Transportation. Situated approximately 150 feet above sea level, the airport has two asphalt-surfaced runways 3/21 and 17/35; both are 6,500 feet long. In 2005, there were slightly more than 100,000 operations and 28 based aircraft at the airport. In 2010, over 2,415,000 passengers and 14,386 tons of air cargo passed through the airport. The proposed project is not in or near a runway approach or clear zone; neither is it sufficiently close to any designated flight paths for reflections from it to adversely affect aircraft in flight.

Princeville Airport. Princeville Airport is a private facility located approximately 11 miles west-northwest of Anahola. Its single runway (5/23) is located at an elevation of 344 feet above mean sea level, is 3,560 feet long and has an asphalt surface. The airport is owned and operated by the Princeville Corporation. The proposed project is not in or near a Princeville Airport runway approach or clear zone; neither is it anywhere near flight paths associated with that airport.

The State DOT Harbors Division owns and operates Nāwiliwili Harbor. It is a manmade port, which includes three piers providing over 1,800 ft. of berthing space and handles all of the island's waterborne commerce. Construction materials for the proposed project would arrive through the harbor and then be trucked to the project site.

5.12.1.2 Roadways: Kūhiō Highway

Road access to the Anahola Solar Project site is via Kūhiō Highway (Hawai'i Route 56). Route 56 is a 28-mile route stretching from Hawai'i Route 50 at the junction of Rice Street in Līhu'e to Ha'ena on the north shore of the island. The road itself is a major thoroughfare for travel to and from the eastern and northern parts of the island and is the principal means of access to communities in the project vicinity. The portion of the highway near the project site is a two-way, two lane roadway with a pavement width of 24 feet; 6-foot shoulders are present on both sides. Sight-distance in both directions is more than 1,000 feet. The posted speed limit is 45 miles per hour.

Several smaller roadways intersect Kūhiō Highway near the project site. To the north along Kūhiō Highway, the nearest intersection is at 'Ioane Road approximately 1,000 feet away. To the south the nearest intersection is at Makanani Street, approximately one mile away. There are multiple unnamed agricultural roads which also have ingress-egress points closer to the project site. In addition, the Anahola Hawaiian Homes Association (AHHA) community center and marketplace is located off an unnamed driveway on the mauka side of the highway, approximately 1,000 feet north of the project site.

Kūhiō Highway in the vicinity of the project site is a Class 2 rural minor arterial roadway.[60] The appropriate design level of service for minor rural arterials highways varies with level and rolling terrain is LOS "B" (see Table 5.27 for level of service definitions). The primary measures for service quality for two-lane Class 2 facilities such as Kūhiō Highway is the percent time-spent-following and average travel speed.

Table 5.28 summarizes peak-hour and total daily traffic volumes on Kūhiō Highway from the State Department of Transportation traffic count station B73005601278 located on Kūhiō Highway between ʻIoane Road and Hokualele Road, a short distance north of the project site. Based on these counts, the Department estimates average daily two-directional traffic of approximately 13,000 vehicles. Afternoon traffic volume is substantially higher than that in the morning, and the directionality of the trips differs considerably between the two periods as well.

As can be seen in Figure 5.21 below, two-way traffic volume increases sharply from overnight lows near zero to over 700 vehicles per hour by 8:00 A.M. It remains between 800 and 900 vehicles per hour through the remainder of the morning and early afternoon, before climbing to its peak of approximately 1,000 vehicles per hour between 3:00 and 5:00 P.M. The peak-hour factor is relatively low, with approximately 6 percent of the 24-hour volume occurring during the morning peak hour and 8 percent occurring during the busiest 60-minute period in the afternoon. The Level of Service (LOS) during the morning peak-hour is generally at the lower end of the "C" range; it is in the lower-middle part of the "C" range during the afternoon peak-hour.

Unlike many segments of the highway closer to Līhuʻe (where the traffic flow in the morning is predominantly towards that town), the directional splits near Anahola are usually quite even, with slightly fewer vehicles traveling northbound than are headed southbound (percentages on the four days in the table were 53%, 55%, 47%, and 51%. In the afternoon (when the volumes were higher than in the morning), the directionality was much greater, with southbound, i.e., Kapaʻa-bound, traffic accounting for about 60% of the two-way total.

[60] Island of Kauaʻi - Inset 4 – Kapaʻa-Wailua, Traffic Analysis Zones (TAZ) – DRAFT, Statewide and Regional Long-Range Land Transportation Plans for the Islands of Maui/Molokaʻi/Lanaʻi, Hawaiʻi and Kauaʻi.

Table 5.27 HCM 2-Lane Highway LOS Classification

Level of Service	*Description*
A	Motorists are able to travel at their desired speed. Without strict enforcement, this highest quality would result in average speeds of 55 mph or more on two-lane highways in Class 1. The passing frequency required to maintain these speeds has not reached a demanding level, so that passing demand is well below passing capacity, and platoons of three or more vehicles are rare. Drivers are delayed no more than 35 percent of their travel time by slower-moving vehicles. A maximum flow rate of 490 pc/h total in both directions may be achieved with base conditions. On **Class II highways**, speeds may fall below 55 mph, but motorists will not be delayed in platoons for more than 40 percent of their travel time.
B	Traffic flow is speeds of 50 mph or slightly higher on level terrain Class 1 highways. The demand for passing to maintain desired speeds becomes significant and approximates the passing capacity at the lower boundary of LOS B. Drivers are delayed in platoons for up to 50 percent of the time. Service flow rates of 780 pc/h total in both directions may be achieved with base conditions. On **Class II highways**, speeds may fall below 50 mph, but motorists will not be delayed in platoons for more than 55 percent of their travel time.
C	Flow increases, resulting in noticeable increases in platoon formation, platoon size and frequency of passing impediments. The average speed still exceeds 45 mph on level terrain Class 1 highways, even though unrestricted passing demand exceeds passing capacity. At higher volumes the chaining of platoons and significant reductions in passing capacity occur. Although traffic flow is stable, it is susceptible to congestion due to turning traffic and slow-moving vehicles. Percent time-spent-following may reach 65 percent of the time. Service flow rates of 1,190 pc/h total in both directions may be achieved with base conditions. On **Class II highways**, speeds may fall below 45 mph, but motorists will not be delayed in platoons for more than 70 percent of their travel time.
D	LOS D represents unstable flow. The two opposing traffic streams begin to operate separately at higher volume levels, as passing becomes extremely difficult. Passing demand is high, but passing capacity approaches zero. Mean platoon sizes of 5 to 10 vehicles are common, although speeds of 40 mph still can be maintained under base conditions on Class 1 highways. The proportions of no-passing zones along the roadway section usually has little influence on passing. Turning vehicles and roadside distractions cause major shock waves in the traffic stream. Motorists are delayed in platoons for nearly 80 percent of their travel time. Maximum service flow rates of 1,830 pc/h total in both directions may be achieved with base conditions. On **Class II highways**, speeds may fall below 40 mph, but in no cases will motorists be delayed in platoons for more than 85 percent of their travel time.
E	Traffic flow conditions have a percent time-spent-following greater than 80 percent on Class 1 highways and greater than 85 percent on **Class II**. Even under base conditions, speeds may drop below 40 mph. Average travel speeds on highways with less than base conditions will be slower, even down to 25 mph on sustained upgrades. Passing is virtually impossible and platooning becomes intense as slower vehicles or other interruptions are encountered. The highest volume attainable under LOS E defines the capacity of the highway, generally 3,200 pc/h in both directions. Operating conditions at capacity are unstable and difficult to predict. Traffic operations seldom reach near capacity on rural highways, primarily because lack of demand.
F	Represents heavily congested flow with traffic demand exceeding capacity. Volumes are lower than capacity and speeds are highly variable.
Source: *2000 Highway Capacity Manual*	

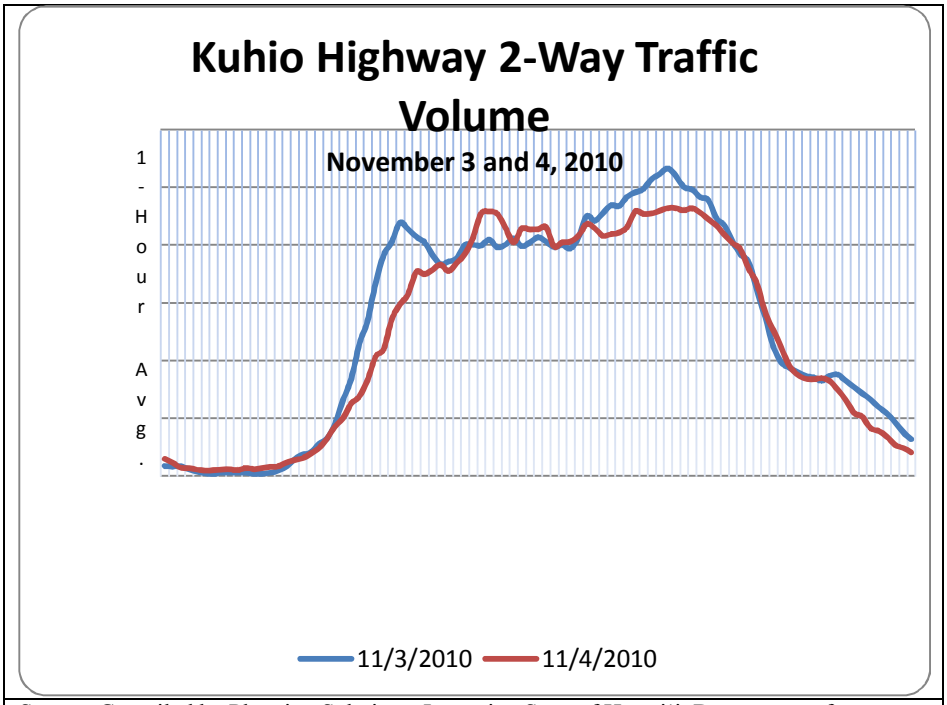
Table 5.28 Traffic Volume on Kūhiō Highway between ʻIoane Road and Hokualele Road

Date	*AM Peak Hour (vph)*					*PM Peak Hour (vph)*					*24-Hour Volume for Both Directions*
	Time	*North-bound*	*South-bound*	*Total*	*LOS*	*Time*	*North-bound*	*South-bound*	*Total*	*LOS*	
07/08/2010	6:00-7:00	458	161	619	**B**	3:00-4:00	407	636	1043	**C**	13,917
	7:15-8:15	439	395	834	**C**	3:45-4:45	475	663	1,138	**C**	
07/09/2010	6:00-7:00	347	227	574	**B**	3:00-4:00	485	673	1158	**C**	14,151
	7:15-8:15	451	376	827	**C**	3:30-4:30	501	673	1,174	**C**	
11/03/2010	6:00-7:00	356	410	766	**B**	3:00-4:00	387	642	1,029	**C**	12,482
	7:15-8:15	415	464	879	**C**	3:30-4:30	397	670	1,067	**C**	
11/04/2010	6:00-7:00	212	229	441	**A**	3:00-4:00	348	562	910	**C**	11,574
	7:45-8:45	364	344	708	**C**	3:30-4:30	361	568	929	**C**	

Note: Survey conducted on at Site ID: B73005601278 on Kūhiō Highway between Ioane Road and Hokualele Road. LOS estimate based on the following *2000 Highway Capacity Manual* criteria for service flow rates (with base conditions) in each direction: A = up to 780 passenger car equivalents/hr; B = up to 780 passenger car equivalents/hr; C = 1,190 passenger car equivalents/hr; and D = 1,830 passenger car equivalents/hr.

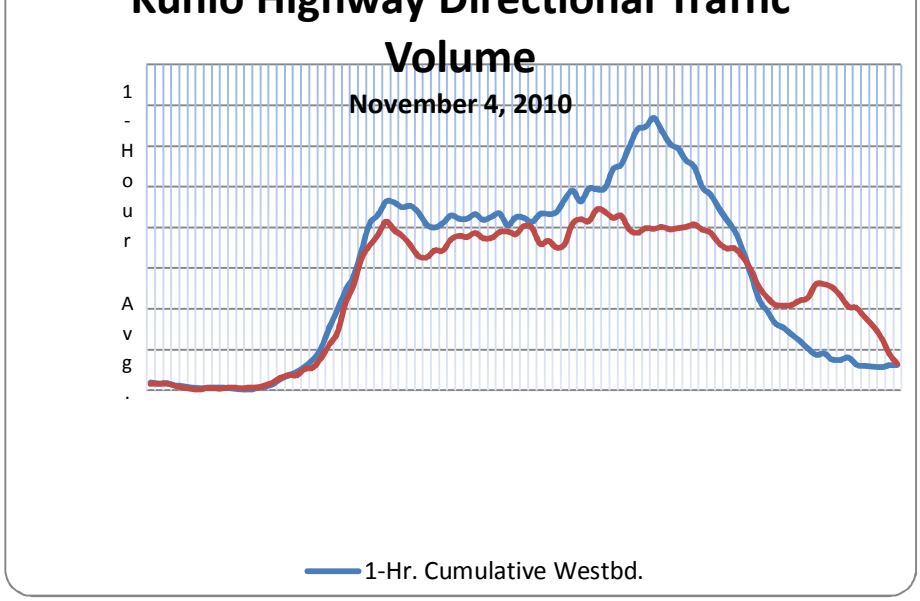
Source: State of Hawai‘i, Department of Transportation, Highways Division, Highways Planning Survey Section.

Figure 5.21 Two-Way Traffic Volumes on Kūhiō Highway



Source: Compiled by Planning Solutions, Inc. using State of Hawai‘i, Department of Transportation traffic counts from Site ID B73005601278 on Kūhiō Highway between Ioane Road and Hokualele Street.

Figure 5.22 Kūhiō Highway Directional Split



Source: Compiled by Planning Solutions, Inc. using State of Hawai'i, Department of Transportation traffic counts from Site ID B73005601278 on Kūhiō Highway between Ioane Road and Hokualele Street.

5.12.2 PROBABLE IMPACTS

Our assessment of the potential effects that construction and operation of the proposed facilities would have on area roadways began with estimates of the vehicle-trips that would be generated by each component of the project. This was done using construction employment estimates provided by REC Solar (the PV contractor) and by KIUC (which has considerable experience with previous substation construction projects and which has information on trips from its existing baseyard at Kapa'a). The same sources estimated other construction traffic that would result from the delivery of equipment and material. In the case of the solar array, the principal consideration was the delivery of the approximately 59,000 solar panels that are at the heart of the project. In the case of the substation, the volume of material that needed to be delivered was of less consequence than the size of a few pieces of equipment.

The proposed Anahola Solar project would affect traffic volumes on area roadways, and in particular, on Kūhiō Highway. Quantitative estimates of the change are presented below. Because the effect would vary substantially between the construction and operational phases, they are discussed separately.

5.12.2.1 Construction Phase Vehicle-Trip Generation

Construction-Worker Employment. Project-related construction will require workers to commute to and from their jobs on the project site, thereby adding to traffic along Kūhiō Highway. Construction employment will vary over the course of the work, rising and falling depending upon the specific type

of activity that is occurring. Table 5.29 shows estimated construction employment on the average day during the busiest month of construction.[61]

Table 5.29 Estimated Construction Work Force

Project Component	***Construction Employment*** *(Average Day During Peak Month)*		
	Residing to North	***Residing to South***	***Total***
Solar Array	25	55	**80**
Substation	5	10	**15**
PV/Substation Total	***30***	***65***	***95***
Service Center Total	***10***	***30***	***40***

Note: "Totals" assume that the busiest work day on the solar array and the substation will coincide. This is a "conservative" assumption (i.e., one that tends to overestimate the actual number) because they are not likely to occur at the same time. Work on the service center and baseyard facilities will not begin until after the other two components of the project are completed. Hence, the two phases will not have a cumulative effect.
The directional splits assume that approximately 25 percent of the work force will reside/come from the north and 75 percent will reside/come from the south.

Source: Compiled by Planning Solutions, Inc. using estimates from REC Solar and KIUC.

While it is unlikely that the peak month of construction activity for the two components (PV array and substation) will coincide, we have made the "conservative" assumption (i.e., the assumption that leads to the highest project-related traffic) that they will, leading to an estimated peak construction work force of 95 persons.

Construction Worker Vehicle-Trips and Vehicle-Trip Routing. The extent to which car-pooling will occur (which affects the number of persons per vehicle) and the place where construction workers reside (and, therefore, the place from which they will arrive-from/depart-to) will differ from phase to phase. The following are among the factors that influence these travel patterns:

Car-pooling (ride-sharing) is more common among construction workers who live well away from the project site, particularly those who are from off-island and/or work for subcontractors based elsewhere on the island, than it is for those who live nearby.

The changing balance between different trades over the course of the construction work will affect the location where workers reside while working on the project. The base work force (i.e., those who work on the project over most of its duration) will be most likely to reside in and around Anahola, and, therefore, to travel to and from the site from the north. The peak period work force will include more workers with specialty trades, and these are more likely to reside in their own homes or in rental units to the south.

[61] It is possible that the number of workers present may be slightly higher on a few days, but the overage would be small and would apply to no more than a few days during the month.

A portion of the peak-period work force is likely to include specialty trades who find it easier to commute to the island on a daily basin and who will, therefore, commute from and to the south (Līhu'e Airport).

In estimating the directionality of the worker commuter trips, we considered that REC has made a strong commitment to the Anahola community to recruit from the local work force to the greatest extent practicable. Accordingly, we have estimated that a substantial proportion of the individuals working on the project for longer periods of time are likely to reside in Anahola and other communities to the north and west of the project site. The remainder will drive to and from points south of the project site, such as Līhu'e and Kapa'a. When work at its very busiest, it is likely to be because in addition to the regular work force there are substantial numbers of specialists on the site, and most of them wound necessarily come from outside of the area.

In order to convert construction employment into vehicle-trips, it was necessary to estimate the average number of workers per vehicle. Vehicle occupancy is influenced by the same kinds of factors as directionality. Workers living relatively near the project site (particularly in the Anahola community) are less likely to car-pool than workers who are commuting from farther away. As that proportion changes in accordance with the kinds of work that is ongoing, vehicle occupancy changes as well. Based on input from individuals familiar with construction work on Kaua'i, Planning Solutions, Inc. estimated average vehicle occupancies during the peak month would be 1.1 workers per vehicle for trips to and from the north and 1.2 persons per vehicle for trips to and from the south.

Planning Solutions, Inc., combined these estimates of construction employee numbers, locations, and average vehicle-occupancies employee trip-timing estimates provided by REC Solar and KIUC to arrive at the construction worker vehicle-trip estimates shown in Table 5.30.

Table 5.30 Summary of Construction-Worker Vehicle-Trips

Period	*Time of Day*	*Solar Array*				*Substation*			
		In (from)		*Out (to)*		*In (from)*		*Out (to)*	
		N	*S*	*N*	*S*	*N*	*S*	*N*	*S*
Busiest Day	*6:00am to 7:00am*	23	67	0	0	4	9	0	0
	7:00am to 3:00pm	10	40	10	40	3	10	3	10
	3:30pm to 4:30pm	0	0	27	67	0	0	4	9
	4:30pm to 6:00am	3	7	3	7	1	3	1	3
	24-Hour Total	36	114	40	114	8	22	8	22
Average Day/ Busiest Month	*6:00am to 7:00am*	22	47	0	0	4	9	0	0
	7:00am to 3:00pm	8	32			3	10	3	10
	3:30pm to 4:30pm	0	0	26	56	0	0	4	9
	4:30pm to 6:00am	2	6	2	6	1	3	1	3
	24-hour Total	32	85	28	62	8	22	8	22

Notes: Estimates are for worker-trips only. Material and equipment delivery vehicle-trips are estimates separately.

Source: Compiled by Planning Solutions, Inc. using estimates by REC Solar and KIUC.

Equipment and Material Delivery Trips. Construction of the proposed project components will involve the importation of several relatively large pieces of diesel-powered equipment such as trucks,

bulldozers, and earthmovers. Many smaller pieces of equipment will be needed as well. This equipment will all have to be brought in from elsewhere on the island. In addition, construction activities will involve the transport of construction materials to the site, including photovoltaic modules, mounting racks, pull boxes and other electrical equipment, including transformers and electrical poles. Moderate quantities of gravel and other fill material will also be brought in from off-site. No large concrete pours are needed for the project, and it does not entail the import or export of significant quantities of earth or other bulk materials (i.e., excess cut or fill or select material). Hence, by far the most significant type of equipment and material delivery trips are expected to be related to the PV Panels. Altogether, approximately 59,000 panels will be used, and these will be trucked to the site as needed in standard 40-foot shipping containers.[62]

Based on preliminary construction plans, REC Solar anticipates approximately 250 truck deliveries will be made to the site and that these will be spread over several months. It estimates that during the peak construction months (months 3 through 6) there will be an average of 2 to 4 such materials deliveries per day, and has pledged to limit the number to no more than 8 per day. These will occur between 8:00 am and 3:00 pm and do not, therefore, overlap with the construction-worker trips.

Oversized Loads. A few deliveries (such as the steel structures for the substation) may require oversized loads. Transporting the largest items (e.g., steel structures for the substation) may produce oversized loads which require special police escort. If this occurs, its contractor will move the materials at off-peak hours, most likely in the early morning hours, when other traffic is minimal. The timing, together with the police escort, will minimize any slowdowns that might otherwise affect other motorists.

Clearing and Demolition Waste. There are no structures on the site which will need to be demolished prior to commencement of construction. Grubbing of the area to be used for both the solar array and, to a lesser extent, the substation will produce a significant amount of green waste, but this would be kept on-site.[63]

Fill Material. Small amounts of select fill (e.g., gravel) may need to be imported. In general, however, cut and fill is expected to be balanced within the project site, avoiding the need for substantial offsite material hauling.

5.12.2.2 Construction Phase Vehicle-Trip Generation

PV Array and Substation. Construction of the PV arrays and substation will not require any temporary lane closures or other actions that would affect the roadway system's ability to accommodate normal traffic flow.[64] Hence, the only mechanism through which those components of the proposed project could adversely affect the level of service on area roadways is through the temporary increase in traffic that the proposed project would cause.

The cumulative totals shown in Table 5.31 reflect the busiest levels of project-related construction traffic.[65] Table 5.31 shows the effect that project-related traffic would on the number of vehicles

[62] Because of their value, REC Solar anticipates that they will be stored off-site in a bonded warehouse until shortly before they are used, then trucked to the site.

[63] As discussed in Section 5.11, small amounts of potentially hazardous material left by previous activities remains on the site. It is possible that some of this material will need to be removed from the site and disposed of. The volume of this material is small and will lead to no more than a few truck trips.

[64] A possible exception to this would occur if the contractor determines that this is needed during the delivery of a few oversize pieces of equipment and/or KIUC deems a lane closure necessary for safety reasons during a few hours on the day that the overhead power line connecting the substation to the existing 69 kV and 12.47 kV power lines within the Kūhiō Highway right-of-way is needed for safety reasons.

[65] Readers should note that the morning peak 60-minute period on the highway at this location actually occurs between 7:15 am and 8:15 am. This is slightly later than the peak project traffic, but the difference is small and to avoid unnecessary complications, we have assumed that the project peak and existing highway peak are the same.

during the peak-hour of the highway (which in this case is nearly the same as the period during which the proposed project would generate the greatest number of vehicle-trips). It indicates that construction traffic would increase peak-hour totals by a little less than 9 percent in the morning and a little more than 7 percent in the afternoon. However, because the trips will be split between areas north and south of the project site, the actual effect on the volume at any one location would be substantially less.

Table 5.31 Impact of Peak Construction-Period Traffic on Highway Volume

Time Period	*Existing Kūhiō Hwy. (vehicle-trips per hour)*			*Anahola Solar Project Construction Totals*			*Project as % of Total*
	North-bound	*South-bound*	*Total*	*In-bound*	*Out-bound*	*Total*	
Morning: Highway Peak-Hour (7:15 a.m.-8:15 a.m.)	415	464	879	77	0	77	8.76%
Afternoon: Highway Peak-Hour (3:30-4:30 p.m.)	397	670	1,067	0	77	77	7.22%
Source: Anahola Solar Project estimates by Planning Solutions, Inc.							

The contractor will be required to prepare and obtain State Department of Transportation approval of a detailed traffic control plan prior to beginning work. KIUC anticipates that the plan will include provisions (e.g., the use flag men, designated arrival/departure routes that do not require vehicles entering and leaving the construction site to cross in front of opposing traffic, etc.) to minimize potential delays. Nonetheless, a small decrease in the level of service can be anticipated during the peak commute hours. Project-related construction traffic is sufficiently low during the middle part of the day (i.e., 8:00 a.m. to 3:00 p.m.) that no noticeable degradation in the level-of-service will occur.

Service Center. The Service Center will require a construction work force no more than a third the size of that needed to construct the solar array/substation components of the project. It will, therefore, generate proportionately fewer worker vehicle commute trips. The level of construction-vehicle travel on the highway during the middle part of the day will be much lower as well. In view of this, construction-vehicle traffic from this component of the project does not have the potential to measurably reduce the level of service on Kūhiō Highway.

At the same time, the Kūhiō Highway intersection that will be required to accommodate the service center and baseyard will require work within the existing highway right-of way that is certain to entail temporary lane closures during the middle of the day and the other temporary changes to the roadway that will have the potential to adversely affect traffic flow. While KIUC will develop and implement a traffic control plan designed to minimize the adverse effects of such work, delays will be recurrent over the 6 to 9 month period that it will take to complete the highway improvements.

5.12.2.3 Operational Phase Trip-Generation

Normal operations and regular maintenance (e.g., washing of the photovoltaic modules, trimming vegetation, applying herbicides, etc.) of the proposed project does not involve activities with the potential to significantly affect transportation facilities. No significant impacts to offsite traffic volumes are predicted during the operational phase. Occasional maintenance trucks would access the site, but this would represent no more than two vehicle-trips per day during typical business hours. Thus, none of the proposed project activities are expected to generate significant additional trip volume on public roads.

The service center and baseyard activities will generate relatively low numbers of vehicle trips, almost certainly no more than 20 vehicle-trips per hour. Given the small number and the intersection improvements that KIUC will make as part of the project, these do not have the potential to adversely affect the level off service. It should be noted that the activities that KIUC proposes to shift to the new service center and base yard are already occurring elsewhere on the island. This means that in many cases there will be a corresponding decrease in the number of vehicles traveling on other segments of the island roadway. As the areas where the reductions will occur are generally more heavily travelled (and congested) than are those in the vicinity of the proposed project, the net benefit on the level of service is likely to be positive when all areas are considered.

5.13 SOCIOECONOMIC FACTORS AND ENVIRONMENTAL JUSTICE

5.13.1 EXISTING CONDITIONS

As of the 2010 Census, the project site is located within the new Anahola Census Tract 9400, which encompasses 55.17 square miles. The resident population of this area was 3,715, representing about 5.5 percent of the island's population of 67,091. According to the 2010 American Community Survey, median household income in Kauai County was somewhat lower than the State average, at $55,723 compared with $63,741.[66] Unemployment within the civilian labor force was 4 percent, 4 percent lower than the countywide average of 8.5 percent.[67]

Executive Order (EO) 12898 *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* requires federal agencies to consider impacts that may arise from human health or environmental effects of a project on either minority or low-income populations. The EO states that, "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health of environmental effects of its programs, policies, and activities on minority populations and low-income populations." A Presidential Memorandum accompanying the EO directed agencies to incorporate environmental justice concerns into their NEPA processes and practices.

Environmental justice issues are identified by determining whether minority or low-income populations are present in the project site. If so, disproportionate effects on these populations should be considered. The Council of Environmental Quality (CEQ) guidance states that minority populations should be identified when the percentage of minority residents in the affected area exceeds 50 percent or is meaningfully greater than the percentage of minority residents in the general population (CEQ, 1997). If the percentage of minority residents of the population in the project site census tract exceeds the county level by more than 10 percent, it is considered to be "meaningfully greater" for the purpose of analysis. The CEQ guidance also states that the low-income populations should be identified based on poverty thresholds as reported by the U.S. Census Bureau. If the poverty rate for the population of the project site census tract exceeds the county poverty rate by more than 10 percent, it is considered to be an area of environmental justice concern for the purposes of analysis. Table 5.32 summarizes the relevant comparative data between Tract 9400 and the County of Kaua'i for an assessment of environmental justice.

[66] American Community Survey 5-Year Estimates Hawaii Geographic Area Profiles, Census Tracts Neighbor Islands.

[67] U.S. Bureau of Labor Statistics for 2011, not seasonally adjusted.

Table 5.32 Comparative Data for Environmental Justice Analysis

Comparative Data for Environmental Justice Analysis		
Race	***Census Tract 9400 (Anahola)***	***Kaua'i County***
	Percentage	***Percentage***
White	29.9	33.0
Black	0.3	0.4
Native American & Alaskan	0.5	0.4
Asian	9.4	31.3
Native Hawaiian & Pacific Islanders	26.1	9.0
Mixed	33.3	24.9
Other	0.5	0.9
TOTAL MINORITY	70.1	67.0
White	29.9	33.0
TOTAL	100	100
Percentage of Population With Income Below Poverty Level		
Anahola	***Kaua'i County***	
13.1	13.2	
Source: U.S. Census Bureau, 2007-2011 American Community Survey		

The Kawaihau Planning District extends from Wailua in the south to Moloa'a in the north, and encompasses the communities of Wailua, Kapa'a, and Anahola, as well as the entire project site. The *Kauai General Plan* (2000) 6.2.4.2(a)(1) states policy for regional growth and public facilities in the Kawaihau Planning District: "Locate new growth in and around the Waipouli-Kapa'a urban center and on DHHL lands in Anahola." It further states that, under the guidance of the Department of Hawaiian Homelands long-range master plan, Anahola will continue to be developed with additional homes, farm homesteads, and ancillary infrastructure.

DHHL's *Anahola, Kamalomalo'o, Moloa'a Regional Plan* (June 2010), which is the most recent of its many plans for the area, notes that DHHL owns 4,228 acres in Anahola and Kamalomalo'o extending from the shoreline mauka to the Keālia. It notes that Anahola is the largest Hawaiian homestead community on Kaua'i, but that most of the land remains undeveloped and unused by homesteaders. It provides the following summary of leases as of 2009: (*i*) 529 residential leases on 165 acres; (*ii*) 47 agricultural leases on 241 acres; and (*iii*) 154 acres of pasture and commercial uses short term leases.

In 1987, DHHL commissioned a comprehensive land use development plan which analyzed all DHHL lands in Anahola and made corresponding land use recommendations. The 1987 Anahola/Kamalomalo'o plan envisioned the area as a contemporary *ahupua'a* and provided for a mixture of land uses: cultural, homestead, agriculture, pastoral, income-generating and public services. In 2004, DHHL produced the Kaua'i Island Plan, which increased the residential land use areas, reflecting DHHL's emphasis on residential awards and therefore ensuring that Anahola would continue to be the largest residential homestead area on the island of Kaua'i.

DHHL's plan also call for commercial facilities, reserve areas, and other services to be located along the highway, south of the main residential area of Anahola. The plan anticipates continued growth to

the residential population of the east coast of the island, but at a slower rate than in the 1970-2000 period. The general intent of the re-designations is to increase residential and employment opportunities in the area, to provide lands for that urban residential growth, and to provide adequate infrastructure to meet this expanding residential base in the Waipouli-Kapa'a urban corridor. A critical part of DHHL's plan is the Ho'omaluō Energy Policy intended to enable the native Hawaiian and other citizens of the state to work together towards a self-sufficient and sustainable energy supply. The project's consistency with this policy is discussed at length in Section 6.2.2.

5.13.2 PROBABLE IMPACTS

As can be seen in Table 5.32, the total minority population in Census Tract 9400 is not meaningfully higher than the County as a whole; readers should note that the total minority population of both the County and the Anahola Census Tract exceeds 50 percent. However, the percentage of residents in Census Tract 9400 (70 percent) is nearly the same as the County average (67 percent). As such it does not represent a meaningful concentration of poverty or a source of environmental concern, particularly given the close cooperation the community has given to the proposed project.

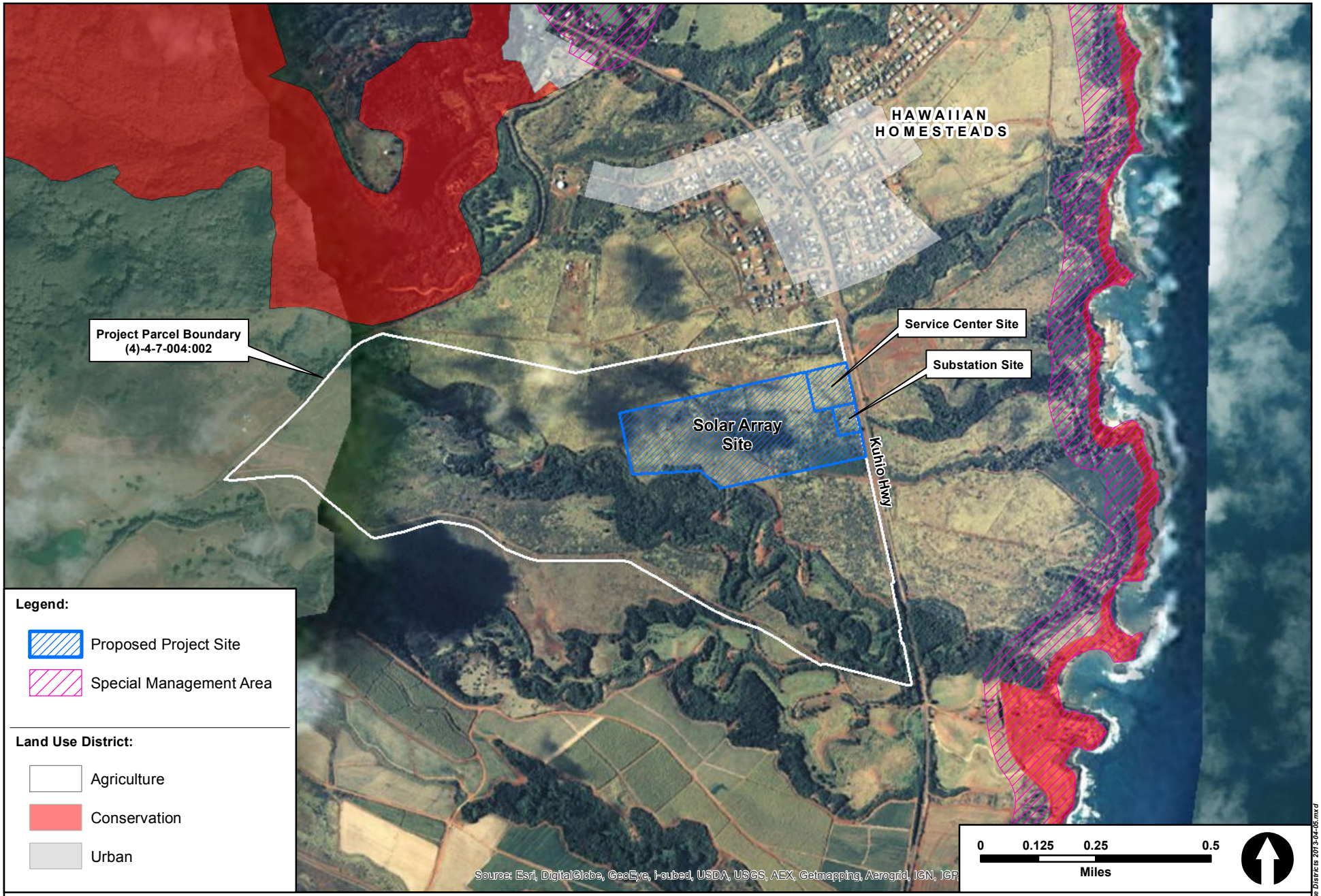
The project site is directly adjacent to the Kūhiō Highway right-of-way. The entire project site is located in the State "Agriculture" district, and the County of Kaua'i "Agriculture" zoning districts. While the proposed Anahola Solar Project would be located on DHHL which is not subject to State and County land use regulations, the proposed project is an allowable use under these designations conforming to their purpose and intent. Figure 1.4 contains photographs of existing conditions on the project site. Figure 5.23 shows state land use districts in the project site. Figure 5.24 depicts the county zoning near the project site.

According to the *Kaua'i Economic Development Plan* 2005-2015, the visitor industry generates about one-third of Kaua'i's real income in a typical year.[68] The plan recognizes that the visitor industry is a mature industry and is a critical component of Kaua'i's economic future. The areas within the Kawaihau Planning District communities and roadways were originally laid out for agricultural homesteads during the Territorial Government, with limited interconnections. The policies on regional growth are intended to support growth within the Kapa'a-Wailua area and on the DHHL lands at Anahola (Kaua'i General Plan 2000).

Table 5.33 Parcels Neighboring the Anahola Solar Project

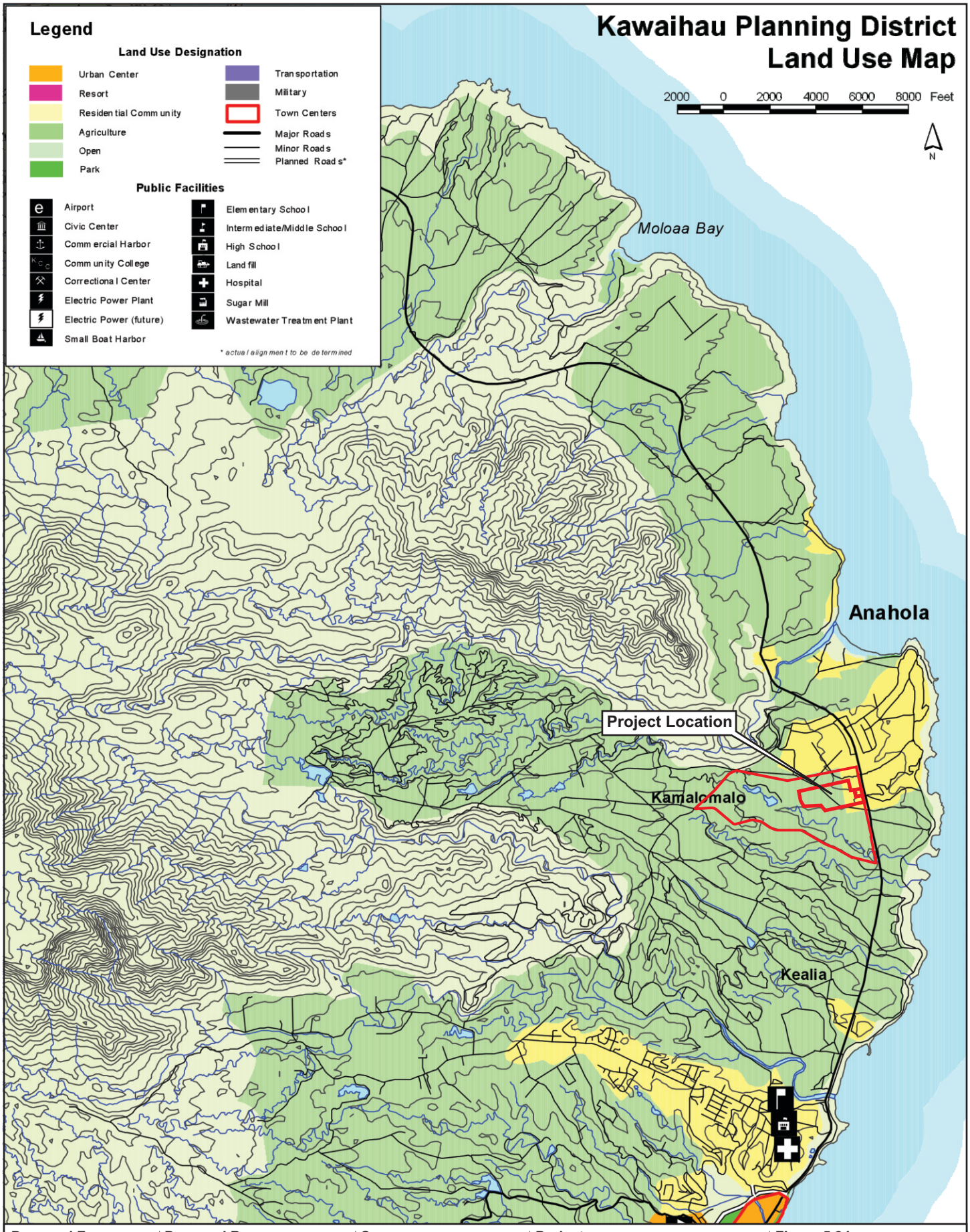
Parcel TMK No.	*Listed Owner*	*Tax Acres*
(4)4-7-004:001	Cornerstone Hawaii	1066.096
(4)4-7-002:003	Cornerstone Hawaii	1679.883
(4)4-7-002:004	Department of Hawaiian Homelands	994.12
(4)4-7-004:007	Department of Hawaiian Homelands	227.438
(4)4-8-003:004	Department of Hawaiian Homelands	35.72
(4)4-8-003:006	Department of Hawaiian Homelands	360.204
(4)4-7-004:999	State of Hawai'i	0
(4)4-8-003:999	State of Hawai'i	0
Note: The TMK numbers ending in 999 are part of the Highway Right of Way and are not subject to taxation.		
Source: State of Hawaii GIS (2011)		

[68] University of Hawai'i, Economic Research Organization, *Kaua'i Economic Outlook*, prepared for the County of Kaua'i, June 14, 2004.



Prepared For:	Prepared By:	Source:	Project:	Figure 5.23:
Kaua'i Island Utility Cooperative	PLANNING SOLUTIONS	-State of Hawai'i GIS -County of Kaua'i GIS ESRI	KIUC Anahola Solar Project	**Land Use Districts & Special Management Area**

Figure 5-23 State Land Use Districts 2013-04-05.mxd



Prepared For:	Prepared By:	Source:	Project:	Figure 5.24:
KIUC	PLANNING SOLUTIONS	Kauai County General Plan November 2000	KIUC Anahola Solar Project	Kawaihau Planning District Land Use Map

Figure 5-24 Kawaihau Planning District Map 2013-04-05.cdr

KIUC believes that the proposed project is compatible with, and in the interest of, the planned for and intended use of the area. Aside from the temporary construction employment it would generate, and the expenditures which it would create, the project would create infrastructure which will accommodate the future growth and economic activity in the area. The project is intended to accommodate customers who already reside in the northeast and North Shore communities of the island who currently must travel to Kāpa‘a to meet with KIUC planners. By improving customer access and increasing the reliability of electricity in the area, this project will have a positive impact on the socio-economic environment. No persons will be displaced by the proposed project.

5.14 RECREATION & SHORELINE ACCESS

5.14.1 EXISTING CONDITIONS

The County of Kaua‘i operates 15 parks encompassing 211 acres of land in the Kawaihau Planning District, which includes Anahola. These include athletic fields, playgrounds, beach parks, and playing courts. There are two parks within a mile of the proposed project: Anahola Hawaiian Homes Park approximately 1,650 feet away, and Anahola Beach Park, one mile away, both in a northerly direction. Anahola Hawaiian Homes Park has a community pavilion, playing courts, and a playing field. Anahola Beach Park accommodates typical beach activities including, but not limited to, picnicking, camping, swimming, surfing, and fishing.

5.14.2 PROBABLE IMPACTS

The existing parks in the area are separated from the project site by significant distances, intervening roadways, and terrain. While the new facilities—screened by vegetation—could be visible from the highway, none of them would be seen from the parks in the area. None of the new facilities or the work required to construct them would obstruct access to area beaches or shoreline. Construction and operation of the proposed facilities will not generate noise or air emissions that have the potential to adversely affect the existing recreational experience in the area. Neither will it generate sufficient vehicular traffic or changes in water quality that could degrade available recreational experiences. Consequently, no recreational or shoreline access impacts are anticipated.

5.15 SUMMARY OF MITIGATION MEASURES

Table 5.34 summarizes the mitigation measures introduced in this chapter.

Table 5.34 Summary of Mitigation Measures

Section	Committed Mitigation Measures
5.1 – Topography, Geology & Soils	None
5.2 – Hydrology	Maintain existing patterns and avoid increase in storm water runoff. Implement Best Management Practices (BMP) in NPDES Permit.
5.3 – Climate/Micro-Climate	None
5.4 – Air Quality	Implement construction minimization measures as called for in Section 5.4.2.1
5.5 – Biota	Implement vegetation management plan contained in Appendix C. Refrain from trimming woody vegetation in excess of 15 feet height between June 1 and September 15.
5.6 – Noise	Equip trucks using service center with broadband noise back-up alarms
5.7 – Archaeological, Historical, & Cultural Resources	If undocumented cultural properties are encountered, KIUC will, at a minimum: (i) immediately cease all work in the area; and (ii) notify the State Historic preservation Division to assess impacts. As appropriate, further mitigation measures would be proposed and coordinated with SHPD.
5.8 – Natural Hazards	Design to appropriate standards as discussed in Section 5.8.
5.9 – Scenic & Aesthetic Resources	Erect and maintain landscape screens as proposed.
5.10 – Public Infrastructure	Install water and telecommunications connections as proposed.
5.11 – Hazardous Materials	Implement recommendations in HAZTECH Phase 1 report.
5.12 – Transportation Facilities	Construct highway intersection improvements before occupying service center.
5.13 – Socioeconomic/ Environmental Justice	None.
5.14 – Recreation and Shoreline Access	None. -

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6. CONSISTENCY WITH EXISTING POLICIES, CONTROLS, AND LAND USE PLANS

In accordance with the requirements of HAR §11-200-17 (h), this chapter discusses the relationship of the proposed Anahola Solar Project to land use plans, policies, and controls for the area. KIUC has evaluated the solar array, substation, and service center for consistency with these regulations. It has also identified the extent to which the proposed project would conform or conflict with objectives and specific terms of approved or proposed land use plans, policies, and controls.

The discussion is organized first by jurisdiction (county, state, or federal) and then by specific ordinance, regulations, or law. This is followed by a listing of the required permits or approvals. An important consideration is that the proposed project is planned to be located in Anahola, Kaua'i on approximately 60 acres of land owned by the Department of Hawaiian Home Lands (DHHL). DHHL will lease the land to the Homestead Community Development Corporation (HCDC), a Hawaiian non-profit corporation. HCDC will in turn sublease the land to KRS One, a subsidiary of KIUC. Because of the unique situation on DHHL lands, not all land use classifications and county zoning regulations—from which DHHL lands are exempt—are applicable. However, KIUC believes that, despite DHHL's exemption, the proposed project is consistent with the rules and regulations which would typically apply.

6.1 COUNTY OF KAUA'I

6.1.1 KAUAI COUNTY GENERAL PLAN

6.1.1.1 Relevant Provisions

The *Kaua'i County General Plan* is the primary document covering long-range and comprehensive development, land use, and allocation of land and water uses within the County of Kaua'i. It serves as the enabling legislation establishing the framework, parameters, constraints, and guidelines for the County's Development Plans, Comprehensive Zoning Ordinance (CZO), infrastructure master plans, and capital improvement programs. The General Plan also establishes the geographic areas of the county to be utilized or developed for various purposes, such as agriculture, open space, communities, and resorts. Other ordinances and regulations (e.g., the CZO) regulate specific uses within these areas. As discussed below, the proposed project is consistent with the provisions of the *Kaua'i County General Plan*. The purpose of the plan is reproduced below in italics:

> *1.2 Purpose of the General Plan*
>
> *The General Plan fulfills the legal mandates of State law and the Charter of the County of Kauai. More importantly, it provides guidance for land use regulations, the location and character of new development and facilities and planning for County and State facilities.*

In that plan, the objective of land use policy related to growth is described as follows:

> *5.1.2 Policy for Future Growth*
>
> *(a) Allow for incremental growth of Towns, contiguous to existing development. Concentrate primary shopping facilities within the Town Center. Support infill development.*
>
> *(b) Provide for build-out of existing Residential Communities, to include areas zoned R-1 or higher. Allow small, neighborhood-oriented commercial sites in Residential Communities.*

(c) In the outlying West Side and North Shore districts, plan for additional residential use to meet regional demands for housing.

The proposed Anahola Solar Project is within the Kawaihau Planning District identified on approved county plans and is intended to meet its growing need for reliable, renewable electrical service. The proposed project's physical design is consistent with existing uses, although it represents an intensification of the utility's presence along Kūhiō Highway, and in the area in general. Attention is given in the plan to balancing urban development in the area with the unique rural character and scenic views which residents of the area value:

6.2 Kawaihau

The Kawaihau district extends from the Wailua River north to Moloa'a, including the Kapa'a-Wailua basin, Keālia and Anahola. The Kapa'a-Wailua basin is home to a large portion of Kaua'i's population. An urban corridor extends along Kūhiō Highway from Haleilio Road in Wailua to Kawaihau Road, at the northern edge of Kapa'a Town.

6.2.1 Community Assets

During the 1988-99 General Plan Update process, Kawaihau residents and business people attending community meetings listed the assets of their communities. The entire list was long and diverse and is available in the GP Update Working Papers. Following is a selection of assets related to the Kawaihau District, particularly the physical environment:

- *Rural scenery, open space, and agricultural lands.*
- *Scenic mountain views.*
- *Recreational opportunities—beaches, ocean, mountains.*
- *Walking paths and bridges.*
- *Plantation town heritage.*
- *Working Town environment.*

It was with concern for this grassroots desire to preserve visual resources, the natural environment, and the opportunities which it affords that the land use policies were mapped out and areas set aside for regional growth:

6.2.4.2 Policy

(a) Regional Growth and Public Facilities

(1) Locate new growth in and around the Waipouli-Kapa'a urban center and on DHHL lands in Anahola.

(c) Support agricultural, residential, and limited commercial development of the Hawaiian Home Lands at Anahola, with the recommendation that projects be sited to avoid the appearance of strip development along the highway and that the highway frontage be enhanced with landscaping.

The proposed project will be constructed on DHHL lands in Anahola, as supported by the *Kaua'i County General Plan*. In addition, the *Kaua'i County General Plan* promotes a move away from dependence on fossil fuels for energy production and towards clean, renewable energy production:

7.7 Energy

> *In the long term, energy generation and use on Kauai will be affected by the cost of imported fuels, technological innovations in energy generation, and deregulation of energy utilities. The cost of imported fuel will drive innovation and encourage energy self-sufficiency. Future development of fuel cell technology and cost-effective photovoltaic generation may enable households and businesses to generate much of their own electrical energy. This in turn may reduce the need for distribution systems. It may also enable broad use of net metering, by which individual establishments can sell energy back to the utility.*
>
> *Purchase of fuel constitutes a substantial flow of money out of the local economy. Replacement of imported fuel with renewable energy produced on Kauai would provide jobs and retain money to circulate and strengthen the island's economy. Opportunities include generating energy from solid waste or from biomass crops; producing liquid fuels from biomass crops; and developing solar and wind generation facilities, either large- or small-scale. Developing additional hydro-electric power should be considered.*

6.1.1.2 Conformance with the Plan

The proposed Anahola Solar Project is in conformance with the *Kaua'i County General Plan*. The plan sets out regional policies that encourage the orderly development of resources and infrastructure for all members of the community. The proposed project meets all applicable design standards. It is also consistent with the stated policy objectives for the Kawaihau Planning District, which specifically calls for development on DHHL lands in Anahola in support of measured residential and commercial growth. The proposed project is allowable under the existing state and county zoning and development regulations. Construction and operation of this project would not produce substantial air or noise emissions which would disturb existing or planned uses on adjacent properties.

6.1.2 COUNTY OF KAUA'I LAND USE ORDINANCE

Pursuant to HRS §205-2, the County of Kaua'i establishes the permitted uses for zoning districts in the Comprehensive Zoning Ordinances (CZO). The purpose of the CZO is to regulate land use in a manner that will encourage orderly development in accordance with adopted land use policies. It does this by establishing zoning districts and specifying the kinds of development and development standards that must be adhered to within each zoning district.

The Anahola Solar Project is located in the County Agriculture District. The proposed facilities are consistent with the applicable height limitations, setback requirements, and other design standards of this zoning district (CZO §8-7.6). As discussed in Chapter 3, the construction of the proposed project is not expected to significantly impact surrounding properties with more sensitive zoning and land uses. If this project were not exempted, it would require a Class IV Use Permit. If such a permit were being sought, it appears as though this project would satisfy all of the conditions and restrictions contained in the applicable section of the CZO (e.g., lot size, setbacks, and height limits).

6.2 STATE OF HAWAI'I

6.2.1 HAWAI'I STATE PLAN

The *Hawai'i State Plan* is intended to guide the long-range development of the State by:

- Identifying goals, objectives, and policies for the State and its residents;
- Establishing a basis for determining priorities and allocating resources; and

- Providing a unifying vision to enable coordination between the various counties' plans, programs, policies, projects and regulatory activities to assist them in developing their county plans, programs, and projects and the State's long-range development objectives.

The *Hawai'i State Plan* is a policy document. It depends upon implementing laws and regulations to achieve its goals. The sections of the *State Plan* that are most relevant to the proposed project are Sections 226-18(a) and (b), which establish objectives and policies for energy facility systems. These sections are reproduced in italics below, and the proposed project's consistency with them is discussed.

§226-18 Objectives and policies for facility systems—energy/telecommunications.

(a) Planning for the State's facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all:

(1) Dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people;

(2) Increased energy self sufficiency.

(b) To further achieve the energy objectives, it shall be the policy of the State to:

(1) *Support research and development as well as promote the use of renewable energy resources.*

Discussion: The proposed project would contribute to the efficiency of KIUC operations while maintaining or improving environmental quality and maintaining costs to KIUC customers at a reasonable level. It would also decrease KIUC's dependence on imported fuel to meet the growing energy needs of the Kaua'i community by promoting the use of a renewable energy resource. Therefore the project is consistent with this provision of the *Hawai'i State Plan*.

6.2.2 DEPARTMENT OF HAWAIIAN HOME LANDS

6.2.2.1 Relevant Position

DHHL has developed the Ho'omaluō Energy Policy intended to enable the native Hawaiian and other citizens of the state to work together towards a self-sufficient and sustainable energy supply. In July, 2009, DHHL entered into an energy partnership with Kaua'i Island Utility Cooperative to work towards these ends. As formalized in the *Anahola Regional Plan* (2010) the partnership agreed to the following (DHHL, 2010):

- *Pursuing opportunities that support economic self-sufficiency and contribute to Hawaii's Clean Energy Initiative through leasing lands owned by DHHL for renewable energy projects;*
- *Incorporating renewable energy technologies into existing homesteads;*
- *Conducting outreach programs to educate and encourage the public to live a "green" lifestyle;*
- *The DHHL-KIUC Energy Partnership agrees to collaborate to achieve critical energy objectives;*
- *Assist homesteaders in their efforts to affordably incorporate energy efficiency into their own homes;*
- *Showcase the Homestead Energy Program and the retrofitting of energy saving devices in existing homesteads, including but not limited to solar water heating systems and compact fluorescent light (CFL) fixtures;*

- *Helping advance the commercialization of developing green technology by identifying appropriate opportunities for demonstration of such technology in the Department's projects;*

In pursuit of these objectives, the Hoʻomaluō Energy Policy was crafted with five critical objectives. Objective 2 is as follows:

> ***Koʻo*[69]*:*** *Facilitate the use of diverse renewable energy resources.*
>
> *Activities:*
>
> - *Identify properties in DHHL's land inventory that have potential for renewable energy projects.*
> - *Pursue the leasing of those lands that are identified as suitable for renewable energy projects. (First priority should be given to entities that would provide "firm" renewable energy power such as garbage-to-energy (mass-burn), geothermal, pump storage, hydropower, solar-thermal and second priority to "as-available" renewable energy power such as wind, solar-photovoltaic, and wave.)*
> - *Encourage existing and future general lessees and licensees of DHHL's properties to design and build their facilities so that they are energy and resource efficient.*
> - *Seek partnerships for the development of renewable energy resources. In this connection, build relationships that could assist DHHL on non-energy related issues.*
> - *Evaluate DHHL's available authorities/powers that could expedite renewable energy projects for the State of Hawai'i.*
> - *Seek innovative processes to provide reliable electricity, by assisting electric utilities (in a world where energy is an essential but very limited resource) to reduce Hawaii's dependency on fossil fuels.*

DHHL views KIUC's Anahola Solar Project as an important opportunity to work towards these and other objectives of its Kaua'i Island Plan, Anahola Regional Plan 2010, and the Hoʻomaluō Energy Policy, as evidenced by its cooperation with KIUC in subleasing its land through the Homestead Community Development Corporation.

6.2.2.2 Conformance with the Policy

The proposed Anahola Solar Project conforms to the stated objectives of the Anahola Regional Plan 2010, the DHHL-KIUC Energy Partnership, and DHHL's Hoʻomaluō Energy Policy. The Anahola Regional Plan 2010 presents the energy partnership with KIUC as a key component of its goal of sustainable development in the area. The Hoʻomaluō Energy Policy specifically identifies photovoltaic facilities sited on DHHL lands as a priority objective. By utilizing DHHL lands and authority to promote self-sufficient and sustainable energy production for the benefit of the native Hawaiian and broader island community the Anahola Solar Project would be compatible with DHHL goals and policy. In addition to supporting its energy policy, the proposed project would also, generate funds to support other DHHL objectives through the revenues generated by its sublease to KRS One.

[69] In the Hawaiian language *koʻo* has the meaning of supporting, bracing, propping, or helping. Here it has the meaning of DHHL actively working to help the implementation of clean, renewable energy projects.

6.2.3 PUBLIC UTILITIES COMMISSION

The State of Hawai'i, Department of Regulatory Agencies under Title VII – Public Utilities Commission has propagated General Order No. 7 Standards for Electric Utility Service in the State of Hawai'i. Under Section 7.5 Interruptions of Service it states:

> *Each utility shall make reasonable efforts to avoid interruptions of service…*

Currently, the North Shore of Kaua'i is an area where power outages have been an ongoing issue. One of the principle objectives of the proposed project, as noted in, is to improve system reliability to customers on the North Shore by breaking the Kapa'a-Princeville transmission corridor into two segments and by providing additional voltage support. Thus, the Anahola Solar Project is intended to meet KIUC's mandate to provide uninterrupted power to its clientele.

6.2.4 CHAPTER 205, HAWAI'I REVISED STATUTES - LAND USE LAW

Chapter 205, Hawai'i Revised Statutes (HRS), establishes the State Land Use Commission (SLUC) and gives this body the authority to designate all lands in the state as Urban, Rural, Agricultural, or Conservation District lands. The Counties make all land use decisions within the Urban Districts in accordance with their respective County general plans, development plans, and zoning ordinances. The counties also regulate land use in the state Rural and Agricultural Districts, but within the limits imposed by Chapter 205.

The Anahola Solar Project is in the State Agricultural District. Hawai'i Revised Statutes §205-2 defines allowable activities within the Agricultural District, in part, as follows:

> *(d)(6) Solar energy facilities; provided that this paragraph shall apply only to land with soil classified by the land study bureau's detailed land classification as overall (master) productivity rating class D or E;*

In addition, HRS §205-4.5 Permissible uses within the agricultural districts, states:

> *(a) Within the agricultural district, all lands with soil classified by the land study bureau's detailed land classification as overall (master) productivity rating class A or B shall be restricted to the following permitted uses:*
>
> *(7) Public, private, and quasi-public utility lines and roadways, transformer stations, communications equipment buildings, solid waste transfer stations, major water storage tanks, and appurtenant small buildings such as booster pump stations, but not including offices or yards for equipment, material, vehicle storage, repair or maintenance, treatment plants, corporation yards, or other small structures;*

The land which has been identified as the preferred alternative in this document has been classified by the Land Study Bureau as being class "B"; thus the proposed project is not an allowable use of land in the Agricultural District without a Special Use Permit, under typical circumstances.

Because the project is larger than 15 acres, this permit would have to be approved by the State of Hawai'i Land Use Commission, as opposed to the County of Kaua'i. However, because this project involves use of lands owned entirely by the Department of Hawaiian Home Lands, and because DHHL lands are not subject to the State's land use classifications and county zoning designations, this requirement would not apply.[70]

[70] Hawaii Attorney General Opinion No. 72-21: "Under this bill certain specific lands are withdrawn from [the public land commissioner's] jurisdiction and from the jurisdiction of every commission except the special one to have charge of these specific lands described in the bill, and those lands are exclusively by the terms of this bill under the control of this commission." The commission which is referred to is the Hawaiian Homes Commission.

The total land area that would be disturbed by the new construction involved in this project is approximately 60 acres. Consequently, this project will require coverage under the State of Hawai'i NPDES General Permit program (HAR §11-55, Appendix C).

6.2.5 COASTAL ZONE MANAGEMENT (CZM) PROGRAM

The objectives of the Hawai'i Coastal Zone Management (CZM) Program are set forth in the Hawai'i Revised Statutes, Chapter 205A. The program is intended to promote the protection and maintenance of valuable coastal resources. All lands in Hawai'i are classified as valuable coastal resources. The State Office of Planning administers Hawai'i's CZM program. A general discussion of the project's consistency with the objectives and policies of Hawai'i's CZM Program follows.

6.2.5.1 Recreational Resources

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

Policies:

1. *Improve coordination and funding of coastal recreational planning and management; and*
2. *Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:*
    a. *Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;*
    b. *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;*
    c. *Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;*
    d. *Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;*
    e. *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;*
    f. *Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;*
    g. *Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and*
    h. *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: The proposed project would have no effects on coastal recreational resources. Once constructed, the proposed facilities would not be visible from Anahola Beach Park or other nearby coastal recreational resources, and construction of the proposed facilities would not disrupt ongoing use of the park or access to the shoreline.

6.2.5.2 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:

1. *Identify and analyze significant archaeological resources;*
2. *Maximize information retention through preservation of remains and artifacts or salvage operations; and*
3. *Support state goals for protection, restoration, interpretation, and display of historic resources.*

Discussion: The proposed work will occur in areas that have already been extensively disturbed. Section 5.7 describes the known locations of historic properties and discusses the steps that KIUC would take to preserve any resources inadvertently discovered during construction. SHPD will be sent a copy of this EA for review and their comments, if any, will be reproduced in the *Final EA*.

6.2.5.3 Scenic and Open Space Resources

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

Policies:

1. *Identify valued scenic resources in the coastal zone management area;*
2. *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;*
3. *Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and*
4. *Encourage those developments that are not coastal dependent to locate in inland areas.*

Discussion: Coastal open space would not be affected by the proposed project. None of the proposed construction would substantially alter natural landforms and much of the proposed structures would be sited well away from any public view of the shoreline. While the project would represent a new visual presence along a scenic highway corridor, the facilities would be generally low-lying and screened by vegetation consistent with other construction along this route.

6.2.5.4 Coastal Ecosystems

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

Policies:

1. *Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;*
2. *Improve the technical basis for natural resource management;*
3. *Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;*

4. *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*
5. *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: The proposed project will not affect coastal ecosystems or any other water body, as described in Section 5.2.2.

6.2.5.5 Economic Uses

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

Policies:

1. *Concentrate coastal dependent development in appropriate areas;*
2. *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*
3. *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:*
    a. *Use of presently designated locations is not feasible;*
    b. *Adverse environmental effects are minimized; and*
    c. *The development is important to the State's economy.*

Discussion: The proposed project would not lead to any changes in the concentration or location of coastal developments. The work would be constructed entirely within an area designated for development, and would not change the character or normal use of surrounding areas.

6.2.5.6 Coastal Hazards

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

Policies:

1. *Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;*
2. *Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;*
3. *Ensure that developments comply with requirements of the Federal Flood Insurance Program; and*
4. *Prevent coastal flooding from inland projects.*

Discussion: Section 5.8 confirms that the project site is outside a designated Special Flood Hazard Area and is not within the County Tsunami Evacuation Zone (see Figure 5.10).

6.2.5.7 Managing Development

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

Policies:

1. *Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;*
2. *Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and*
3. *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: KIUC has initiated contact and continues to work cooperatively with all government agencies with oversight responsibilities to facilitate efficient processing of permits and informed decision making by the responsible parties.

6.2.5.8 Public Participation

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

Policies:

1. *Promote public involvement in coastal zone management processes;*
2. *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*
3. *Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.*

Discussion: The public will have an opportunity to review and comment on the EA, pursuant to the requirements of Hawai‘i Administrative Rules §11-200.

6.2.5.9 Beach Protection

Objective: *Protect beaches for public use and recreation.*

Policies:

1. *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;*
2. *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*
3. *Minimize the construction of public erosion-protection structures seaward of the shoreline.*

Discussion: The project poses no risks to beaches. No structures are planned seaward of the shoreline, and no interactions with littoral processes would be involved.

6.2.5.10 Marine Resources

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

Policies:

1. *Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;*
2. *Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;*
3. *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;*
4. *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*
5. *Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.*

Discussion: The proposed project does not have the potential to affect marine resources.

6.3 FEDERAL REGULATIONS, STATUTES, AND EXECUTIVE ORDERS

The following sub-sections address the proposed project's relationship to federal regulations, statutes, and executive orders as required by RUS for electric projects requiring an environmental assessment.

6.3.1 NATIONAL HISTORIC PRESERVATION ACT (16 U.S.C. § 470)

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by ACHP. RUS, in consultation with both the State of Hawai'i Historic Preservation Division (SHPD) of the Department of Land and Natural Resources and Native Hawaiian organizations has determined that the project will have no effect on historic properties, and the impact assessment conducted for the project detected no evidence that the site is used or valued for cultural purposes. Consequently, the proposed project is in compliance with these regulations.

6.3.2 CLEAN AIR ACT (42 U.S.C. § 7401)

The Clean Air Act requires the Environmental Protection Agency (EPA) to develop and enforce regulations to protect the public from airborne contaminants known to be hazardous to human health by regulating emissions. As discussed in Section 5.4.2.1, any emissions of fugitive dust during construction of the project are expected to be temporary and relatively minor. It is anticipated that diesel-powered construction equipment will be used to construct the proposed facilities. Emissions from the diesel will slightly degrade air quality for the relatively short period of time they are in operation. However, all applicable emission and ambient air quality standards will continue to be met. The contractors will employ Best Management Practices (BMPs) to control fugitive dust emissions during the construction phase. Normal operation of the Anahola Solar Project will not produce any on-site air emissions, will not alter air flow in the vicinity, and will have no other measureable effect on the area's micro-climate.

Substitution of photovoltaic energy production for the use of a portion of the fossil fuels needed to meet the growing demand for electricity on Kaua'i will reduce emissions of regulated pollutants over

time. Hence, not only does the proposed project comply with the provisions of the Clean Air Act, it will have a beneficial effect on air quality.

6.3.3 CLEAN WATER ACT

The Clean Water Act (Federal Water Pollution Control Act, 33 USC 1251, et seq.) is the principal law governing pollution control and water quality of the nation's waterways. As discussed above, there are no water bodies near the project site that could be affected. This project does not require KIUC to seek approvals under the Clean Water Act. It will, however, obtain an NPDES Construction permit from the State of Hawai'i Department of Health.

6.3.4 COASTAL BARRIER IMPROVEMENT ACT (42 U.S.C. 4028)

The Coastal Barrier Improvement Act requires that no new flood insurance coverage may be provided for any new construction or substantial improvements of structures located on any coastal barrier within the John H. Chafee Coastal Barrier Resources System established by Section 3503 of Title 16. Coastal Barrier Resources Act (CBRA), Public Law 97-348 (96 Stat. 1653; 16 U.S.C. 3501 et seq.), enacted October 18, 1982, designated various undeveloped coastal barrier islands, depicted by specific maps, for inclusion in the Coastal Barrier Resources System (System). Areas so designated were made ineligible for direct or indirect Federal financial assistance that might support development, including flood insurance, except for emergency life-saving activities. This Act does not apply to the State of Hawai'i at this time, therefore the proposed project will not affect any areas protected by this Act.

6.3.5 COASTAL BARRIER RESOURCES ACT (16 U.S.C. § 3501)

Coastal Barrier Resources Act (CBRA), Public Law 97-348 (96 Stat. 1653; 16 U.S.C. 3501 et seq.), enacted October 18, 1982, designated various undeveloped coastal barrier islands, depicted by specific maps, for inclusion in the Coastal Barrier Resources System (System). Areas so designated were made ineligible for direct or indirect Federal financial assistance that might support development, including flood insurance, except for emergency life-saving activities. This Act does not apply to the State of Hawai'i at this time, therefore the proposed project will not affect any areas protected by this Act.

6.3.6 COASTAL ZONE MANAGEMENT ACT (16 U.S.C. § 1456(C) (1))

Enacted as Chapter 205A, HRS, the Hawai'i Coastal Zone Management (CZM) Program was promulgated in 1977 in response to the Federal Coastal Zone Management Act of 1972. The CZM area encompasses the entire state, including all marine waters seaward to the extent of the state's police power and management authority, as well as the 12-mile U.S. territorial sea and all archipelagic waters. Section 6.2.5 above discusses the consistency of the projects with the CZMP's ten policy objectives.

6.3.7 COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, & LIABILITY ACT (42 U.S.C. 9601)

The Comprehensive Environmental Response, Compensation, and Liability Act – also known as CERCLA or Superfund -- provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment. Through CERCLA, EPA was given power to seek out those parties responsible for any release and assure their cooperation in the cleanup. As detailed in Section 5.11, there are no known hazardous materials remaining on the site from previous uses of the area. No hazardous materials will be used in the construction or operation of the proposed project and therefore is in compliance with this Act.

6.3.8 COUNCIL ON ENVIRONMENTAL QUALITY REGULATIONS (40 CFR PARTS 1500-1508)

The National Environmental Policy Act (NEPA) is the basic national charter for protection of the environment. It establishes policy, sets goals, and provides means for carrying out the policy. Two sets of regulations govern EPA's implementation of NEPA; The Council on Environmental Quality (CEQ) regulations and EPA's NEPA implementing regulations. This EA has been prepared in accordance with the requirements of these federal environmental impact assessment regulations, as discussed in Section 1.3. As part of the assessment process, RUS has consulted with other government agencies, private organizations, and the public in the preparation of this document and has concluded that the proposed project will not have a significant effect on the quality of the human environment.

6.3.9 ENDANGERED SPECIES ACT (16 U.S.C. 1531 ET SEQ.)

The Endangered Species Act (16 U.S.C. §§ 1531-1544, December 28, 1973, as amended 1976-1982, 1984 and 1988) provides broad protection for species of fish, wildlife, and plants that are listed as threatened or endangered in the U.S. or elsewhere. The Act mandates that federal agencies seek to conserve endangered and threatened species and use their authorities in furtherance of the Act's purposes. It provides for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The Act outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species, and contains exceptions and exemptions.

Existing biota on and near the project site is discussed in Section 5.5.1. The discussion documents the fact that there are no known rare or endangered species on or immediately adjacent to the project site that would be adversely affected by the project. RUS, in consultation with the USFWS, has made the determination that the proposed project is not likely to adversely affect any threatened, endangered, or candidate species.

6.3.10 FARMLAND PROTECTION POLICY ACT (7 U.S.C. § 4201 ET SEQ.)

The U.S. Congress adopted the Farmland Protection Policy Act (FPPA) (Public Law 97-98) on December 22, 1981). The U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) has national leadership for administering the FPPA. The effective date of the FPPA rule (part 658 of Title 7 of the Code of Federal Regulations) is August 6, 1984.

The stated purposes of the FPPA are to:

- Minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses.
- Assure that Federal programs are administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland.

"Farmland", as used in the FPPA, includes prime farmland, unique farmland, and land of statewide or local importance. "Farmland" subject to FPPA requirements does not have to be currently used for cropland. Because the Anahola Solar Project will use federal funds for the conversion of prime agricultural lands, pursuant to the requirements of the Farm Policy Protection Act (FPPA), KIUC consulted with the Natural Resources Conservation Service (NRCS) on behalf of RUS, filing two USDA Form AD-1006 Farmland Conversion Impact Ratings (one for the solar array and the Anahola Substation and one for the Service Center) (see Appendix D). Based on the impact ratings, RUS and NRCS concluded that this project was wholly consistent with the FPPA.

6.3.11 MARINE PROTECTION, RESEARCH, & SANCTUARIES ACT (33 U.S.C. 1401)

The purpose of this act, as stated in Section 2(b) is as follows:

> *The Congress declares that it is the policy of the United States to regulate the dumping of all types of materials into ocean waters and to prevent or strictly limit the dumping into ocean waters of any material which would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities.*

Construction and operational activities associated with the proposed project will not entail any dumping of materials into ocean waters. As indicated in Section 5.10.5, all solid waste from the proposed project will be disposed of at approved off-site locations. The contractor will comply with all best management practices as necessary during the construction phase to prevent fugitive contaminants and soil from leaving the project site with storm water runoff (see Section 5.2.2). Consequently, the Anahola Solar Project is consistent with the provisions of the Marine Protection, Research, & Sanctuaries Act.

6.3.12 NATIONAL ENVIRONMENTAL POLICY ACT (42 U.S.C. 4321-4346)

The National Environmental Policy Act (NEPA) establishes national environmental policy and goals for the protection, maintenance, and enhancement of the environment and provides a process for implementing these goals within the federal agencies. The Act also establishes the Council on Environmental Quality (CEQ). The purpose of the Act is as follows:

> *"To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality."*

It is KIUC's intent to implement all appropriate measures in order to avoid or eliminate any significant impacts to the environment. As described in this report, the Anahola Solar Project is expected to have little or no effect on the surrounding environment. In fact, the proposed project will have a beneficial impact to the stimulation of the health and welfare of those who live on Kaua'i as the project will use a clean renewable resource to generate energy. Reducing the island's combustion of fossil fuel will decrease a substantial volume of pollutants into the atmosphere.

6.3.13 NATIONAL TRAILS SYSTEM ACT (16 U.S.C. 1241)

The purpose of this act, as stated in Section 2(a) of its preamble is as follows:

> *Considerations for determining establishment of trails in order to provide for the ever increasing outdoor recreation needs of an expanding population and in order to promote the preservation of, public access to, travel within, and enjoyment and appreciation of the open air, outdoor areas and historic resources of the Nation, trails should be established (i) primarily, near the urban areas of the Nation, and (ii) secondarily, within scenic areas and along historic travel routes of the Nation, which are often more remotely located.*

There are no known recreational, scenic or historic trails in or around the proposed project site. Therefore the proposed project will not affect any areas protected by this Act.

6.3.14 NATIVE AMERICAN GRAVES & REPATRIATION ACT (25 U.S.C. 3001)

The Native American Graves Protection and Repatriation Act (NAGPRA) was enacted on November 16, 1990, to address the rights of lineal descendants, Indian tribes, and Native Hawaiian organizations to Native American cultural items, including human remains, funerary objects, sacred objects, and objects of cultural patrimony. As indicated in Section 5.7, it is highly unlikely any archaeological and/or cultural remains will be encountered as the project site has been highly disturbed due to past agricultural use. In the unlikely event that undocumented remains are discovered, the contractor will: (1) cease work immediately; (2) protect the inadvertent discovery from additional disturbance; and (3)

notify the SHPD immediately. As appropriate, additional mitigative measures will be proposed and coordinated with SHPD. Consequently, the Anahola Solar Project is consistent with the provisions of this Act.

6.3.15 NOISE CONTROL ACT (42 U.S.C. 7901)

The purpose of this act, as stated in Section 2(b) of its preamble is as follows:

> *The Congress declares that it is the policy of the United States to promote an environment for all Americans free from noise that jeopardizes their health or welfare. To that end, it is the purpose of this Act to establish a means for effective coordination of Federal research and activities in noise control, to authorize the establishment of Federal noise emission standards for products distributed in commerce, and to provide information to the public respecting the noise emission and noise reduction characteristics of such products.*

As described in Section 5.6.4 all construction activities will comply with all applicable federal and state noise controls. Operation of the proposed project is not expected to alter noise levels over the present conditions. Consequently, the Anahola Solar Project is consistent with the provisions of the Noise Control Act.

6.3.16 RESOURCE CONSERVATION & RECOVERY ACT (42 U.S.C. 3251)

The Resource Conservation and Recovery Act gives EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous solid wastes. As described in Section 5.11 no hazardous materials will be used in the construction of the proposed facilities nor would any be produced as a result of its operation. Consequently, the proposed project is consistent with the provisions of the Act.

6.3.17 SAFE DRINKING WATER ACT (42 U.S.C. § 300(F))

The Safe Drinking Water Act (SDWA) is the principal federal law that ensures the quality of Americans' drinking water. Under SDWA, EPA sets standards for drinking water quality and oversees the states, localities, and water suppliers who implement those standards. The Safe Drinking Water Act requires that all public water systems meet stringent water quality standards. These standards cover a long list of potential chemical, radiological and biological contaminants. The standards distinguish between surface water and groundwater sources, with the testing and monitoring requirements for surface water and GWUDI sources being far greater than those for groundwater sources.

As discussed in this report, the proposed Anahola Solar Project and any associated work will not impact the surface water and groundwater sources. None of the proposed work will require or lead directly to sustained withdrawals from any aquifer and would not affect any sole source aquifer as none exist in Kaua'i. Therefore, the proposed project is in compliance with the Safe Drinking Water Act.

6.3.18 TOXIC SUBSTANCES CONTROL ACT (15 U.S.C. 2601)

The purpose of this act, as stated in Section 1-3 of its preamble is as follows:

> *It is the policy of the United States that-*
>
> *(1) adequate data should be developed with respect to the effect of chemical substances and mixtures on health and the environment and that the development of such data should be the responsibility of those who manufacture and those who process such chemical substances and mixtures;*

(2) adequate authority should exist to regulate chemical substances and mixtures which present an unreasonable risk of injury to health or the environment, and to take action with respect to chemical substances and mixtures which are imminent hazards; and

(3) authority over chemical substances and mixtures should be exercised in such a manner as not to impede unduly or create unnecessary economic barriers to technological innovation while fulfilling the primary purpose of this chapter to assure that such innovation and commerce in such chemical substances and mixtures do not present an unreasonable risk of injury to health or the environment.

As described in Section 5.11 no hazardous materials will be used in the construction of the proposed facilities nor would any be produced as a result of operations. Consequently, the proposed project is consistent with the provisions of the Toxic Substances Control Act.

6.3.19 WILD AND SCENIC RIVERS ACT (16 U.S.C. §1271)

The purpose of this act, as stated in Section (b) of its preamble is as follows:

It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.

There are no designated Wild and Scenic Rivers in the State of Hawai‘i at this time. Consequently, the proposed project is consistent with the provisions of the Wild and Scenic Rivers Act.

6.3.20 WILDERNESS ACT (16 U.S.C. 1131)

The purpose of this act, as stated in Section 2(a) of its preamble is as follows:

In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness. For this purpose there is hereby established a National Wilderness Preservation System to be composed of federally owned areas designated by Congress as "wilderness areas", and these shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness; and no Federal lands shall be designated as "wilderness areas" except as provided for in this Act or by a subsequent Act.

There are no designated “wilderness areas” in or around Anahola. Consequently, the proposed project is consistent with the provisions of the Wilderness Act.

6.3.21 EXECUTIVE ORDER 11593, PROTECTION AND ENHANCEMENT OF THE CULTURAL ENVIRONMENT (3 CFR 1971 COMP., PG. 154)

Executive Order 11593 was issued by President Nixon on May 13, 1971, directing federal agencies to inventory their cultural resources and establish policies and procedures to ensure the protection, restoration, and maintenance of federally owned sites, structures, and objects of historical, architectural, or archaeological significance. The Anahola Solar Project is not being constructed on federally owned land and there are no known archaeological, historical, and/or cultural resources found in or around the project site as noted in the Section 5.7. As a result, the proposed project is in compliance with this Executive Order.

6.3.22 EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT (3 CFR 1977 COMP., PG. 117)

As described in Section 5.2.1, the Anahola Solar Project lies within Flood Zone X, Zone X is defined as the flood insurance rate zone that corresponds to: (*i*) areas outside the 500-year floodplain; (*ii*) areas within the 500-year floodplain where the water depth resulting from the 100-year flood is less than 1 foot; (*iii*) areas where the contributing drainage area is less than 1 square mile; and (*iv*) areas protected from the 100-year flood by levees. Because of the low probability of flooding, no base flood elevations or depths have been defined within the zone. The proposed improvements comply with the standards of the National Flood Insurance Program. Neither the new structures, nor those structures being relocated would exacerbate existing flood hazards in the area.

6.3.23 EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS (3 CFR 1977 COMP., PG. 121)

There are no wetlands on or near the site. Neither are there food resources on the site that are important to wildlife that use wetlands elsewhere on the island. Copies of the *Draft EA* are being sent to the administrator of the Pacific Island Eco-Region, U.S. Fish & Wildlife Service, and to the State Department of Land and Natural Resources Department of Aquatic Resources to ensure adequate consideration of this topic in the environmental review for this project.

6.3.24 EXECUTIVE ORDER 12898, ENVIRONMENTAL JUSTICE (3 CFR 1994 COMP., PG. 859)

Environmental Justice is defined by the EPA as "The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies."

As discussed in Section 5.13, a given census tract can be considered a community of environmental justice concern if: (i) the minority population is greater than 50 percent of the total population; (ii) if the minority population is 10 percent (or more) greater than the surrounding county; or (iii) the number of persons with income below the poverty level is 10 percent higher than the surrounding county. While the Census Tract 9400, where the proposed project would be located, does not possess a meaningfully higher proportion of minority or impoverished residents than the county as a whole, it does have a minority population greater than 50 percent. However, the objective of the proposed Anahola Solar Project is to help reduce Kaua'i's dependence on fossil fuels by producing a renewable energy source which will in turn reduce emissions of pollutants over time. KIUC has at length engaged the community discussing their needs and concerns with regard to the project and how it will benefit both their community, and the island, on both an economical and environmental level. Consequently, the Anahola Solar Project is in compliance with Executive Order 12898.

6.3.25 HIGHLY ERODIBLE LAND & WETLAND CONSERVATION (7 CFR PART 12)

The purpose of this provision is to set forth the terms and conditions under which a person who produces an agricultural commodity on highly erodible land or designates such land for conservation use, plants an agricultural commodity on a converted wetland, or converts a wetland shall be determined to be ineligible for certain benefits provided by the USDA and its agents. The parcel on which the proposed project site is located is not classified as highly erodible land or as a wetland. As indicated in Section 5.1.2, the Anahola Solar Project will have very little effect on local topography. Consequently, the provision does not apply to the proposed project.

6.3.26 USDA'S ENHANCEMENT, PROTECTION, & MANAGEMENT OF THE CULTURAL ENVIRONMENT (7 CFR PART 3100)

The purpose of this regulation, as stated in Section 3100.43 (a) and (d) is as follows:

> *(a) The nonrenewable cultural environment of our country constitutes a valuable and treasured portion of the national heritage of the American people. The Department of Agriculture is committed to the management—identification, protection, preservation, interpretation, evaluation and nomination—of our prehistoric and historic cultural resources for the benefit of all people of this and future generations.*
>
> *(d) The Department is committed to consideration of the needs of American Indians, Eskimo, Aleut, and Native Hawaiians in the practice of their traditional religions.*

There are no archaeological or cultural resources in the areas on or near the proposed Anahola Solar Project. The project site does not contain any cultural resources that pertain to any Native Hawaiian cultural practices. Consequently, the proposed project is consistent with the requirements of this regulation.

6.4 REQUIRED PERMITS AND APPROVALS

The permits and approvals required for the proposed projects include:

- NEPA Environmental Assessment;
- Chapter 343 Environmental Assessment;
- National Pollutant Discharge Elimination System – Notice of Intent [Construction] (NPDES-NOI[C]);
- Noise permit;
- Construction on a State Highway Permit;
- Certificate of Public Convenience and Necessity;
- Grading Permit;[71]
- Building Permit (Service Center only);
- Driveway Approach and Road Permits;
- Stockpiling Permit; and
- Water Service Permit.

All of these approvals are issued by the State of Hawai'i and the County of Kaua'i. No federal permits are required for the project.

[71] As an electrical utility, KIUC is exempt from building permit requirements for the substation and PV arrays. While not technically required, a grading permit will be sought.

7. HAWAI'I STATE ANTICIPATED DETERMINATION

7.1 SIGNIFICANCE CRITERIA

The information in this chapter applies only to the State of Hawai'i environmental review process, defined in Hawaii Revised Statutes Chapter 343 and its implementing regulations in Hawai'i Administrative Rules (HAR) §11-200; this information does not apply to the RUS federal review process. HAR §11-200-11.2 establishes procedures for determining if an environmental impact statement (EIS) should be prepared or if a finding of no significant impact is warranted. HAR §11-200-11.2 (1) provides that applicants should issue an environmental impact statement preparation notice (EISPN) for actions that it determines may have a significant effect on the environment. HAR §11-200-12 lists the following criteria to be used in making that determination:

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

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

7.2 FINDINGS

The potential effects of the proposed work described earlier in this document were evaluated using these significance criteria. The findings with respect to each criterion are summarized below.

7.2.1 IRREVOCABLE LOSS OR DESTRUCTION OF VALUABLE RESOURCE

The proposed Anahola Solar Project would be constructed entirely within vacant agricultural lands. They do not involve the loss of any significant cultural or natural resources.

7.2.2 CURTAILS BENEFICIAL USES

Construction and operation of the new solar array and substation would not curtail other beneficial uses of the remainder of the parcel. In addition, should the photovoltaic arrays be decommissioned, those 53 acres could be converted back to agriculture. These facilities will not substantially modify any of the existing uses of the unused portion of the parcel.

7.2.3 CONFLICTS WITH LONG-TERM ENVIRONMENTAL POLICIES OR GOALS

The proposed project is consistent with the *County of Kaua'i General Plan* (see Section 6.1.1) and with the State's long-term environmental policies and goals as expressed in Chapter 344, Hawai'i Revised statutes and elsewhere in State law.

7.2.4 SUBSTANTIALLY AFFECTS ECONOMIC OR SOCIAL WELFARE

During the construction phase some short-term employment opportunities will be created and attempts will be made to hire locally. Once constructed, the proposed project will not substantially alter the economic or social welfare of the community, except insofar as they allow KIUC to improve the efficiency of its operations and continue to provide electricity at a low cost, while maintaining or improving environmental quality.

7.2.5 PUBLIC HEALTH EFFECTS

The proposed project will not adversely affect air quality or any water sources used for drinking or recreation. Neither will they generate large amounts of solid waste or produce other emissions that will have a significant adverse effect on public health.

7.2.6 PRODUCE SUBSTANTIAL SECONDARY IMPACTS

The proposed project will not produce significant secondary impacts. They are not designed or intended to foster population growth or promote economic development. Instead, they are intended to support KIUC's current operations.

7.2.7 SUBSTANTIALLY DEGRADE ENVIRONMENTAL QUALITY

The proposed project will not have substantial long-term environmental effects. The work will temporarily elevate noise levels and generate airborne dust during construction, but these impacts will be localized and of limited duration. So long as adequate measures are taken to control the intensity of the construction noise and the release of dust, effects will be minimal.

7.2.8 CUMULATIVE EFFECTS OR COMMITMENT TO A LARGER ACTION

The proposed project is not a commitment to a larger action and is not intended to facilitate substantial population growth in the region. They are part of KIUC's expansion of its renewable energy portfolio and of its regular, ongoing activities as the electrical utility provider for the island of Kaua'i.

7.2.9 EFFECTS ON RARE, THREATENED, OR ENDANGERED SPECIES

No rare, threatened, or endangered species are known to utilize the project sites. The projects will not utilize a resource needed for the protection of rare, threatened, or endangered species.

7.2.10 AFFECTS AIR OR WATER QUALITY OR AMBIENT NOISE LEVELS

Construction and operation of the proposed project will not have a measurable effect on water or air quality (see Sections 5.2.2 and 5.4.2). Noise levels will temporarily increase during construction of the improvements but are not anticipated to affect any noise-sensitive uses, as discussed in Section 5.6.

7.2.11 ENVIRONMENTALLY SENSITIVE AREAS

There are no environmentally sensitive areas or resources near the proposed project. The project site is outside defined flood and tsunami hazard zones. The structures built as part of the project will be constructed consistent with the Hawai'i Uniform Building Code for Earthquake Zone 1.

7.2.12 AFFECTS SCENIC VISTAS AND VIEW PLANES

The proposed project is located along a scenic highway corridor. However, the majority of the facility will be removed from the highway and would be screened by vegetation in a manner consistent with other construction in the area. The construction would be low-lying and would not significantly alter the visual character of the site or significantly change views across it (see Section 5.9).

7.2.13 REQUIRES SUBSTANTIAL ENERGY CONSUMPTION

Construction of the improvements will use some energy, however once operation commences, the structures will be net producers of energy and will require infrequent maintenance.

7.3 ANTICIPATED DETERMINATION

In view of the foregoing, KIUC and DHHL have concluded that the proposed project will not have a significant adverse impact on the environment. Consequently, DHHL anticipates issuing a Finding of No Significant Impact for the proposed project.

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9. CONSULTATION & DISTRIBUTION

9.1 CONSULTATION

The Kauaʻi County Planning Department was consulted during the development of this Draft EA (DEA) in order to determine applicable County zoning designations. Government agencies and the public will also have an opportunity to comment on this *Draft EA*, as discussed in the following section.

9.2 DISTRIBUTION OF THE DRAFT EA

KIUC distributed copies of the *Draft EA* to the parties listed in Table 9.1.

Table 9.1. Draft EA Distribution List

State Agencies	**City and County of Kauaʻi**
Office of Environmental Quality Control (1 HC, 1 CD)	Department of Parks & Recreation
Department of Agriculture	Department of Planning & Permitting (5 copies)
Department of Accounting and General Services	Department of Public Works
Department of Business, Economic Development, and Tourism (DBEDT)	Department of Transportation
DBEDT - Energy Division	Department of Water
DBEDT – Office of Planning	Kauaʻi County Fire Department
Department of Defense	Kauaʻi County Police Department
Department of Education	
Department of Hawaiian Home Lands	
Environmental Planning Office, Department of Health	
Clean Air Branch, Department of Health	
Clean Water Branch, Department of Health	**Elected Officials**
Wastewater Branch, Department of Health	US Senator Brian Schatz
Department of Human Services	US Senator Colleen Hanabusa
Department of Labor and Industrial Relations	US Representative Mazie Hirono
Department of Land and Natural Resources (5 copies)	US Representative Tulsi Gabbard
DLNR Historic Preservation Division (1 HC)	State Senator Ronald D. Kouchi (Dist. 7)
Department of Transportation	State Representative Derek S.K. Kawakami (Dist. 14)
Hawaii Housing Finance and Development Corp.	Mayor Bernard P. Carvalho, Jr.
Office of Hawaiian Affairs	
UH Environmental Center	
Federal Agencies	**Libraries and Depositories**
US Department of the Army, Regulatory Branch	Hawaiʻi State Library Hawaiʻi Documents Center (1 HC)
US Department of Agriculture	
US Fish and Wildlife Service (1 HC)	Kapaʻa Public Library
US Department of the Interior, Geological Survey	Līhuʻe Regional Library
Utility Companies	
Hawaiian Telcom	
The Gas Company	
Oceanic Time Warner Cable	**News Media**
Other	Honolulu Star Advertiser
Anahola Homestead Association	Garden Island

Source: Compiled by Planning Solutions, Inc.

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A. ARCHAEOLOGICAL RECONNAISSANCE SURVEY

T. S. Dye & Colleagues, Archaeologists, Inc.
735 Bishop St., Suite 315, Honolulu, Hawai'i 96813

Archaeological Inventory Survey with Backhoe Trenching near Anahola*

Kamalomalo'o Ahupua'a, Puna District, Kaua'i Island
TMK: (4) 4–7–004:002

Carl E. Sholin Thomas S. Dye

February 14, 2013

Abstract

At the request of Planning Solutions, Inc., T. S. Dye & Colleagues, Archaeologists conducted an archaeological inventory survey for a 60 ac. portion of TMK: (4) 4–7–004:002, located near Anahola, in Kamalomalo'o Ahupua'a, Puna District, Kaua'i Island. The Kaua'i Island Utility Cooperative (KIUC) proposes to install a photovoltaic facility, substation, and service center at this location. The inventory survey was undertaken in support of KIUC's request for financial assistance from the Rural Utilities Service (RUS), pursuant to Section 106 of the National Historic Preservation Act of 1966 (NHPA). The area of potential effect (APE) includes includes the area of the proposed photovoltaic facility, and a substation, service center, access roads, and storage yards. Background research indicated that the APE had been a sugarcane field for many years. The archaeological inventory survey consisted of the excavation and sampling of ten test trenches throughout the APE. Four stratigraphic layers were identified during the inventory survey: two were determined to be related to historic-era agriculture, and two were determined to be deposits of natural terrestrial sediments that developed in situ. No traditional Hawaiian cultural materials were identified during the inventory survey; however, features from use of the area as a sugarcane field, including two historic-era raised agricultural ditches, were identified within the APE. The entire APE has been assigned State site 50–30–08–2160 to identify the sugarcane field features. This site is evaluated as significant for its information content. All pertinent information related to site 50–30–08–2160 has been recorded in this document. Therefore, no further work at the site is recommended. It is further recommended that installation of a photovoltaic facility, substation, and service center be determined to have no adverse effect on historic properties.

*Prepared for Planning Solutions, Inc., Ward Plaza, Suite 330, 210 Ward Avenue, Honolulu, Hawai'i 96814.

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Illustrations

Tables

1 Introduction

At the request of Planning Solutions, Inc., T. S. Dye & Colleagues, Archaeologists conducted an inventory survey of a 60 ac. portion of the subject parcel, TMK: (4) 4–7–004:002, located near Anahola, in Kamalomaloʻo Ahupuaʻa, Puna District, Kauaʻi Island (fig. 1). The Kauaʻi

Island Utility Cooperative is proposing to install a photovoltaic facility, substation, and service center on this property which is owned by the State of Hawai'i, Department of Hawaiian Homelands. KIUC has applied for financial assistance to facilitate the construction and operation of the project to the USDA Rural Utilities Service (RUS), an agency authorized to provide financial assistance for the development of infrastructure in rural America. In accordance with Section 106 of the NHPA, it is the legal responsibility of RUS to take into account effects to historic properties of its actions. Pursuant to 36 CFR §800.3(a), RUS has determined that the proposed project is an undertaking subject to review under Section 106. In accordance with §800.4(a)(1), and on behalf of RUS, KIUC's consultant, Planning Solutions, Inc., requested the completion of this inventory survey by T. S. Dye & Colleagues, Archaeologists to identify potentially affected historic properties. The APE for the project is the entire 60 ac. of land on which the proposed photovoltaic facility, substation, and service center will be built. The archaeological inventory survey consisted of the excavation and recording of ten test trenches throughout the APE.

1.1 Existing Conditions

The APE is located west and *mauka*[1] of Hawai'i State Highway 56, which is also known as Kūhiō Highway. The APE is accessible by a dirt road that intersects Kūhiō Highway. The property is currently utilized as pasture for cattle and horses belonging to local Hawaiian Homestead beneficiaries. An existing barbed wire livestock fence trends northwest to southeast through the APE, bisecting it into east and west halves. Other notable features includes another barbed wire livestock fence that follows a portion of the southern APE, and two raised irrigation ditches that were presumably installed during the period when the APE was used for *sugarcane* cultivation. These recent structural features are visible on current satellite imagery of the APE. At the time of survey, the APE was overgrown with various grasses, shrubs, and introduced trees, including *Christmas berry* and *koa haole*.

1.2 Description of the Proposed Undertaking

The Kaua'i Island Utilities Cooperative is proposing to construct a photovoltaic facility, substation, and service center on the APE. The proposed photovoltaic facility will use a low profile photovoltaic module installation system in which photovoltaic panels are installed on pipe frames that are anchored by 12 in. diameter concrete piers typically 36–60 in. deep. Power generated by the panels is collected at a series of pull boxes and transmitted to a substation near the highway (fig. 2). The substation would occupy a 2 ac. area adjacent to the highway; it would contain transformers, switches, controls, batteries, and other electrical equipment that would allow KIUC to feed power into the existing electrical power lines along Kūhiō Highway. The 5 ac. service center would contain offices, storage areas, and other facilities that would support KIUC operations in this part of the island.

[1]Hawaiian terms are defined in a glossary at the end of this report. See page 34.

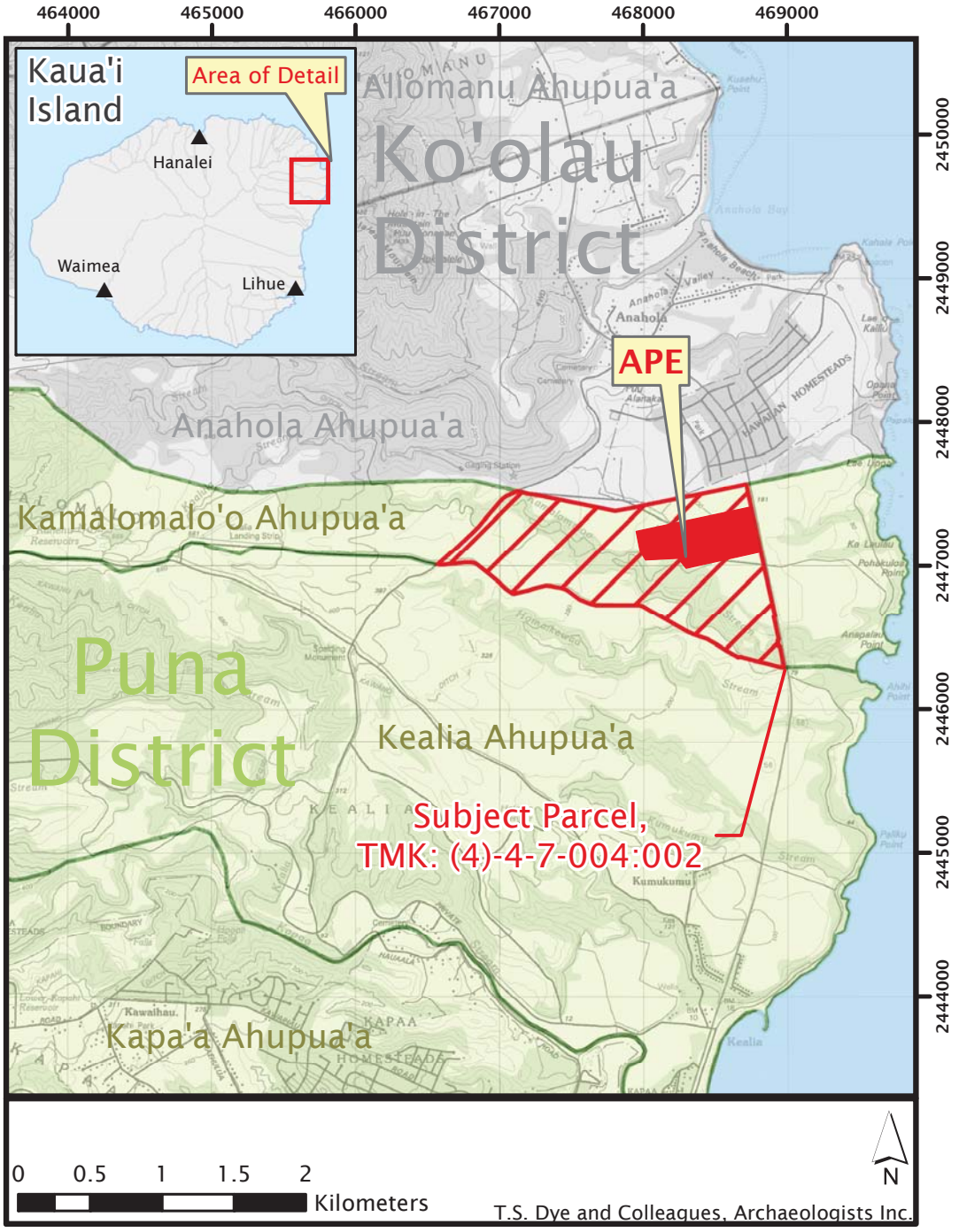

Figure 1: Map of the APE in relation to the subject parcel and the surrounding *ahupua'a*.

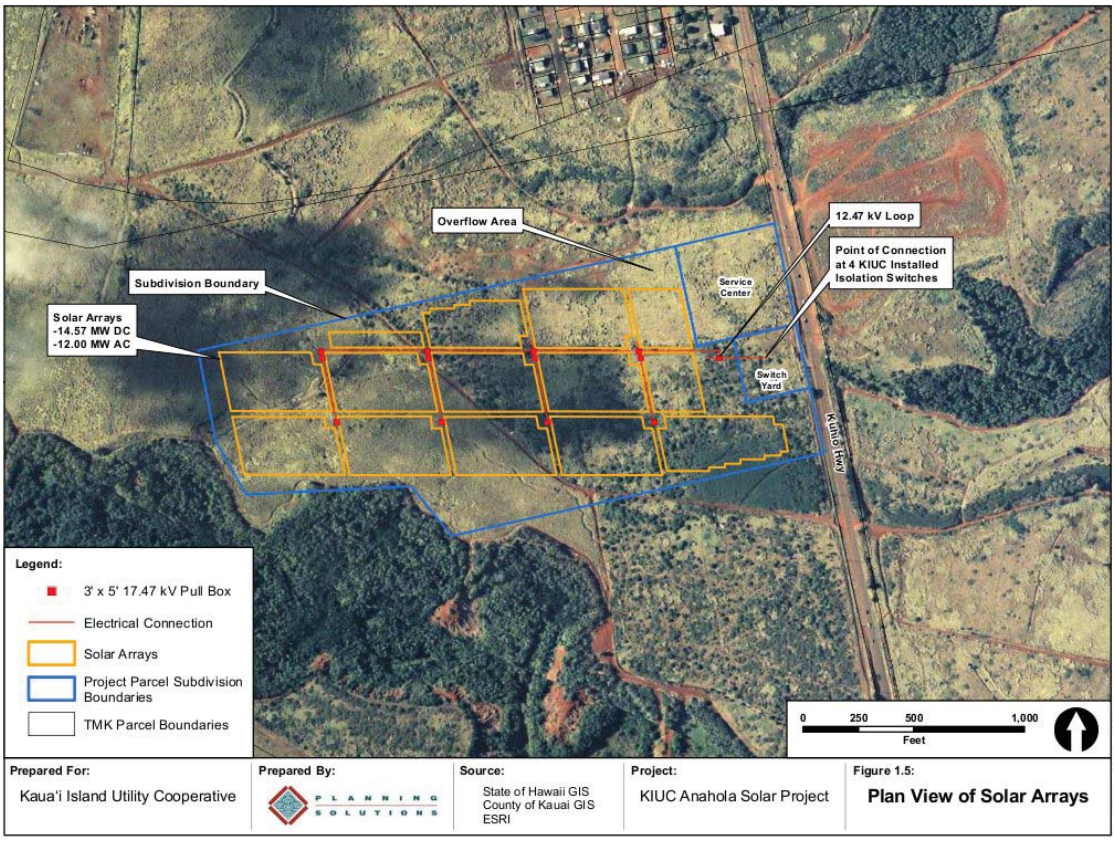

Figure 2: Map of the proposed project on aerial imagery. Image courtesy of Planning Solutions, Inc.

1.3 Report Organization

The remainder of the report is organized into four sections. Section 2 provides an overview of the APE with a focus on land use history. Section 3 describes the field and laboratory methods used during the course of this *project*. Section 4 describes the field observations, including detailed descriptions of all excavations. Finally, Section 5 summarizes the results of the inventory survey with backhoe trenching, evaluates the *significance* of *site* 50–30–08–2160, and makes recommendations on (i) the need for further work, and (ii) a determination of the effect of the proposed project on historic properties.

The report is supported by Appendix A, which lists the archaeological contexts identified during the excavations, and Appendix B, which catalogs the materials collected during the inventory survey and transported to the laboratory for identification and description. In addition, glossaries are provided for technical terms, Hawaiian words, and abbreviations. Technical terms that appear in the glossary are italicized where they first appear in the text.

2 Background

This section presents background information that was used to predict the kinds and distributions of historic properties that may be present at the APE. The information also provides context for understanding and evaluating the significance of historic properties. Documents and materials at the State Historic Preservation Division (SHPD) library, the SHPD geographic information system database, the survey office of the State of Hawai‘i Department of Accounting and General Services, the Hawai‘i State Library, and the library of T. S. Dye & Colleagues, Archaeologists, as well as information provided by Planning Solutions, Inc., were reviewed. Section 2.1 summarizes the natural environment of the APE with specific emphasis on the underlying bedrock and soil deposits. Sections 2.2 and 2.3 summarize the uses of the APE and surrounding lands based on oral traditions and historic documents. Section 2.4 summarizes the findings of archaeological work that has been conducted near the APE.

2.1 Natural Setting

The APE lies at an elevation of ca. 180–360 ft. above sea level. The bedrock deposit at the APEarea is classified as Kōloa volcanic *‘a‘ā* and lesser *pāhoehoe* lava flow (QTkol) [11]. This series is composed of porphyritic and aphyric basanite in which the mineral *olivine* is the only large *phenocryst*. This rock group is relatively young for the island of Kaua‘i, having formed between 1.7–3.85 million years ago during late-stage rejuvenation eruptions [1].

The soil underlying the APE is Lihue silty *clay*, 0 to 8 percent slopes (LhB). This series is described as deep, well-drained soils that formed in material weathered from basic igneous rock and influenced by tropospheric dust.[2] The APE area receives 40–60 in. of rainfall annually [5].

2.2 Traditional and Early Historic Land Use

The APE is located in the *ahupua‘a* of Kamalomalo‘o in the district of Puna on the northeast coast of Kaua‘i Island (see fig. 1). The names of Ko‘olau and Puna Districts are likely to be relatively recent; portions of these two districts are also discussed as belonging to Kawaihau District [10]. Kamalomalo‘o is translated as “the dry loincloth.” It is said to be named thus because of an ancient practice:

> In olden days, when an *ali‘i* came ashore from a canoe voyage or surfing, his bodyguards threw their spears at him. It was a mark of chiefly strength that he could dodge or catch every spear. After this, he was ceremoniously given a dry *malo* (a piece of tapa . . . , the principal clothing for men). [13]

Kamalomalo‘o Ahupua‘a is just south of Anahola Ahupua‘a, and is the northernmost *ahupua‘a* in Puna District. Anahola is named “after a *mo‘o*, a lizard *kupua* that appeared on land as a man and in the sea as a merman” [13].

A *heiau* that once existed in Kamalomalo‘o is described thus:

[2] USDA Web Soil Survey, `http://websoilsurvey.nrcs.usda.gov`.

> Māhu-nā-puʻu-one, "vapor that rises from the sand dunes," was a *heiau* where humans were sacrificed. It was built in the late 1600s by Kawelomahamahaiʻa to celebrate the birth of his twin grandsons who were owners of the dreaded *kapu moe* (prostration taboo). [13:87]

Handy and Handy [6:423] provide the following descriptions of Anahola, Kamalomaloʻo, and Keālia.

> The last *ahupuaʻa* on this, the *koʻolau* (east and northeast) coast, is Anahola. Here is the largest river in Koʻolau District. There are old abandoned terraces along its banks far upstream. There are old *loʻi* from two to four miles inland along Anahola River and its tributary Kaʻalua Stream, and below their point of juncture there are many *loʻi* on flats along the river banks as it meanders through its wide gulch. The delta is three-fourths mile wide, and this was all terraced...
>
> Two small *ahupuaʻa*, Kamalomaloʻo (Dry Kamalo) and Kealia are rather dry, with small streams and gulches and only a few *loʻi* areas. Where Kealia and Kapaʻa Streams join inland there are wide flats that were terraced. Seaward there were formerly many terraced areas. There are clumps of coconut and mango trees where formerly were *kuleana* with their *loʻi*. Inland there were a number of small streams which doubtless once had small *loʻi* developments.

Numerous Land Commission Awards (LCA) were granted during the *Māhele* in the neighboring *ahupuaʻa* of Anahola, which for the most part are clustered around the Anahola River and near the coast. There were no claims in Kamalomaloʻo.

2.3 Historic Land Use: Sugarcane

Several factors contributed to the growth of the sugarcane industry in Hawaiʻi. First, the steamships travelling between the United States of America and the Hawaiian Kingdom provided rapid transportation. Second, the *Māhele* of 1848 allowed foreigners to purchase and own land. Third, the American Civil War had increased demand for sugar. Lastly, the Reciprocity Treaty of 1875 allowed Hawaiian sugar to be sold in the US free of taxes. These things combined created a big buzz around sugar and the money to be made from it.

Kauaʻi is known affectionately as the Garden Isle. This name is owed to the abundant rainfall that the island receives, which keeps it lush and green. The Waiʻaleʻale Mountain Range reaches an elevation of 5,080 ft. and has a mean annual rainfall of 476 in.[3] *Waiʻaleʻale* is translated as "rippling water" or "overflowing water" [10]. The runoff provides plentiful water for irrigation, making Kauaʻi an attractive place for sugarcane cultivation.

[3] In recent years, however, Mount Waiʻaleʻale's running 30-year average annual rainfall total has been decreasing almost steadily, from 406 inches in 1997 to just below 384 inches in 2010. For more information, see the National Oceanic and Atmospheric Administration's National Weather Service website, `http://www.weather.gov/`.

The history of commercial sugarcane agriculture on Kaua‘i began in 1835 with the establishment of Koloa Plantation in southern Kaua‘i. Koloa Plantation is known as Hawai‘i’s first sugar plantation [14:76]. In east Kaua‘i, Lihue Plantation, founded in 1849 and the second-oldest sugar plantation in Hawai‘i, transformed much of the land into sugarcane fields and created the water irrigation system that supported those fields [14:68]. The ditch system was so effective that “[b]y 1931, some 79 percent of the 6712 acres of Lihue Plantation’s cane land was irrigated by gravity flow [and] average water production was 82 mgd [million gallons per day]” [14:73]. Also, a system of railroad tracks helped transport the cane to the mill. On a tax map dated November 1936, railroad tracks are shown running through the subject parcel. These are probably associated with the sugar industry.

The APE is shown within Fields 13 and 14 on a 1926 field map of Makee Sugar Company (fig. 3). Capt. James Makee founded Makee Sugar Co. in 1877. Makee founded the company with several others, including King Kalākaua, who owned a quarter interest. Lihue Plantation Co. absorbed Makee Sugar Co. in 1933.

> By the time Lihue Plantation acquired Makee, it had 7200 acres in cane with another 2200 acres planted by independent planters, primarily homesteaders. It had a well-developed water collection and delivery system, too, which delivered an average of some 30 mgd [million gallons per day] and included Anahola, Kaneha and Kapaa ditches. [14:73]

Lihue Plantation Co. eventually became part of Amfac, and Amfac Sugar Kauai remained in operation until 2000. At some point in the relatively recent past the APE fell out of use for commercial sugar. It is currently being used for pasture lands.

2.4 Archaeological Background

There are no known archaeological studies for the subject parcel. However, studies have been conducted of nearby areas, in Kumukumu and Keālia, just south of Kamalomalo‘o. Sugarcane cultivation is known to have occurred in these areas as well.

In 2006, Scientific Consultant Services, Inc. (SCS) conducted an archaeological inventory survey of a 2,008 ac. parcel located in Kumukumu and Keālia Ahupua‘a, which are the two *ahupua‘a* south of Kamalomalo‘o. The parcel is located at a distance from the coast similar to that of the APE, and thus it contains similar environments. The SCS project was divided into four phases (fig. 4).[4]

Phase II The Phase II portion totaled 670 ac. and consisted of a portion lying in Kumukumu and another portion lying in Keālia. Thirty new sites were identified in this phase. There was a total of 82 features: 27 associated with the plantation era, 3 *pre-contact* features associated with native Hawaiian habitation and/or agriculture, 5 pre-contact features with use continuing into the historic period, and 47 associated with the historic period. All 30 of the plantation era and pre-contact sites have been

[4]Reports for Phases II through IV were found at the SHPD library in Kapolei. However, a Phase I report could not be located.

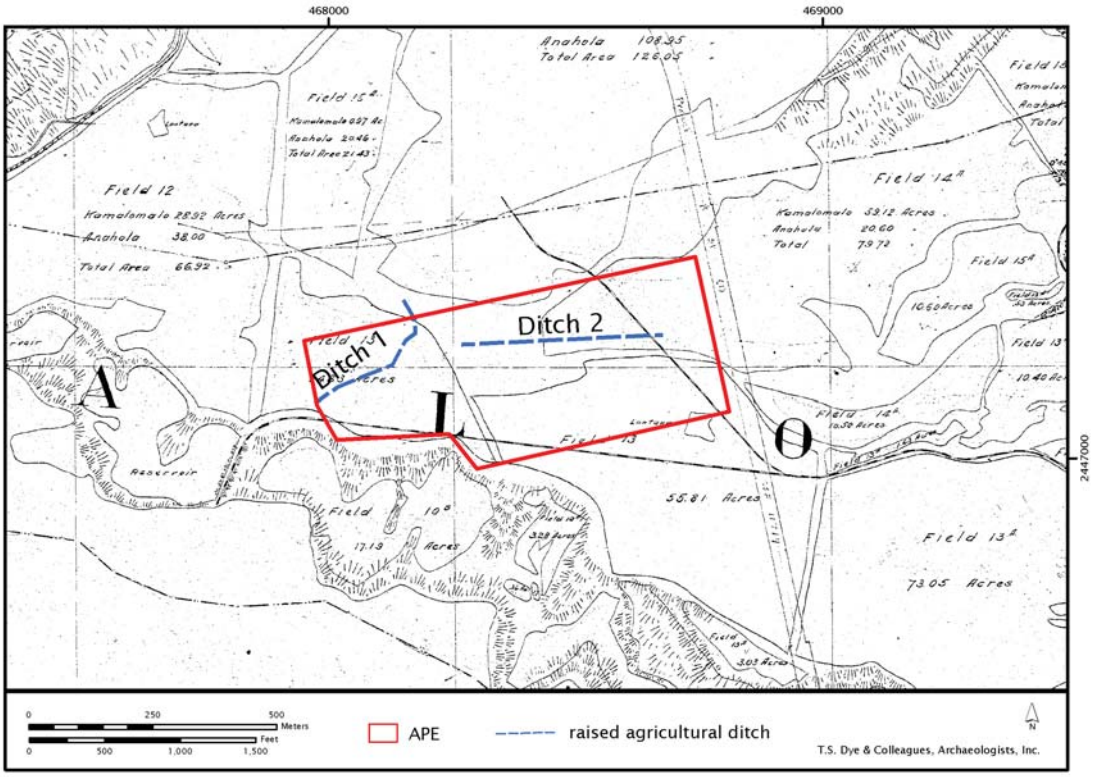

Figure 3: Map of Makee Sugar Co. Fields 13 and 14 on a portion of Registered Map 2282, "Anahola–Kamalomalo, Kauai," 1904. The map shows the same field numbers as a 1926 field map of Makee Sugar Company. Note the railroad tracks shown coming in from the east and forking, with one track running from the southeast corner of the APE going northwest, and the other track running through the southwestern portion of the APE. The symbols for the raised irrigation ditches don't line up precisely with their representation on the old map; this is due to the inherent problems of geo-registering old maps.

assessed as significant under Criterion D. Two of these sites, sites 50–30–08–3959 and 3960, are also significant under Criterion E because of the identification of human remains at the sites.[5] A feature of site 50–30–08–7027, a railroad bridge with earthen berm, is recommended for preservation because it represents a uniquely constructed sugar plantation *stone* and mortar railroad bridge. Data recovery is

[5]This previous archaeological work was performed under the authority of Section 6E of the Hawai'i Administrative Rules (§13-275-6) which states that historic properties assessed as significant under Criterion E 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 hisotry and cultural identity.

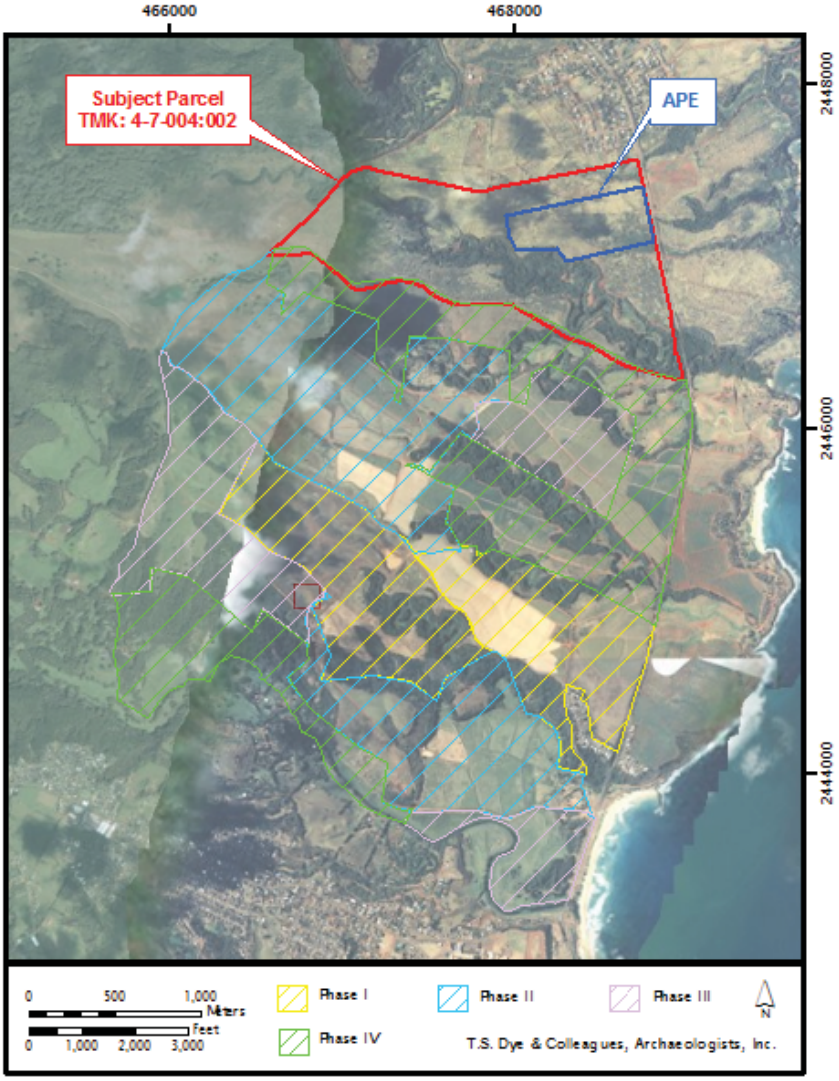

Figure 4: Areas of previous archaeological inventory surveys conducted by Scientific Consultant Services, Inc. in Kumukumu and Keālia [2–4]. The 2,008 ac. parcel was divided into four phases.

recommended for site 50-30-08-3959, a pre-contact/historic habitation site. Also, it is recommended that a burial treatment plan be written for sites 3959 and 3960. All other sites require no further work [2].

Phase III The Phase III portion covered 386 ac., which consisted of one section in Kumukumu and two sections in Keālia. Nineteen new sites were identified with a total of 93 features. Thirteen features are associated with the plantation era; 2 features are interpreted as historic; 63 are associated with the historic and/or

plantation era; 11 are historic/plantation era in origin and have continued use in modern times; 4 appear to be part of a burial site associated with traditional Hawaiian habitation and/or agriculture. All 19 sites are assessed as significant under Criterion D. Sites 50–30–08–7028 and 7040 are also significant under Criterion E because human remains were identified at those sites. Site 50–30–08–7043, the Spalding Monument—a memorial for the former Makee Sugar Company owner, Col. Zephaniah Swift Spalding—is also significant under Criterion B. Preservation and data recovery is recommended for site 50–30–08–7028, an historic cemetery. Sites 50–30–08–7040 and 7043 are recommended for preservation. All other sites require no further work [4].

Phase IV The Phase IV portion consisted of 562 ac., with a section in Kumukumu that neighbors the project parcel, lying just south of it, and a second section in the southern portion of Keālia. Thirty-seven new sites were identified, composed of a total of 66 features. Thirty-six features are associated with the plantation era; 22 are associated with the historic era; 5 are interpreted as historic and/or plantation era features; 11 are of the historic/plantation era and have continued use in modern times; 2 are pre-contact and/or historic, associated with traditional Hawaiian habitation and/or agriculture. All of the sites are significant under Criterion D. Site 50–30–08–1120, feature 2, an historic *petroglyph*, and site 50–30–08–1136, a traditional petroglyph, are recommended for preservation. All other sites require no further work [3].

The nearest documented burial was discovered at Donkey Beach, which lies about 1.2 mi. southeast of the APE. A burial there was inadvertently exposed in 1992 [8]. The orientation of the bones indicated it was a primary burial. Because the burial was vulnerable to beach erosion, it was excavated and brought the Office of Hawaiian Affairs (OHA) Kauaʻi branch.

In 1999, an archaeological inventory survey was conducted by Perzinski et al. [9] of a 300 ac. parcel in Keālia, which lies just southeast of the subject parcel. Three sites were identified. Site 50–30–08–789 is a complex of plantation-era features. Site 50–30–08–790 is a complex of World War II–era features. Site 50–30–08–1899 consists of burials at the south end of Donkey Beach which are likely prehistoric and/or early historic native Hawaiian in origin. All three sites were assessed as significant under Criterion D. Site 1899 is also significant under Criterion E because of the presence of burials. No further work is recommended for sites 789 and 790. Site 1899 is recommended to be preserved in place. As was anticipated, a majority of the features were remnants of the plantation era because use of the area for commercial sugarcane cultivation had significant impact on the land. There were no feature remnants that predate plantation-era use. The burials at Donkey Beach, however, potentially predate the plantation era.

In 1983, the Hawaii State DLNR commissioned a survey of all of the significant agricultural ditches in the state[14]. This survey distinguished between water collection ditches, which served to divert water from their source, and water distribution ditches, which distributed the diverted water to local agricultural fields. The water collection ditches were the more substantial, since they involved complicated feats of civil engineering. The closest collection ditches, Anahola, Kaneha, and Kapaʻa ditches, were all associated with Makee Sugar Company which was later acquired by Lihue Plantation. These ditches are

likely to have been constructed at some time between 1880–1900. The closest collection ditch to the APE was Anahola ditch, which was located approximately 0.4 km west of the APE.

3 Methods

The backhoe test trenching for the archaeological inventory survey was conducted by archaeologists Thomas S. Dye and Carl E. Sholin on February 1–3, 2012. Additional photograph recording of the raised agricultural ditch features of site 50–30–08–2160 was conducted by Sholin and Nathan Divito on February 7, 2013. The archaeological inventory survey consisted of the backhoe excavation and systematic description of ten test trenches placed throughout the APE to determine if subsurface historic properties were present. All archaeological field recording, sampling, and laboratory methods described below are standard operating procedures of T. S. Dye & Colleagues, Archaeologists designed to report the observational basis of statements made in the report.

An effort was made to position the test trenches throughout the APE in order to have a broad coverage of the APE. In some portions of the APE dense vegetation, the livestock fences, and the raised agricultural ditches limited access. There is no reason to expect that subsurface historic properties are spatially associated with these modern conditions. Thus, It is unlikely that these limitations affected the outcome of the investigation. The position of each of the trenches was recorded using differentially corrected GPS; ninety-five percent of the recorded positions were accurate to a meter's resolution. A log of GPS point files was kept in the archaeologists' field notebook and approximate locations were additionally recorded on a paper map of the APE.

All trenches were excavated by backhoe. Backhoe trenches were 4.2–7 m in length, 0.7–1.15 m in width, and 125–240 cm below ground surface in depth. The maximum depth of a trench was determined by the identification of what soil scientists term the *C horizon*. The *C* horizon is the region of a soil profile in which the local bedrock material deteriorates into its mineral components. In this investigation, the *C* horizon is referred to as *Context* 3. Context 3 was identified by examining the soil *ped*s to see if they retained the texture of the parent rock instead of the texture of unconsolidated sediment (fig. 5). Excavation to this depth ensured that no buried ground surfaces would be present below the base of excavation.

Stratigraphic information was recorded using the method described by Harris [7]. Layers of material were assigned a *unit of stratification number*, referred to here as a context. An inventory of all recorded stratigraphic contexts was recorded in the archaeologists' field notebook and is presented in Appendix A. Representative profiles were recorded for exposures in all trenches. Recorded profiles reference the contexts that were exposed, and describe these deposits with the standardized terminology used by the US Soil Conservation Service [12].

Digital photographs were recorded for all trenches. The archaeologists recorded images of the trench location in relation to the horizon and Kalalea Mountain. Detail photographs of the trench exposures were also collected. A photograph log was kept in the archae-

Figure 5: Detail photograph of deteriorating bedrock from Context 3, showing mineral phenocrysts and vesicles in groundmass. This piece is from Trench 8. It is likely to have been a piece of the Kōloa series basanite, and the remaining mineral phenocrysts are likely to have once been olivine. The tip of a mechanical pencil is included for scale.

ologists' field notebook; it contained descriptions of each image including location and orientation. Several of these field images are presented in this report; the remainder of the photographs are archived at the facilities of T. S. Dye & Colleagues, Archaeologists.

Soil samples were collected for all exposed stratigraphic contexts in each trench. Sediment samples were placed in plastic bags for transport to the laboratory. Each bag was identified with a unique number. A bag list with provenience information, including trench and context, was recorded in the archaeologists' field notebook. This bag list would ensure that all collections could be unambiguously identified. This bag list is presented in Appendix B.

Stratigraphic profiles, photographs, and the APE maps were analyzed in the laboratory to develop a depositional *chronology* for the APE. The general patterns of deposition were synthesized into a relative chronological model consisting of three *phase*s of deposition at the APE. This model is discussed in detail in section 5. The phases are: 1) naturally deposited and *in situ* weathered material; 2) historic plow zone material; and 3) modern surface material.

All identified stratigraphic contexts were classified according to this model. Phase 1 was characterized as all material that was naturally deposited or weathered in situ from the parent material and showed no signs of human alteration of the deposit. Phase 2 was characterized as mineral soil that had been reworked by the plowshare during historic sugarcane agriculture, or moved into place by heavy machinery during sugarcane field preparation. Phase 3 was characterized as surface material consisting of plowed material that has been further reworked by livestock, modern vehicles, and vegetation. The phases are identified in stratigraphic profiles and included in Appendix A.

4 Inventory Survey Results

This section reports the results of the inventory survey. It includes descriptions of the individual test trenches and the historic-era raised agricultural ditches identified

at the surface. These ditches and the associated agricultural fields are assigned to site 50-30-08-2160.

4.1 Test Trenches

Ten test trenches were excavated throughout the APE (fig. 6). Trenches 1–3 and 5–10 revealed similar profiles consisting of three typical strata. Phase 3, Context 1 surface material overlay Phase 2 agricultural mineral soil (fig. 7). Following the procedure outlined by Harris [7], the Phase 2 agricultural mineral soil in each trench was assigned to a separate context. Contexts 2, 4, 5, 6, 8, 9, 10, 11, 12, and 13 were assigned to Phase 2 deposits. The Phase 2 deposits overlay the Phase 1, Context 3 layer of deteriorating bedrock. Only Trench 4 diverged from the normal depositional pattern; here Phase 3, Context 1 surface material overlay Phase 2, Context 6 agricultural mineral soil, which overlay a Phase 1, Context 7 *paleosol*. All test trenches are described in detail below.

4.1.1 Trench 1

Trench 1 was located in the northeast portion of the APE, near a yellow gate that provides access from Kūhiō Highway (see figs. 6, 8). It was 4.2 m long, oriented east–west, 0.70 m

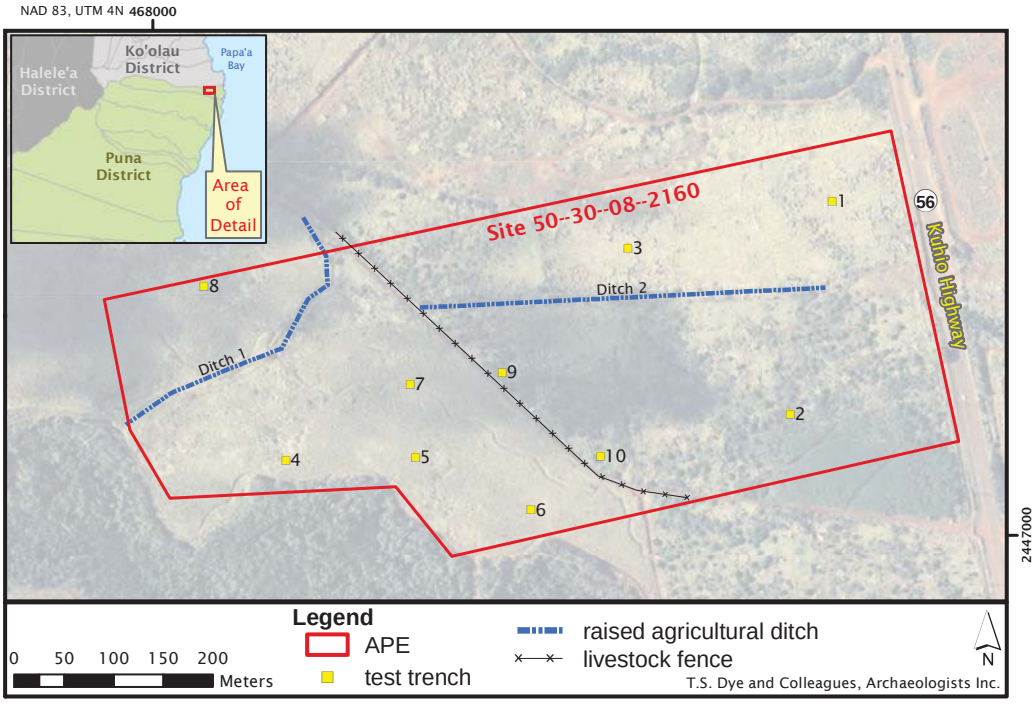

Figure 6: Map of the test trench locations in relation to the APE and the raised agricultural ditches. Features are overlaid on an aerial image accessed via ESRI World Imagery.

Figure 7: Photograph of the typical profile at Trench 9, looking southeast, showing Context 1 surface material overlying Context 12 mineral soil which grades into Context 3 decaying bedrock. The scale is in ten centimeter increments.

wide, and reached a maximum depth of 136 cm below ground surface. Phase 3, Context 1 dark reddish brown surface material was present 0–35 cm below ground surface (see fig. 9; table 1). Context 1 overlay Phase 2, Context 2 dark reddish brown agricultural mineral soil which was present 35–127 cm below ground surface. Context 2 overlay Phase 1, Context 3 black deteriorating volcanic bedrock which was present 127–136 cm below ground surface, the base of excavation. No cultural materials were identified at Trench 1.

Figure 8: Photograph of the backhoe excavation of Trench 1, looking northwest. Kalalea Mountain is in the background.

4.1.2 Trench 2

Trench 2 was located in the southeast portion of the APE near Kūhiō Highway, southwest of Trench 1 and a raised agricultural ditch (see figs. 6, 10). Trench 2 was 4.2 m long, oriented east–west, 0.7 m wide, and reached a maximum depth of 150 cm below ground surface. Phase 3, Context 1 dark reddish brown surface material was present 0–51 cm below ground surface (fig. 9; table 2). Context 1 overlay Phase 2, Context 4 dark reddish brown agricultural mineral soil which was present 51–127 cm below ground surface. Context 4 overlay Phase 1, Context 3 reddish brown deteriorating volcanic bedrock which

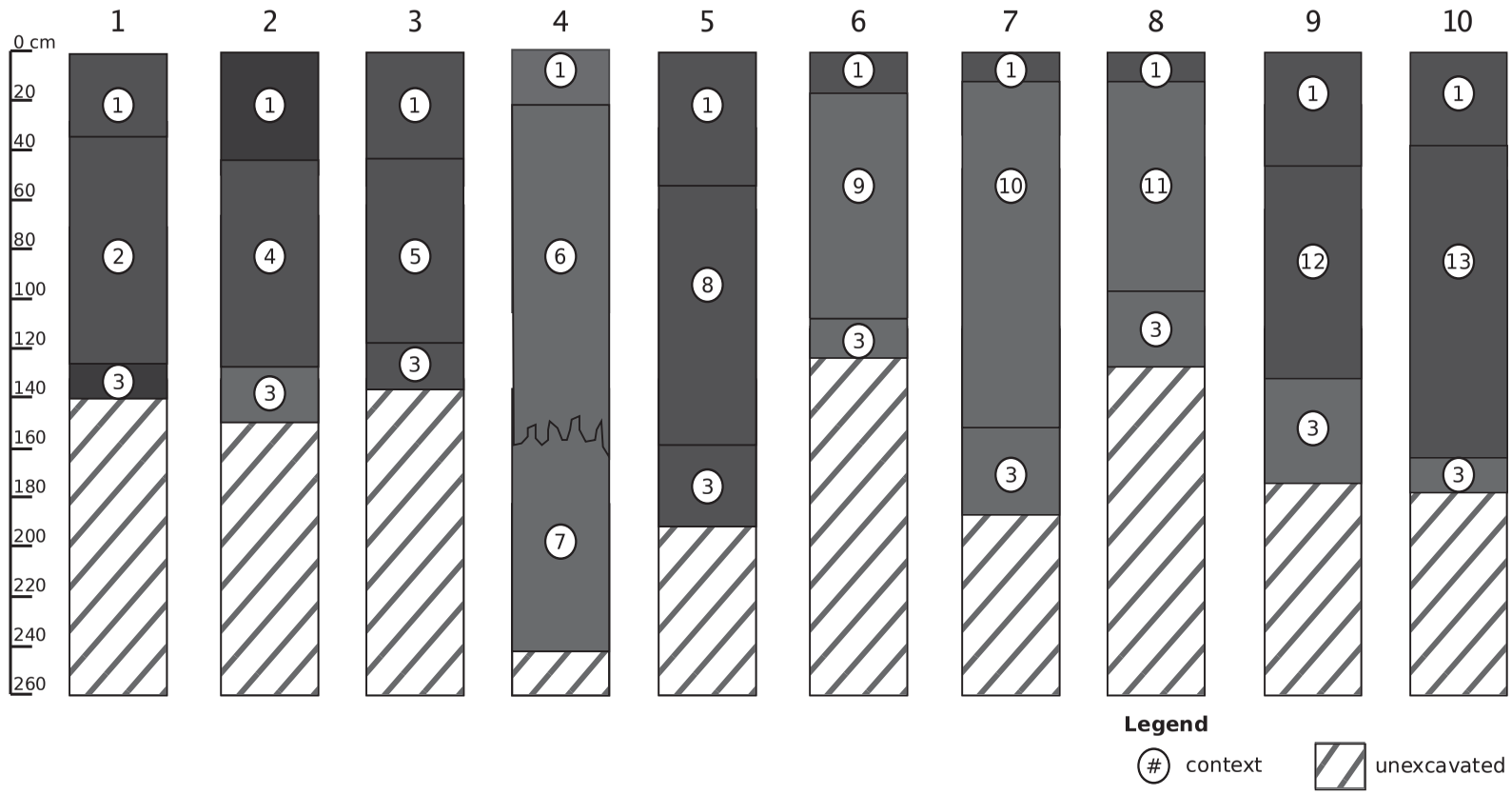

Figure 9: Representative stratigraphic profile drawings for Trenches 1–10. The trench numbers are above each profile drawing.

Table 1: Sediment descriptions for Trench 1

Context	Phase	Depth*	Description	Interpretation
1	3	0–35	Dark reddish brown (5YR 3/3) terrestrial silty clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
2	2	35–127	Dark reddish brown (5YR 3/3) terrestrial clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
3	1	127–136+	Black (5YR 2.5/1) terrestrial clay loam; very sticky, moderately plastic; base of excavation	Natural deposition process

*Depth in cm below surface.

was present 127–150 cm below ground surface, the base of the excavation. No cultural materials were identified at Trench 2.

Figure 10: Photograph of the area in which Trench 2 was excavated, looking northwest. Kalalea Mountain is in the background.

4.1.3 Trench 3

Trench 3 was located in the north-central portion of the APE, north of a raised agricultural ditch (see figs. 6, 11). Trench 3 was 4.9 m long, oriented north–south, 0.7 m wide, and reached a maximum depth of 138 cm below ground surface. Phase 3, Context 1 dark reddish brown surface material was present 0–54 cm below ground surface. Context 1 overlay Phase 2, Context 5 dark reddish brown agricultural mineral soil, which was present 54–119 cm below ground surface. Context 5 overlay Phase 1, Context 3 dark reddish brown deteriorating volcanic bedrock which was present 119–138 cm below ground surface (see fig. 9; table 3). No cultural materials were identified at Trench 3.

Table 2: Sediment descriptions for Trench 2

Context	Phase	Depth*	Description	Interpretation
1	3	0–51	Dark reddish brown (5YR 2.5/2) terrestrial silty clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
4	2	51–127	Dark reddish brown (5YR 3/3) terrestrial clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
3	1	127–150+	Reddish brown (5YR 4/4) terrestrial clay loam; very sticky, moderately plastic; base of excavation	Natural deposition process

*Depth in cm below surface.

Figure 11: Photograph of the backhoe excavation of Trench 3, looking northwest. Kalalea Mountain is in the background.

Table 3: Sediment descriptions for Trench 3

Context	Phase	Depth*	Description	Interpretation
1	3	0–54	Dark reddish brown (5YR 3/2) terrestrial silty clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
5	2	54–119	Dark reddish brown (5YR 3/3) terrestrial clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
3	1	119–138+	Dark reddish brown (5YR 3/3) terrestrial clay loam; very sticky, moderately plastic; base of excavation	Natural deposition process

*Depth in cm below surface.

4.1.4 Trench 4

Trench 4 was the southwesternmost test trench excavated, located near the tree line that defined a portion of the southern boundary of the APE (see figs. 6, 12). It was located near

a slope that led into an adjacent stream drainage south of the APE. Trench 4 was 4.9 m long, oriented east–west, 0.7 m wide, and reached a maximum depth of 240 cm below ground surface. Phase 3, Context 1 dark reddish brown surface material was present 0–23 cm below ground surface (see fig. 9; table 4). Context 1 overlay Phase 2, Context 6 agricultural mineral soil containing several small to medium volcanic boulders which was present 23–162 cm below ground surface. Context 6 overlay a Phase 1, Context 7 brown paleosol with few to common rootlets. No cultural materials were identified at Trench 4.

Figure 12: Photograph of Trench 4, looking northwest. Kalalea Mountain is framed below the boom arm of the backhoe.

Table 4: Sediment descriptions for Trench 4

Context	Phase	Depth*	Description	Interpretation
1	3	0–23	Dark reddish brown (5YR 2.5/2) terrestrial silty clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
6	2	23–162	Reddish brown (5YR 4/4) terrestrial clay loam; very sticky, moderately plastic; diffuse, irregular lower boundary	Fill material deposition event
7	1	162–240+	Brown (7.5YR 4/3) terrestrial clay loam; very sticky, moderately plastic; base of excavation	Natural deposition process

*Depth in cm below surface.

4.1.5 Trench 5

Trench 5 was located in the southwest portion of the APE, east of Trench 4 and near the tree line which defines the southern boundary of the APE (see figs. 6, 13). Trench 5 was 5.2 m long, oriented east–west, 0.7 m wide, and reached a maximum depth of 190 cm below ground surface. Phase 3, Context 1 dark reddish brown surface material was present 0–33 cm below ground surface (see fig. 9; table 5). Context 1 overlay Phase 2, Context 8

dark reddish brown agricultural mineral soil which was present 33–158 cm below ground surface. Context 8 overlay Phase 1, Context 3 dark reddish brown deteriorating volcanic bedrock. No cultural materials were identified at Trench 5.

Figure 13: Photograph of the backhoe excavation of Trench 5, looking northwest. Kalalea Mountain is in the background.

Table 5: Sediment descriptions for Trench 5

Context	Phase	Depth*	Description	Interpretation
1	3	0–33	Dark reddish brown (5YR 3/2) terrestrial silty clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
8	2	33–158	Dark reddish brown (5YR 3/3) terrestrial clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
3	1	158–190+	Dark reddish brown (5YR 3/3) terrestrial clay loam; very sticky, moderately plastic; base of excavation	Natural deposition process

*Depth in cm below surface.

4.1.6 Trench 6

Trench 6 was located in the south-central portion of the APE, southeast of Trench 5 and southwest of a barbed wire livestock fence (see figs. 6, 14). Trench 6 was 4.9 m long, oriented east–west, 0.7 m wide, and reached a maximum depth of 125 cm below ground surface. Phase 3, Context 1 dark reddish brown surface material was present 0–9 cm below ground surface (see fig. 9; table 6). Context 1 overlay Phase 2, Context 9 reddish brown agricultural mineral soil present 9–110 cm below ground surface. Context 9 overlay Phase 1, Context 3 reddish brown deteriorating volcanic bedrock. No cultural materials were identified at Trench 6.

Figure 14: Photograph of the backhoe excavation of Trench 6, looking northwest. Kalalea Mountain is in the background.

Table 6: Sediment descriptions for Trench 6

Context	Phase	Depth*	Description	Interpretation
1	3	0–9	Dark reddish brown (5YR 3/3) terrestrial silty clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
9	2	9–110	Reddish brown (5YR 4/3) terrestrial clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
3	1	110–125+	Reddish brown (5YR 4/4) terrestrial clay loam; very sticky, moderately plastic; base of excavation	Natural deposition process

*Depth in cm below surface.

4.1.7 Trench 7

Trench 7 was located in the central portion of the APE, west of a barbed wire livestock fence and north of Trench 5 (see figs. 6, 15). Trench 7 was 5.6 m long, oriented northwest–southeast, 0.7 m wide, and reached a maximum depth of 185 cm below ground surface. Phase 3, Context 1 dark reddish brown surface material was present 0–34 cm below ground surface (see fig. 9; table 7). Context 1 overlay Phase 2, Context 10 reddish brown agricultural mineral soil, which was present 34–152 cm below ground surface. Context 10 overlay Phase 1, Context 3 brown deteriorating volcanic bedrock, which was present 152–185 cm below ground surface, the base of excavation. No cultural materials were identified at Trench 7.

4.1.8 Trench 8

Trench 8 was the northwesternmost trench, located just south of the northern boundary of the APE, northwest of a raised agricultural ditch (see figs. 6, 16). Trench 8 was 4.9 m long, oriented east–west, 0.7 m wide, and reached a maximum depth of 126 cm below ground surface. Phase 3, Context 1 dark reddish brown surface material was present 0–28 cm below ground surface (see fig. 9; table 8). Context 1 overlay Phase 2, Context

Figure 15: Photograph of the backhoe excavation of Trench 7, looking northwest. Kalalea Mountain is in the background.

Table 7: Sediment descriptions for Trench 7

Context	Phase	Depth*	Description	Interpretation
1	3	0–34	Dark reddish brown (5YR 3/2) terrestrial silty clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
10	2	34–152	Reddish brown (5YR 4/4) terrestrial clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
3	1	152–185+	Brown (7.5YR 4/3) terrestrial clay loam; very sticky, moderately plastic; base of excavation	Natural deposition process

*Depth in cm below surface.

11 yellowish red agricultural mineral soil, which was present 28–96 cm below ground surface. Context 11 overlay Phase 1, Context 3 yellowish red deteriorating volcanic bedrock, which was present 96–126 cm below ground surface, the base of excavation. No cultural materials were identified at Trench 8.

Figure 16: Photograph of the backhoe excavation of Trench 8, looking northwest. Kalalea Mountain is in the background.

Table 8: Sediment descriptions for Trench 8

Context	Phase	Depth*	Description	Interpretation
1	3	0–28	Dark reddish brown (5YR 3/3) terrestrial silty clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
11	2	28–96	Yellowish red (5YR 4/6) terrestrial clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
3	1	96–126+	Yellowish red (5YR 4/6) terrestrial clay loam; very sticky, moderately plastic; base of excavation	Natural deposition process

*Depth in cm below surface.

4.1.9 Trench 9

Trench 9 was located in the central portion of the APE, south of a raised agricultural ditch, and east of Trench 7 and a barbed wire livestock fence (see figs. 6, 17). Trench 9 was 7 m long, oriented northeast–southwest, 1.5 m wide, and reached a maximum depth of 175 cm below ground surface. Phase 3, Context 1 very dark gray surface material was present 0–45 cm below ground surface (see fig. 9; table 9). Context 1 overlay Phase 2, Context 12 dark reddish brown agricultural mineral soil, which was present 45–132 cm below ground surface. Context 12 overlay Phase 1, Context 3 reddish brown deteriorating volcanic bedrock, which was present 132–175 cm below ground surface, the base of excavation. No cultural materials were identified at Trench 9.

Figure 17: Photograph of Trench 9, looking northwest toward Kalalea Mountain. Trench 9 is in the foreground, and Kalalea Mountain is obscured by *koa haole* and other vegetation in the background.

Table 9: Sediment descriptions for Trench 9

Context	Phase	Depth*	Description	Interpretation
1	3	0–45	Very dark gray (5YR 3/1) terrestrial silty clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
12	2	45–132	Dark reddish brown (5YR 3/2) terrestrial clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
3	1	132–175+	Reddish brown (5YR 4/4) terrestrial clay loam; very sticky, moderately plastic; base of excavation	Natural deposition process

*Depth in cm below surface.

4.1.10 Trench 10

Trench 10 was located in the south-central portion of the APE, east of Trench 6 and a barbed wire livestock fence (see figs. 6, 18). Trench 10 was 7 m long, oriented northeast–southwest, 1.15 m wide, and reached a maximum depth of 175 cm below ground surface. Phase 3, Context 1 dark reddish brown surface material was present 0–38 cm below ground surface (see fig. 9; table 10). Context 1 overlay Phase 2, Context 13 dark reddish brown agricultural mineral soil, which was present 38–164 cm below ground surface. Context 13 overlay Phase 1, Context 3 brown deteriorating volcanic bedrock. No cultural materials were identified at Trench 10.

Figure 18: Photograph of the backhoe excavation of Trench 10, looking northwest. The northeast wall of Trench 10 is in the foreground, below the bar scale. Kalalea Mountain is in the background. The scale is in ten centimeter increments.

4.2 Site 50-30-08-2160

Site 50-30-08-2160 was assigned to extant features of the sugarcane field within the APE (fig. 19). This includes the areas of the sugarcane fields and two historic-era raised

Table 10: Sediment descriptions for Trench 10

Context	Phase	Depth*	Description	Interpretation
1	3	0–38	Dark reddish brown (5YR 3/2) terrestrial silty clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
13	2	38–164	Dark reddish brown (5YR 3/3) terrestrial clay loam; very sticky, moderately plastic; diffuse, smooth lower boundary	Secondary deposition process
3	1	164–179+	Brown (7.5YR 4/4) terrestrial clay loam; very sticky, moderately plastic; base of excavation	Natural deposition process

*Depth in cm below surface.

agricultural ditches that were observed within the APE, Ditch 1 and Ditch 2 (see fig. 6, p. 15). Both of the raised agricultural ditches were distribution ditches, and were marked by earthen linear mound embankments on either side of a canal (see sec. 2.4, p. 9).

Ditch 1 is located west of the livestock fence bisecting the APE. It was irregular; however, it generally trended from northeast to southwest. The ditch was composed of two parallel earthen linear mound embankments, each approximately 1.5 m wide, on either side of a canal which was approximately 1.5–2 m wide by 1.2 m deep (fig. 20). The entire raised ditch assembly was between 5 and 6 m wide, and 330 m long. The feature was covered with medium to large *java plum* trees, which indicate that it had not been in use for several decades. In some discontinuous sections, the linear mound embankments of the canal were lined by dry-laid basalt cobbles stacked one to two courses high (fig. 21). Two sections contained culverts. The northern culvert was constructed of metal pipe encased with basalt cobble and concrete mortar masonry. The southern culvert was constructed of metal pipe and formed basalt gravel and concrete aggregate. Grooved concrete sluice gate fittings were present near each of the culverts. One of these sluice fittings, near the northern culvert, had the date "11/11/66" inscribed in the concrete (figs. 22, 23). All of the concrete and concrete mortar masonry sections are likely to be contemporary. Thus, the integrity of the design of the original irrigation ditch was compromised in the modern era.[6]

Ditch 2 was located east of the livestock fence bisecting the APE. It was straight and trended east to west (figs. 24, 25). The ditch was composed of two parallel earthen linear mounds, with a canal in between. Ditch 2 was less formal than Ditch 1, but it was constructed of approximately the same dimensions: approximately 1 m high linear mound embankments paralleling a 1.5 m wide by 1.5 m deep canal. The entire raised ditch assembly was approximately 5–6 m wide by 400 m long. Ditch 2 was more obscured

[6]Historic properties are defined by HAR Chapter 13–277 as "any building, structure, object, district, area, or site . . . including heiau which is over fifty years old." Within this context, the term *modern* is defined, here, as having occurred less than fifty years ago.

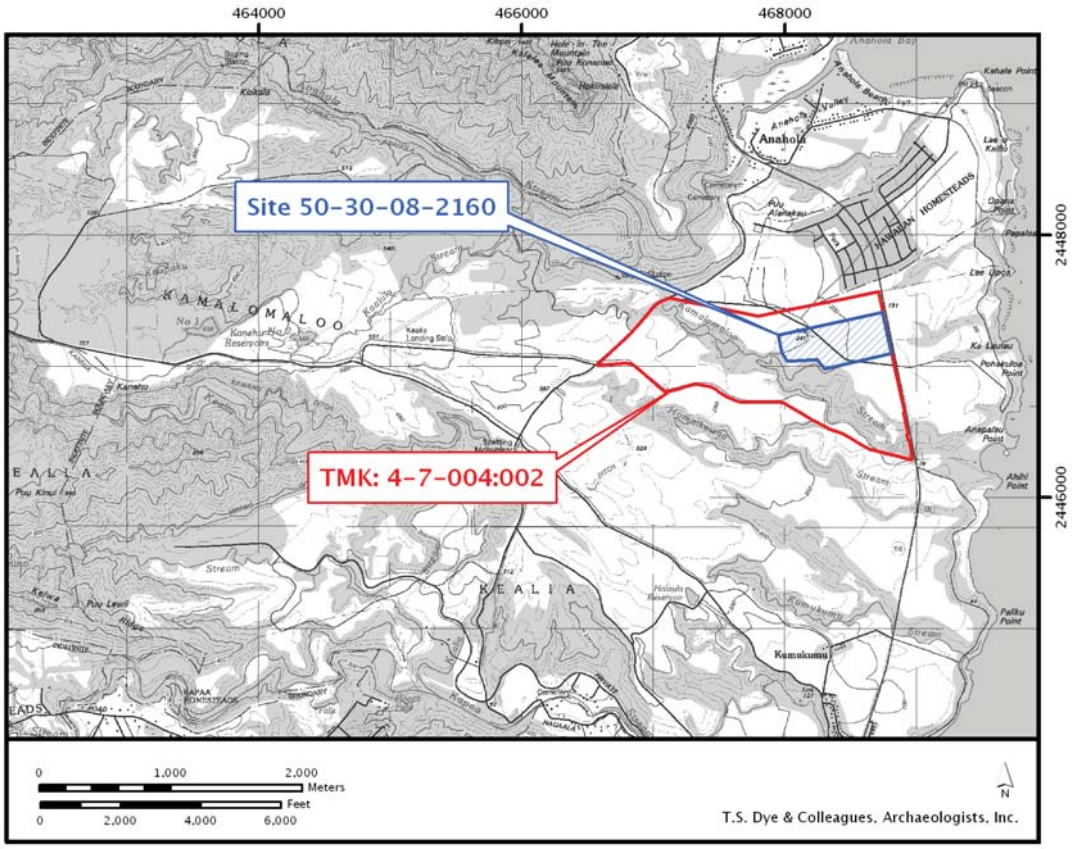

Figure 19: Map of site 50–30–08–2160 in relation to the subject parcel.

Figure 20: Photograph of site 50–30–08–2160, Ditch 1, looking northwest toward Kalalea Mountain. Note the raised linear mound embankments and canal at the center of the frame. The scale is in decimeters.

from view by vegetation, including grass, shrubs, and trees. Plastic irrigation piping was common, buried in the earthen linear mounds. Also, concentrations of basalt cobbles, similar to the dry stacked basalt cobbles observed in Ditch 1, were common outside of Ditch 2. This may indicate that the ditch had been dredged and re-excavated in recent history.

Figure 21: Detail photograph of the site 50–30–08–2160, Ditch 1 canal showing dry stacked basalt cobbles in profile, looking south. The scale is in decimeters.

Figure 22: Detail photograph of the 1966 notched sluice gate fittings in Ditch 1 of site 50–30–08–2160, looking south. Note that the left scale bar marks the inscribed date (fig. 23). The scale is in decimeters.

Figure 23: Detail photograph of the "11/11/66" date inscription on a site 50–30–08–2160, Ditch 1 sluice gate fitting, looking down. Note the grooves at the left of the frame for the sluice gate boards. Figure 22 depicts an expanded view of this sluice gate fitting. The scale is in decimeters.

Figure 24: Photograph of the location of a ditch crossing of site 50–30–80–2160, Ditch 2, looking northwest. Note that the majority of Ditch 2 is obscured by vegetation.

Figure 25: Photograph of the canal of site 50–30–80–2160, Ditch 2, looking east. Note the plastic irrigation pipe lying on the ground surface and extending from the walls of the linear mounds.

No trace of the railroad tracks shown on the 1904 map was found in the field. Given the extent of land alteration during sugarcane cultivation, as revealed by the deeply buried paleosol in Trench 4 (see p. 19), all traces of a former rail line would be removed by subsequent field preparation.

Site 50–30–08–2160 is likely related to site 50–30–08–789, a feature complex of plantation-era infrastructure identified south of the APE [9].

5 Summary and Conclusions

The sugarcane fields and the raised agricultural ditches, which were constructed sometime during the use of the APE for plantation agriculture, are assigned to site 50–30–08–2160. They are likely to be related to site 50–30–08–789, a complex of plantation-era infrastructure *makai* of Hawai'i State Highway 56, located approximately 1.2 km southeast

of the APE. The features of site 50–30–08–2160 are related to historic-era industrial agriculture known to have taken place on the property between the mid-nineteenth and mid-twentieth centuries. The two raised agricultural irrigation ditches of site 50–30–08–2160 are likely to have first been built in this time period. More-recent concrete and concrete mortar components dating to the mid-1960s were also identified, however, which indicates that the integrity of these features have been compromised in the modern era.

Historic maps also show a section of historic-era train track intersecting the subject property (see sec. 2.2). No historic-era train tracks were observed during the inventory survey.

Ten test trenches were excavated throughout the APE. They revealed a profile consisting of Phase 1 natural sediment including deteriorating bedrock and a paleosol, which was overlain by two layers of agricultural soil, Phases 2 and 3. This pattern was consistent throughout the APE. The Phase 1, Context 3 material was identified by peds that retained the texture of the parent material. Context 3 very likely represents deteriorating Kōloa series aphyric basanite (see sec. 2, p. 7). The overlying Phase 2 and Phase 3 material further degraded in situ into Lihue silty clay. This soil was then reworked during historic sugarcane agriculture. It is very likely that had cultural materials been present at the APE, their context would have been substantially altered or destroyed by plowing for historic agriculture. No cultural materials of any kind were observed at any of the test trenches.

Trenches 1–3 and 5–10 all revealed similar profiles consisting of Phase 1 deteriorating bedrock, which was overlain by Phase 2 reworked agricultural mineral soil, which was overlain by Phase 3 surface material. Given the recent history of the APE as agricultural land, this *sequence* met the researchers' expectations.

Trench 4 was the only trench that differed from this typical depositional pattern. Here a Phase 1, Context 7 paleosol was overlain by Phase 2, Context 6 agricultural soil with small to medium *boulder* inclusions. Context 6 was overlain by Context 1 modern surface material. Since the Context 6 material overlaid a paleosol and contained many small to medium boulders, it is likely that Context 6 was fill material. Since Trench 4 is located adjacent to an existing stream drainage, it is likely that during the use of the subject property for historic agriculture, the Context 6 material was pushed from upslope to extend the arable land.

Site 50–30–08–2160 is significant for its information content (Criterion D); however, its features lack integrity. Information regarding these features has been documented in historic maps and the description of the raised agricultural ditches in section 4.2. No further archaeological work for site 50–30–08–2160 is recommended. It is further recommended that the proposed KIUC project, which involves installation of a photovoltaic facility, substation, and service center, be determined to have no adverse effect on site 50–30–08–2160.

A Stratigraphic Contexts

Context	Phase	Unit	Description
1	3	Solar Farm	Ground surface soil at the APE. It overlay Phase 2 material.
2	2	Trench 1	Agricultural mineral soil located beneath Context 1 and above Context 3 in Trench 1.
3	1	Solar Farm	Natural decaying bedrock material located beneath the Phase 2 material.
4	2	Trench 2	Agricultural mineral soil located beneath Context 1 and above Context 3 in Trench 2.
5	2	Trench 3	Agricultural mineral soil located beneath Context 1 and above Context 3 in Trench 3.
6	2	Trench 4	Agricultural mineral soil containing many small to medium boulders located beneath Context 1 and above the Context 7 paleosol in Trench 4.
7	1	Trench 4	Paleosol containing buried organic material located beneath Context 6 and present to the base of excavation in Trench 4.
8	2	Trench 5	Agricultural mineral soil located beneath Context 1 and above Context 3 in Trench 5.
9	2	Trench 6	Agricultural mineral soil located beneath Context 1 and above Context 3 Trench 6.
10	2	Trench 7	Agricultural mineral soil located beneath Context 1 and above Context 3 in Trench 7.
11	2	Trench 8	Agricultural mineral soil located beneath Context 1 and above Context 3 in Trench 8.
12	2	Trench 9	Agricultural mineral soil located beneath Context 1 and above Context 3 in Trench 9.
13	2	Trench 10	Agricultural mineral soil located beneath Context 1 and above Context 3 in Trench 10.

B Field Catalog

Catalog	Site	Unit	Context	Contents
1	50-30-08-2160	Trench 1	1	Sediment
2	50-30-08-2160	Trench 1	2	Sediment
3	50-30-08-2160	Trench 1	3	Sediment
4	50-30-08-2160	Trench 2	1	Sediment
5	50-30-08-2160	Trench 2	4	Sediment
6	50-30-08-2160	Trench 2	3	Sediment
7	50-30-08-2160	Trench 3	1	Sediment
8	50-30-08-2160	Trench 3	5	Sediment
9	50-30-08-2160	Trench 3	3	Sediment
11	50-30-08-2160	Trench 4	1	Sediment
12	50-30-08-2160	Trench 4	6	Sediment
13	50-30-08-2160	Trench 4	7	Sediment
14	50-30-08-2160	Trench 5	1	Sediment

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Catalog	Site	Unit	Context	Contents
15	50-30-08-2160	Trench 5	8	Sediment
16	50-30-08-2160	Trench 5	3	Sediment
17	50-30-08-2160	Trench 6	1	Sediment
18	50-30-08-2160	Trench 6	9	Sediment
19	50-30-08-2160	Trench 6	3	Sediment
20	50-30-08-2160	Trench 7	1	Sediment
21	50-30-08-2160	Trench 7	10	Sediment
22	50-30-08-2160	Trench 7	3	Sediment
23	50-30-08-2160	Trench 8	1	Sediment
24	50-30-08-2160	Trench 8	11	Sediment
25	50-30-08-2160	Trench 8	3	Sediment
26	50-30-08-2160	Trench 9	1	Sediment
27	50-30-08-2160	Trench 9	12	Sediment
28	50-30-08-2160	Trench 9	3	Sediment
29	50-30-08-2160	Trench 10	1	Sediment
30	50-30-08-2160	Trench 10	13	Sediment
31	50-30-08-2160	Trench 10	3	Sediment

Glossary

***A* horizon** The surface layer in the soil containing humus, an eluvial layer from which minerals etc. are leached. See also *horizon*.

***B* horizon** The soil layer underlying the *A horizon*, an illuvial horizon into which minerals, etc. from the *A* horizon are washed. See also horizon.

boulder Rock fragment 600 mm and greater.

***C* horizon** A distinct layer in the soil underlying the *A* or *B horizon*s, or the organic or mineral horizons, consisting of the parent material, i.e., the little altered but weathered bedrock, transported glacial or alluvial material, or an earlier soil, from which the soil is formed. See also horizon.

Christmas berry The ornamental tree, *Schinus terebinthifolius*, known for its bright red berry-like fruits.

chronology The assigning of dates to given events, objects or, by inference, to units of stratification.

clay Fine earth particles less than 0.002 mm.

coconut The palm, *Cocos nucifera*.

context A unit of stratification associated with a natural or cultural process or event.

dendroglyph A subcategory of *rock art* where images are carved into the bark of trees.

diffuse A transition between horizons that is 15 cm or greater. See also horizon.

fill Any sediment deposited by any agent so as to fill or partly fill a valley, sink, or other depression.

geoglyph A subcategory of rock art that consists of an image created when rocks are aligned on the surface of the ground (an additive process); this method is also used with the *intaglio* method to create the image. See also intaglio.

geomorph A subcategory of rock art that consists of images created by reshaping the

surface of the earth into mounded forms.

horizon A subdivision of soil.

horizontal feature interface Associated with upstanding units of stratification and marks the interfacial levels to which the units have been destroyed.

in situ In the natural or original position.

intaglio A subcategory of rock art where an image is created on the ground by removing rocks and stone (extractive process), leaving the blank area to define the image.

irregular A soil boundary in which the depth of undulation is greater than its width.

java plum A historically introduced tree or shrub of the genus *Eugenia*.

moderately plastic A 4 mm diameter roll of soil will support itself if held on end, but a 2 mm diameter roll of soil will not.

olivine An important rock-forming mineral, also known as chrysolite or peridot.

paleosol A soil of the past, often buried.

ped A natural soil aggregate.

period The largest grouping of the stratification of a site; it is usually composed of several phases.

petroglyph A subcategory of rock art that includes images created by an extractive process on a rock surface by pecking, engraving or incising, abrading, or bruising.

phase A grouping between an individual unit of stratification and a *period*: several units of stratification make up a phase and several phases compose a period.

phenocryst One of the large, conspicuous crystals of the earliest generation in a porphyritic rock.

pictograph A subcategory of rock art that includes images drawn or painted onto the surface of a rock (an additive process).

pre-contact Prior to AD 1778 and the first written records of the Hawaiian Islands made by Captain James Cook and his crew.

project The archaeological investigation, including laboratory analyses and report preparation. See also *undertaking*.

rock art A term used to include petroglyphs, *pictograph*s, *geoglyph*s, intaglios, *dendroglyph*s, and *geomorph*s. Hawaiian rock art essentially falls into the categories of petroglyphs (primary type of the rock art) or pictographs.

sequence A succession of events, as opposed to chronology which is the dating of such events. See also chronology.

significance A quality of a historic property that possesses integrity of location, design, setting, materials, workmanship, feeling, and association. The qualities are set out in SHPD administrative rule §13–275–6, *Evaluations of Significance*.

site The fundamental unit of archaeological investigation, a location that exhibits material evidence of past human activity.

smooth A soil boundary which is planar with few or no irregularities.

stone Rock fragment ranging from 250 mm to less than 600 mm.

sugarcane A grass, *Saccharum officinarum*, widely grown in warm regions as a source of sugar. See also *kō*.

undertaking Any action with the potential for an adverse effect on significant historic properties. See also project.

unit of stratification number A number assigned to each natural and man-made layer, upstanding stratum, and vertical and *horizontal feature interface*. Once numbered, each unit will automatically have a set of stratigraphic relationships which must be defined and recorded.

very sticky Soil adheres to both fingers after release of pressure. Soil stretches greatly on separation of fingers.

Hawaiian Terms

ʻaʻā Basaltic lava flows typified by a rough, jagged, spinose, clinkery surface. See also *pāhoehoe*.

ahupuaʻa Traditional Hawaiian land division, usually extending from the uplands to the sea.

aliʻi Chief, chiefess, officer, ruler, monarch, peer, head man, noble, aristocrat, king, queen, commander.

heiau Traditional Hawaiian place of worship.

ʻili A land section, next in importance to *ahupuaʻa*, and usually a subdivision of an *ahupuaʻa*.

kō Sugarcane, *Saccharum officinarum*, was introduced to Hawaiʻi by Polynesian settlers, who cultivated it widely. The stalk was chewed between meals for its sweetness, brought on long journeys to ease hunger, and eaten in times of famine; juice from the stalk was fed to nursing babies, and used as a sweetening agent in medicinal herbal concoctions; the leaves were used as thatching for houses; the leaf midrib was used for plaiting braids that were made into hats; the stem of the flower was used to make darts for a child's game.

koa haole A historically introduced small tree, *Leucaena glauca*.

kuleana Right, title, property, portion, responsibility, jurisdiction, authority, interest, claim, ownership.

kupua Demigod or culture hero, especially a supernatural being possessing several forms.

loʻi A single irrigated taro patch; irrigated terrace, especially for taro.

Māhele The mid-nineteenth century land division responsible for the introduction of fee simple land title in Hawaiʻi.

makai Seaward.

mauka Inland, upland, toward the mountain.

moʻo 1. Narrow strip of land, smaller than an *ʻili*.
2. Lizard, reptile of any kind, dragon, serpent; water spirit.

pāhoehoe Basaltic lava flows typified by smooth, billowy, or ropy surface. See also *ʻaʻā*.

Abbreviations

APE The geographic area or areas within which an undertaking may cause changes in the character or use of historic properties, if any such properties exist. See also undertaking.

ARPA The Archaeological Resources Protection Act of 1979 is federal legislation that was enacted to increase the protection of archaeological sites already provided by the Antiquities Act of 1906 and the National Historic Preservation Act of 1966 (NHPA). It includes increased penalties for destruction of archaeological sites, explicitly prohibits the sale of archaeological resources, and requires federal land managers to create programs for continued research and education. See also NHPA.

cm The centimeter, a derived unit of length in the International System of Units, equal to 10^{-2} m. See also m.

GPS Global Positioning System, operated by the government of the United States. The term is often used for the unit used to communicate with the GPS.

km The kilometer, a derived unit of length in the International System of Units, equal to 10^{3} m. See also m.

LCA Awards issued by the Board of Commissioners to Quiet Land Titles between 1846 and 1855 to persons who filed claims to land between 1846 and 1848.

m The meter, a base unit of length in the International System of Units, equal to the length of the path traveled by light in vacuum during a time interval of 1/299,792,458 of a second.

NHPA The National Historic Preservation Act of 1966 is legislation that was enacted to preserve historic places and archaeological sites in the United States. It is responsible for the creation of the National Register of Historic Places and the National Historic Landmarks Program. It was preceded by the Antiquities Act of 1906 and succeeded by the Archaeological Resources Protection Act of 1979 (ARPA). See also Archaeological Resources Protection Act of 1979 (ARPA).

SHPD The State Historic Preservation Division of the Hawai'i Department of Land and Natural Resources, a government agency responsible for implementing the National Historic Preservation Act of 1966, as amended, and Chapter 6E of the Hawai'i Revised Statutes.

USDA A federal government agency whose mission is to provide leadership on food, agriculture, natural resources, and related issues based on sound public policy, the best available science, and efficient management. Archaeologists in Hawai'i typically describe sediments according to standards established by the agency.

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B. BIOLOGICAL SURVEY OF THE PROJECT SITE

Biological Surveys Conducted for the Anahola Solar Project, Kawaihau District, Island of Kauaʻi, Hawaiʻi

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Introduction and Background

The Kauaʻi Island Utility Cooperative (KIUC), through its subsidiary KIUC Renewable Solutions One LLC (KRS One), is planning to develop, operate, and maintain a 12 MW photovoltaic facility, including a dedicated substation with interconnections to the island-wide electrical grid. The proposed facilities would occupy approximately 55 acres on the *makai* portion of a large, 422-acre parcel (TMK (4) 4-7-004:002) located in Anahola, Kauaʻi, Hawaiʻi (Figure 1). The site, which is owned by the Department of Hawaiian Home Lands (DHHL) was formerly used for sugarcane cultivation but is currently fallow (Figure 2).

The proposed facilities include:

(1) Fifty-three acres of photovoltaic (PV) panels, inverters, and transformers providing up to 12 megawatts of electrical energy to KIUC's electrical grid.

(2) An adjacent 2-acre substation, which will be used for control equipment for the solar farm and to boost the power from the 12 kilovolts (kV) delivered by the PV system to the 57/69 kV voltage of KIUC's electrical transmission system. [1]

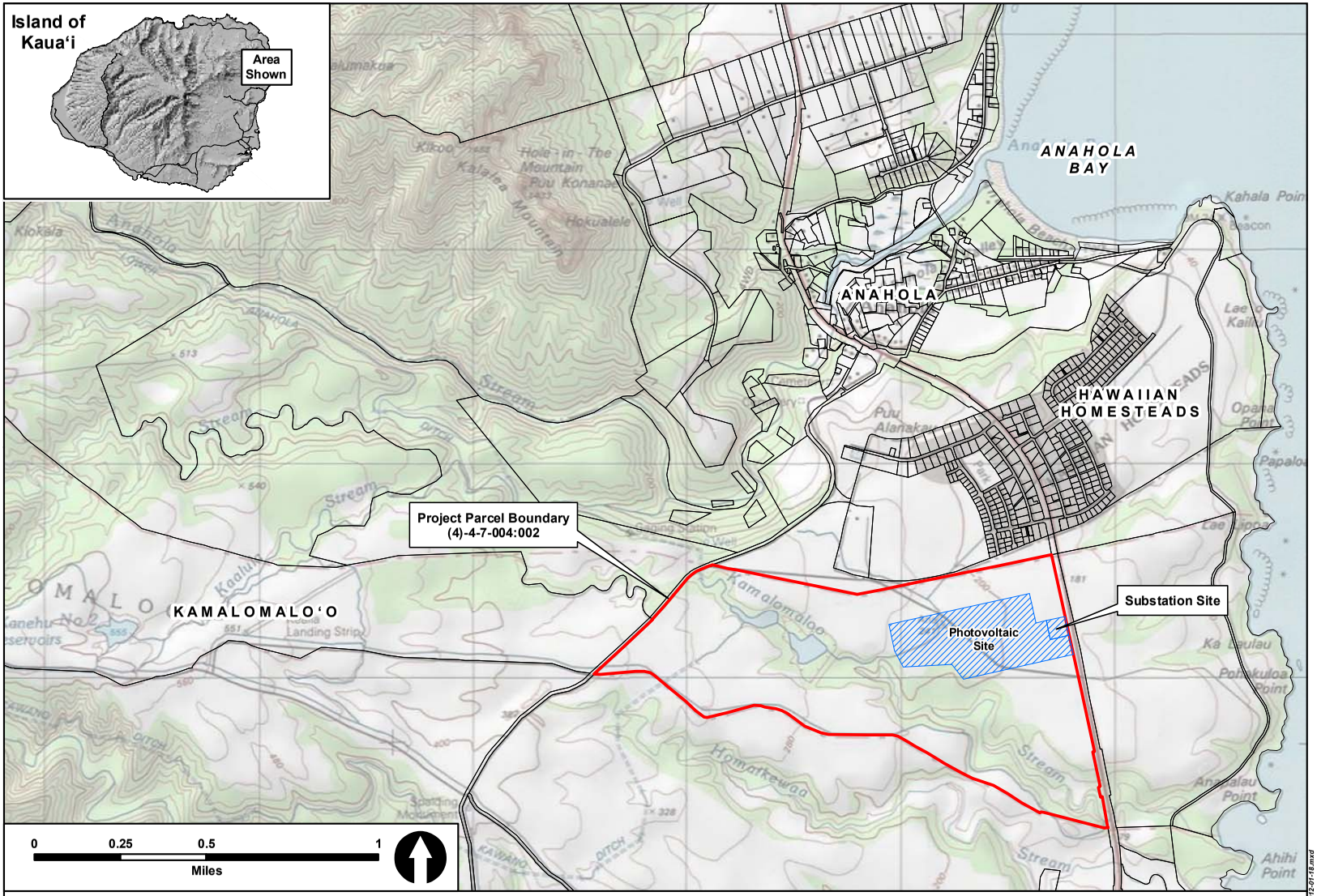
(3) Short overhead cables linking the substation to the existing KIUC electrical power lines within the Kūhiō Highway right-of-way.

KIUC is also considering the possibility of adding a small service center on an adjacent 5-acre parcel immediately north of the proposed substation. However, because the service center is not functionally related to the photovoltaic/substation project, is on a separate timetable, and would not create cumulative effects, which would substantially alter the analysis of impacts, KIUC has determined that it is both necessary and appropriate to deal with its environmental documentation separately.

This report describes the methods used and the results of the botanical, avian and terrestrial mammalian surveys conducted on the project site as part of the environmental disclosure process associated with the proposed project.

The primary purpose of the surveys was to determine if there are any botanical, avian and terrestrial mammalian species currently listed, or proposed for listing under either federal or State of Hawaiʻi endangered species statutes within or adjacent to the study area. We were also asked to evaluate the potential impacts that the development of the project might pose to any sensitive or protected native botanical, avian or mammalian species, and to propose appropriate minimization and or mitigative measures that could be implemented to reduce or eliminate any such impacts. The federal and State of Hawaiʻi listed species status follows species identified in the following referenced documents, (Department of

[1] The project may also include an integral Battery Energy Storage System (BESS) that will provide an electrical buffer between the PV system and KIUC's grid. The batteries would be located within the proposed substation serving the PV facility.



Prepared For:	Prepared By:	Source:	Project:	Figure 1:
Kaua'i Island Utility Cooperative	PLANNING SOLUTIONS	-State of Hawaii GIS -County of Kauai GIS -ESRI	Anahola Solar Project	**Location Map**

Figure 1 Location Map 2012-01-18.mxd

Kuhio Hwy
Makaio Rd
Konona Rd
Ipane Rd
Kawelo St
Kealia Rd
Switch Yard
Photovoltaic Site
Project Parcel Boundary (4)-4-7-004:002
0
0.125
0.25
0.5
Miles
Legend:
Proposed Project Site
TMK Parcel Boundaries
Prepared For:
Kaua'i Island Utility Cooperative
Prepared By:
PLANNING SOLUTIONS
Source:
State of Hawaii GIS
County of Kauai GIS
ESRI
Project:
KIUC Anahola Solar Project
Figure 2:
Vicinity Map
Figure 2 Vicinity Map 2012-01-18.mxd

Land and Natural Resources (DLNR) 1998, U. S. Fish & Wildlife Service (USFWS) 2005a, 2005b, 2011). Fieldwork was conducted on January 16, 2012.

Hawaiian and scientific names are italicized in the text. A glossary of technical terms and acronyms used in the document, which may be unfamiliar to the reader, are included at the end of the narrative text.

General Site Description

The proposed facilities will occupy approximately 55 acres of land within a larger 422-acre parcel. The project site is bound to the east by Kūhiō Highway and to the north, west and south by undeveloped pasturelands (Figure 2). The site has numerous primitive roads within it; some are passable by 4 x 4 vehicles while many others are not. The vegetation is dominated by Guinea grass (*Panicum maximum*) with varying amounts of Christmas berry (*Schinus terebinthifolius*), and (in places) dense patches of lantana (*Lantana camara*), with individual Java plum (*Syzygium cuminii*) trees doted across the landscape (Figures 3 and 4).

Figure 3 – Typical Guinea grass/Christmas berry shrub vegetation looking nortwest with Anahola Mountains in the background

Figure 4 – typical Guinea grass vegetation looking east – utility poles are fronting Kūhiō Highway

The riparian forest vegetation that defines the course of Kamalomaloʻo Stream is outside of the project site (Figure 1 and 2).

Methods

Plant names mostly follow *Manual of the Flowering Plants of Hawai'i* (Wagner et al., 1990, 1999) for native and naturalized flowering plants, and *A Tropical Garden Flora* (Staples and Herbst, 2005) for crop and ornamental plants. Some plant species names have been updated following more recently published literature. The avian phylogenetic order and nomenclature used in this report follows the *AOU Check-List of North American Birds* (American Ornithologists' Union, 1998), and the 42nd through the 52nd supplements to the Check-List (American Ornithologists' Union, 2000; Banks et al., 2002, 2003, 2004, 2005, 2006, 2007, 2008; Chesser et al., 2009, 2010, 2011). Mammalian species scientific names follow (Tomich, 1986). Place names follow (Pukui et al., 1974).

Botanical Survey Methods

The botanical survey was conducted using a pedestrian (walking) transect methodology to cover the project area. Guided by a real-time, GPS tracking record (using a Trimble GeoXT), the botanist attempted to cover all the different parts of the site and to visit all areas representing various vegetation types and environments supporting plants. As the walking survey progressed, a list of all higher plants (ferns, conifers, and flowering plants) encountered was recorded in field notes, along with a sense of the relative abundance of each species overall or within a vegetation type.

This approach is superior to using more rigorous quantitative transects when the primary purpose is to both characterize the flora and discover the presence of rare species, listed species, or native species having resource value. In essence, by recording all plants encountered, the resulting flora (plant species) listing provides information useful to characterize the nature of botanical resources present, including species that now or perhaps in the future may be of interest or concern from a variety of perspectives, such as native plant protection, future state or federal listing as threatened or endangered, occurrence of invasive species, etc. Although completeness of the listing is partly dependent upon the actual proportion of the survey area covered by the survey transects, it is neither reasonable nor necessary to traverse 100 percent of the area. Utilizing ever-changing view planes and the fact that species occur in populations of individuals that form a repeating mosaic within environment types enables the botanist to direct the survey track into all areas of the site that hold promise of yielding species not encountered earlier in a survey; and this process is repeated until no new species are being added to the field notes. Thus, very rare species represented by one or just a few individuals in an area as large as the project lands could be missed, but certainly the vast majority of species present will be "discovered" by the approach used.

Avian Survey Methods

A total of 8 avian point count stations were sited equidistant from each other, along two transects running parallel to each other from the top of the site to its eastern boundary. Six-minute point counts were made at each of the count stations. Each station was counted

once. Field observations were made with the aid of Leica 8 X 42 binoculars and by listening for vocalizations. Point counts were concentrated during the early morning hours, the peak of daily bird activity. Time not spent counting was used to search the remainder of the project site for species and habitats that were not detected during count sessions.

Mammalian Survey Methods

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or *ʻōpeʻapeʻa* as it is known locally, all terrestrial mammals currently found on the Island of Kauaʻi are alien species, and most are ubiquitous. The survey for terrestrial mammalian species was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. No trapping program or heterodyne bat detection survey methods were used during the course of this survey. A running tally was kept of all terrestrial vertebrate mammalian species detected within the project area during time spent within the project site.

Results

Botanical Surveys, Flora

The term "flora" is the diversity of plant species living in a survey area. A plant checklist (Table 1) was compiled from our field observations, with entries arranged alphabetically under plant family names (standard practice). Included in the list are scientific name, common name, and status (whether native or non-native) for each species observed during the survey. Table 1 is subdivided into Table 1a listing all non-native plant species (naturalized or ornamental plants) followed by Table 1b listing all native and early Polynesian introductions (indigenous, endemic, or Polynesian plants). Since the plants in Table 1b are likely to be of greatest interest or concern (for example, state or federal listed species would only appear in Table 1b), splitting the table in this manner facilitates focusing on those species. Qualitative estimates of plant abundance were recorded for each species encountered in the survey on January 16. Abundance values are coded in the table as explained in the legend to Table 1.

A total of 67 species of vascular plants was identified from the survey area; of these only three are native species. The diversity recorded is low, although in keeping with abandoned sugar cane lands that have been allowed to go fallow and then converted to pasturage. Of the total number of species recorded, 64 or 95.5 percent are naturalized or ornamental species. Two of three native species recorded - yellow wood sorrel (*Oxalis corniculata*), and *pōpolo* (*Solanum americanum*) - are Polynesian introductions and the third, *ʻuhaloa* (*Waltheria indica*) is an indigenous species. All three of these species are common on the Island of Kauaʻi, although all were rare or occasional on this site (Table 1).

Botanical Surveys, Vegetation

"Vegetation" refers to the type of plants that dominate an area. On this site pasturelands are the dominant vegetation type. The dominant grass is Guinea grass (Figures 3 and 4), which in areas not subjected to recent grazing, has grown to a couple of meters (6 or more feet) in height and is nearly impenetrable. In these situations, the grass tends to be monospecific (only Guinea grass is present-out competing all other plant species). In the lower parts of the site, dense shrub growth of Christmas berry and lantana form a mosaic within areas of tall Guinea grass.

Table 1. Flora for KIUC Solar Energy Site, Anahola, Kaua'i

1a. Non-native (ornamentals and naturalized) plants

Family Species	Common name	Status	Abund.	Note
ACANTHACEAE				
Thunbergia fragrans Roxb.	sweet clock vine	Nat	O	
AMARANTHACEAE				
Amaranthus spinosus L.	spiny amaranth	Nat	R	
ANACARDIACEAE				
Schinus terebinthifolius Raddi	Christmas berry	Nat	A	
ARALIACEAE				
Schefflera actinophylla (Endl.) Harms	octopus tree, umbrella tree	Nat	R	
ASTERACEAE (COMPOSITAE)				
Ageratum conyzoides L.	*maile hohono*	Nat	R3	
Calyptocarpus vialis Less.	---	Nat	R1	
Conyza sp.	horseweed	Nat	O2	
Cyanthillium cinereum (L.) H. Rob.	little ironweed	Nat	R	
Emilia fosbergii Nicolson	Flora's paintbrush	Nat	U2	
Parthenium hysterophorus L.	false ragweed	Nat	U3	
Pluchea carolinensis (Jacq.) G. Don	sourbush	Nat	O	
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown-beard	Nat	U	
BIGNONIACEAE				
Spathodea campanulata P. Beauv.	African tulip tree	Nat	U	
BRASSICACEAE				
Lepidium virginicum L.	pepperwort	Nat	U2	
CONVOLVULACEAE				
Ipomoea obscura (L.) Ker-Gawl.	---	Nat	U	
Ipomoea triloba L.	field bindweed	Nat	R	
EUPHORBIACEAE				
Euphorbia hypericifolia L.	graceful spurge	Nat	R	
Phyllanthus debilis Klein ex Willd.	niuri	Nat	R1	
Ricinus communis L.	castor bean	Nat	R1	
FABACEAE				
Canavalia cathartica Thours	*maunaloa*	Nat	U1	<1>
Chamaecrista nictitans (L.) Moench	partridge pea, *lauki*	Nat	A	
Crotalaria assamica		Nat	C	
Crotalaria incana L.	fuzzy rattlepod	Nat	U	
Crotalariua pallida Aiton	smooth rattlepod	Nat	C1	
Desmanthus pernambucanus (L.) Thellung	virgate mimosa	Nat	R	
Desmodium incanum DC	Spanish clover	Nat	U	
Desmodium triflorum (L.) DC	---	Nat	R	
Indigofera hendecaphylla Jacq.	prostrate indigo	Nat	R1	
Indigophera suffruticosa Mill.	indigo	Nat	O1	
Leucaena leucocephala (Lam.) deWit	*koa haole*	Nat	O1	
Mimosa pudica L.	sensitive plant	Nat	A	
Neonotonia wightii (Wight & Arnott) Lackey	glycine vine	Nat	U2	
Senna occidentalis (L.) Link	coffee senna	Nat	R	<1>

Table 1 (continued.)

Family Species	Common name	Status	Abund.	Note
MALVACEAE				
Malvastrum coromandelianum (L.) Garcke	false mallow	Nat	R1	
Sida acuta N. L. Burm.	---	Nat	U	
Sida ciliaris L.	---	Nat	R	
Sida rhombifolia L.	---	Nat	U	
Sida spinosa L.	prickly sida	Nat	R2	
MYRTACEAE				
Psidium guajava L.	common guava	Nat	U	
Syzygium cuminii (L.) Skeels	Java plum	Nat	C	
NYCTAGINACEAE				
Bougainvillea glabra Choisy	bougainvillea	Orn	R	
PAPAVERACEAE				
Argemone mexicana L.	Mexican poppy	Nat	R	<1>
PASSIFLORACEAE				
Passiflora laurifolia L.	yellow grandilla	Nat	R	
POLYGALACEAE				
Polygala paniculata L.	bubblegum plant	Nat	O2	
PORTULACACEAE				
Portulaca oleracea L.	pig weed	Nat	R	
RUBIACEAE				
Hedyotis corymbosa (L.) Lam.	---	Nat	R	
Spermacoce assurgens Ruiz & Pav.	buttonweed	Nat	R	
VERBENACEAE				
Citharexylum caudatum L.	fiddlewood	Nat	U	
Lantana camara L.	lantana	Nat	A	
Stachytarpheta australis Mold.	---	Nat	R	<1>
Stachytarpheta cayennensis (Rich.) Vahl	---	Nat	C	
Stachytarpheta jamaicensis (L.) Vahl	Jamaican vervain	Nat	R1	
Verbena litoralis Kunth	*ōwī*	Nat	A	
	MONOCOTYLEDONES			
CYPERACEAE				
Cyperus rotundus L.	nut grass	Nat	R1	
POACEAE (GRAMINEAE)				
Axonopus fissifolius (Raddi) Kuhlm.	nrw-lvd carpet grass	Nat	R1	
Bothriochloa pertusa (L.) A. Camus	pitted beardgrass	Nat	O3	
Brachiaria subquadripara (Trin.) Hitchc.	---	Nat	R	
Chloris barbata (L.) Sw.	swollen fingergrass	Nat	U2	
Chrysopogon acicularis (Retz.) Trin.	golden beardgrass	Nat	R1	
Cynodon dactylon (L.) Pers.	Bermuda grass	Nat	U2	
Digiteria insularis (L.) Mez ex Ekman	sourgrass	Nat	O3	
Eleusine indica (L.) Gaertn.	wiregrass	Nat	O	
Melinus repens (Willd.) Zizka	Natal redtop	Nat	O3	
Panicum maximum Jacq.	Guinea grass	Nat	AA	

Table 1b. Native (and early Polynesian introduced) Plants

Family Species	Common name	Status	Abund.	Note
	FLOWERING PLANTS DICOTYLEDONE			
OXALIDACEAE				
Oxalis corniculata L.	yellow wood sorrel, *ʻihiʻai*	Pol	R	
STERCULIACEAE				
Waltheria indica L.	*ʻuhaloa*	**Ind**	O	
SOLANACEAE				
Solanum americanum Mill.	*pōpolo*	Pol	R	

Legend to Table 1:

Status = distributional status
- **Ind** = indigenous; native to Hawaiʻi, but not unique to the Hawaiian Islands.
- Nat = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation
- Orn = Ornamental, not known to be established in the wild without human assistance

.

Abundance = occurrence ratings for plants on property in January 2012
- R – Rare - only one or two plants seen.
- U - Uncommon - several to a dozen plants observed.
- O - Occasional - found regularly, but not abundant anywhere.
- C - Common - considered an important part of the vegetation and observed numerous times.
- A - Abundant - found in large numbers; may be locally dominant.
- AA - Abundant - very abundant and dominant; defining vegetation type.

Numbers (as in R3) offset occurrence ratings (1 – several plants; 2 – many plants; 3 – abundant in a limited area) in cases where distribution across the survey area may be limited, but individuals seen are more than indicated by the occurrence rating alone.

Notes:
- <1> Generally found in disturbed sites and along roads; ruderal weed.

Avian Survey Results

A total of 499 individual birds of 21 species, representing 16 separate families, were recorded during station counts, or as incidental observations while transiting between point count stations (Table 2). Of these 21 species two, Pacific Golden-Plover (*Pluvialis fulva*) and White-tailed Tropicbird (*Phaethon lepturus dorothea*) are native species. The remaining 19 species recorded during point counts or as incidental observations while transiting the site between count stations are considered to be alien to the Hawaiian Islands (Table 2).

Avian diversity and densities were in keeping with the location of the property and the habitat presently on the site. Three species, Nutmeg Mannikin (*Lonchura punctulata*), Zebra Dove (*Geopelia striata*) and Chestnut Munia (*Lonchura atricapilla*) accounted for 60.50 percent of all birds recorded during station counts. The most commonly recorded species was Nutmeg Mannikin, which accounted for slightly more than 28 percent of the total number of individual birds recorded. An average of 62 individual birds was recorded per station count; a number that is quite high for point counts in this area on the Island of Kauaʻi.

No avian species currently proposed or listed under either the State of Hawaiʻi or federal endangered species statutes was detected during the course of this survey, nor would they be expected given the habitat currently present on the site.

Table 4 – Avian Species Detected Anahola Solar Site

Common Name	***Scientific Name***	***ST***	***RA***
	GALLIFORMES		
	PHASIANIDAE – Pheasants & Partridges		
	Phasianinae – Pheasants & Allies		
Red Junglefowl	*Gallus gallus*	A	1.50
Kalij Pheasant	*Lophura leucomelanos*	A	**I-1**
	PHAETHONIFORMES		
	PHAETHONTIDAE - Tropicbirds		
White-tailed Tropicbird	*Phaethon lepturus dorothea*	IB	0.06
	PELECANIFORMES		
	ARDEIDAE - Herons, Bitterns & Allies		
Cattle Egret	*Bubulcus ibis*	A	0.17
	CHARADRIIFORMES		
	CHARADRIIDAE - Lapwings & Plovers		
	Charadriinae - Plovers		
Pacific Golden-Plover	*Pluvialis fulva*	IM	0.60
	COLUMBIDAE - Pigeons & Doves		
Spotted Dove	*Streptopelia chinensis*	A	0.72
Zebra Dove	*Geopelia striata*	A	3.11
	PASSERIFORMES		
	CETTIIDAE - Cettia Warblers & Allies		
Japanese Bush-Warbler	*Cettia diphone*	A	0.50
	ZOSTEROPIDAE - White-eyes		
Japanese White-eye	*Zosterops japonicus*	A	2.33
	TIMALIIDAE - Babblers		
Chinese Hwamei	*Garrulax canorus*	A	0.39

Table 2 (continued.)

Common Name	*Scientific Name*	*ST*	*RA*
	TURDIDAE - Thrushes		
White-rumped Shama	*Copsychus malabaricus*	A	0.78
	MIMIDAE - Mockingbirds & Thrashers		
Northern Mockingbird	*Mimus polyglottos*	A	0.06
	STURNIDAE - Starlings		
Common Myna	*Acridotheres tristis*	A	0.72
	EMBERIZIDAE - Emberizids		
Red-crested Cardinal	*Paroaria coronata*	A	0.33
	CARDINALIDAE - Cardinals Saltators & Allies		
Northern Cardinal	*Cardinalis cardinalis*	A	0.33
	ICTERIDAE - Blackbirds		
Western Meadowlark	*Sturnella neglecta*	A	0.06
	FRINGILLIDAE - Fringilline and Carduleline Finches & Allies		
	Carduelinae - Carduline Finches		
House Finch	*Carpodacus mexicanus*	A	2.28
	ESTRILDIDAE - Estrildid Finches		
	Estrildinae - Estrildine Finches		
Red Avadavat	*Amandava amandava*	A	0.56
Nutmeg Mannikin	*Lonchura punctulata*	A	11.17
Chestnut Munia	*Lonchura atricapilla*	A	2.50
Java Sparrow	*Padda oryzivora*	A	0.11

Key to Table 2

ST Status

A Alien – Introduced to the Hawaiian Islands by humans

IB Indigenous Breeding – Native naturally occurring in Hawaii, but not restricted to the Hawaiian Islands

IM Indigenous Migrant – Native migratory species, does not breed in Hawai'i

RA Relative Abundance - Number of birds detected divided by the number of count stations (8)

I- Incidental Observation – Recorded while transiting between count stations followed by the number seen

Mammalian Survey Results

We recorded three terrestrial mammalian species while on the site. Three horses (*Equss c. caballus*) were encountered all of them tethered to stakes. One pig (*Sus s. scrofa*) was seen in the upper reaches of the site, and several dogs (*Canis f. familiaris*), were heard barking from areas adjacent to the site. Additionally, scat, tracks and sign of horse, dog, and pig were encountered at several locations within the study site.

Discussion

Botanical Resources

The percentage of indigenous and early Polynesian plants at 4.5 percent is remarkably low for a lowland site on the Island of Kaua'i. These findings illustrate the highly disturbed and depauperate nature of the native vegetation present on this site.

Avian Resources

The findings of the avian survey are consistent with the location of the property, and the habitat present on the site. Two of the species recorded, White-tailed Tropicbird and Pacific Golden-Plover are indigenous species. White-tailed Tropicbirds are an indigenous breeding seabird species which nest in cliff faces on the Island of Kaua'i. The single White-tailed Tropicbird recoded was seen flying high over the site. There is no suitable habitat on the site that could be utilized by this species. The plover is an indigenous migratory shorebird species which nests in the high Arctic during the late spring and summer months, returning to Hawai'i and the Tropical Pacific to spend the fall and winter months each year. They usually leave Hawai'i for their trip back to the Arctic in late April or the very early part of May each year. The lone plover recorded was seen loafing in an area of short grass close to a tethered horse – one of the few locations on the site that currently has habitat that could be used by this species. The remaining avian species detected during this survey are all considered to be alien to the Hawaiian Islands (Table 2).

Although not detected during this survey, the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened endemic sub-species of the Newell's Shearwater (*Puffinus auricularis newelli*) have been recorded over-flying the project site between April and the end of November each year (David, 1995; Morgan *et al*., 2003, 2004; David and Planning Solutions 2008). Additionally, the Save Our Shearwaters Program has recovered both species from the general project area on an annual basis over the past three decades (Morgan *et al*., 2003, 2004; David and Planning Solutions, 2008; Save our Shearwater Program, 2012).

The petrel is listed as endangered, and the shearwater as threatened under both Federal and State of Hawai'i endangered species statutes. The primary cause of mortality in both Hawaiian Petrels and Newell's Shearwaters is thought to be predation by alien mammalian species at the nesting colonies (USFWS 1983, Simons and Hodges 1998, Ainley *et al*., 2001). Collision with man-made structures is considered to be the second most significant cause of mortality of these seabird species in Hawai'i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds can collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Hadley 1961; Telfer 1979; Sincock 1981; Reed *et al.*, 1985; Telfer *et al.*, 1987; Cooper and Day, 1998; Podolsky *et al*. 1998; Ainley *et al.,* 2001; Hue *et al.,* 2001; Day *et al*

2003). There are no nesting colonies nor appropriate nesting habitat for either of these listed seabird species within the current study site.

Mammalian Resources

The findings of the mammalian survey are consistent with the location of the property and the habitat currently present on the site. We did not record Hawaiian hoary bats overflying the site. Hawaiian hoary bats are widely distributed in the lowland areas on the Island of Kaua'i, and have been documented in and around almost all areas that still have some dense vegetation (Tomich, 1986; USFWS 1998, David, 2011).

Although no rodents were detected during the course of this survey, it is virtually certain one or more of the four established alien muridae found on Kaua'i, roof rat (*Rattus r. rattus*), Norway rat (*Rattus norvegicus*), European house mouse (*Mus musculus domesticus*) and possibly Polynesian rats (*Rattus exulans hawaiiensis*) use various resources found within the general project area. All of these introduced rodents are deleterious to native ecosystems and the native faunal species dependant on them.

Potential Impacts to Protected Species

Seabirds

The principal potential impact that construction and operation of the Anahola solar project poses to protected seabirds is the increased threat that birds will be downed after becoming disoriented by lights associated with the project during the nesting season. The two main ways that outdoor lighting could pose a threat to these nocturnally flying seabirds is if, 1) during construction it is deemed expedient, or necessary to conduct nighttime construction activities, and 2) following build-out, the potential operation of streetlights and exterior safety and security lighting.

Hawaiian hoary bat

The principal potential impact that the development of the Anahola solar project poses to bats is during the clearing and grubbing phases of construction as vegetation is removed. The removal of vegetation within the project site may temporarily displace individual bats, which may use the vegetation as a roosting location. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season, females carrying their pups may be less able to rapidly vacate a roost site as the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage. Very small pups may be unable to flee a tree that is being felled. Potential adverse effects from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 4.6 meters (15-feet), between June 15 and September 15, the period in which bats are potentially at risk from vegetation clearing. With that said, there is very little suitable bat roosting habitat present within the site. The densest areas of Christmas berry and the ornamental fruit trees dotted about the site represent the only habitat present that might be used by roosting bats.

Critical Habitat

There is no federally delineated Critical Habitat for any species present on or adjacent to the project area. Thus the development and operation of the proposed project will not result in impacts to federally designated Critical Habitat. There is no equivalent statute under State law.

Recommendations

1. All exterior lights installed in conjunction with the proposed project should be shielded to reduce the potential for interactions of nocturnally flying seabirds with external lights and man-made structures (Reed *et al.*, 1985; Telfer *et al.*, 1987). Any lighting fixtures that meet the "Dark Skies" guidelines are appropriate.

2. It is recommended that woody vegetation taller than 4.6 meters (15-feet), not be cleared between June 1 and September 15, the period in which bats are potentially at risk from vegetation clearing.

Glossary

Alien – Introduced to Hawai‘i by humans
Commensal – Animals that share human food and lodgings, such as rats, mice cats and dogs.
Crepuscular – Twilight hours
Endangered – Listed and protected under the Endangered Species Act of 1973, as amended (ESA) as an endangered species
Endemic – Native to the Hawaiian Islands and unique to Hawai‘i
Indigenous – Native to the Hawaiian Islands, but also found elsewhere naturally
Mauka – Upslope, towards the mountains
Muridae – Rodents, including rats, mice and voles, one of the most diverse family of mammals
Naturalized – A plant or animal that has become established in an area that it is not indigenous to
Nocturnal – Night-time, after dark
‘Ōpe‘ape‘a – Endemic endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*)
Pelagic – An animal that spends its life at sea – in this case seabirds that only return to land to nest and rear their young
Phylogenetic – The evolutionary order that organisms are arranged by
Ruderal – Disturbed, rocky, rubbishy areas, such as old agricultural fields and rock piles
Sign – Biological term referring to tracks, scat, rubbing, odor, marks, nests, and other signs created by animals by which their presence may be detected
Taxa – a taxonomic group of any rank, such as a species, family, or class
Threatened – Listed and protected under the ESA as a threatened species.

DHHL – Department of Hawaiian Home Lands
DLNR – Hawai‘i State Department of Land & Natural Resources
DOFAW – Division of Forestry and Wildlife
ESA – Endangered Species Act of 1973, as amended
GPS – Global Positioning System, an accurate worldwide navigational and surveying facility based on the reception of signals from an array of orbiting satellites.
KRS One - KIUC Renewable Solutions One LLC
MSL – Mean sea level
MW – Megawatt
MWh – Megawatt hours
TMK – Tax Map Key
USFWS – United State Fish & Wildlife Service
UTM – Universal Transverse Mercator System, a standardized mapping coordinate system that uses grids to identify the specific location of any feature on the surface of the planet

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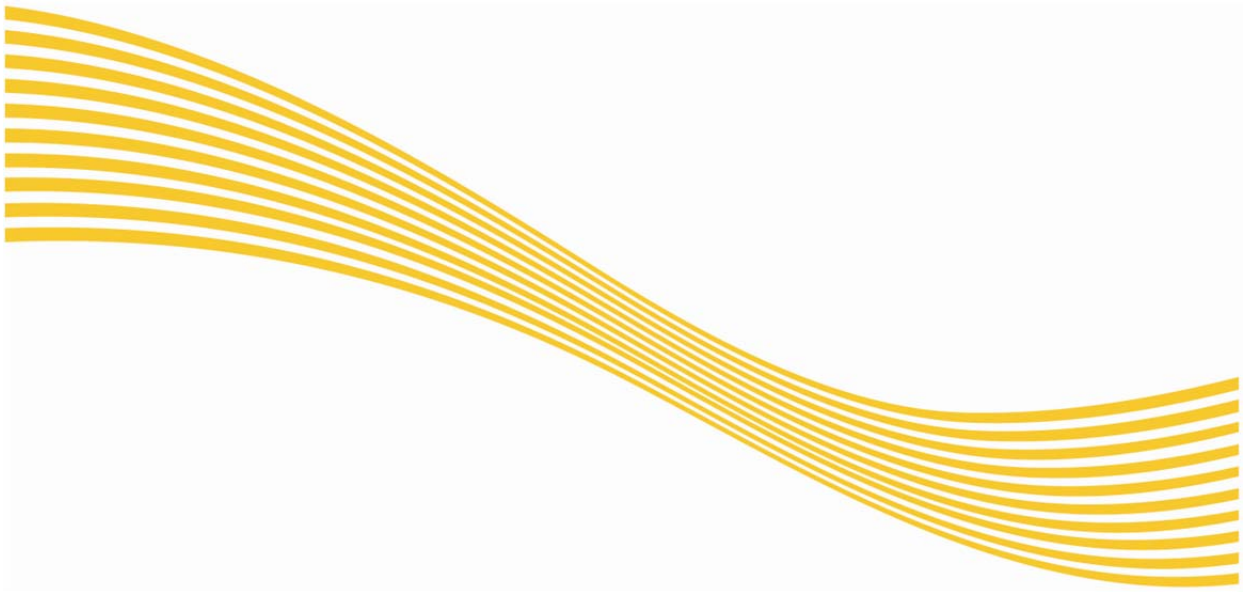
C. VEGETATION MANAGEMENT PLAN

Vegetation Management Plan

KIUC Anahola
12MW Solar Power Plant

REC PROJECT # 401C-000ANAH

December 5, 2012



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1.0 Introduction

The purpose of this Vegetation Management Plan (VMP) is to outline several methods of controlling the vegetation within the 53 acre, 12MW fixed tilt ground mounted solar farm for Kaua'i Island Utility Cooperative. Vegetation management is necessary to implement construction of the proposed solar facilities and to control vegetation from shading or interfering with solar equipment and general site maintenance procedures.

There are a variety of conditions on the solar project site such as maintenance roadways, access aisles, drainage facilities, inverter station structures, fence lines, and partially shaded areas directly beneath the solar arrays. Because of the variety of site conditions there will be an integrated approach to eradicating unwanted vegetation and controlling desirable vegetation. The goal of the VMP is to control dense woody vegetation, vines, tall grasses and noxious invasive vegetation around solar arrays, structures, access roads, and in any location that may reduce solar access to subject solar panels.

2.0 Primary Goals and Objectives of the VMP

The primary goal of this VMP is to outline the standard operating procedures for vegetation management operations on the 53 acre ground mounted solar farm. Its purpose is to document the owner's practices and standard procedures which are designed to control undesirable vegetation on the site while minimizing the risk of undesirable effects on human health and the environment. It also provides guidance for the technicians contracted by the owner to physically accomplish the VMP.

The following items are objectives that must be taken into consideration as part of the primary goal of the Vegetation Management Plan:

- To ensure full solar access to solar array
- To ensure full access to solar equipment for maintenance and repair purposes
- To minimize on site erosion and sediment transport
- To reduce airborne dust particles
- To increase water infiltration
- To minimize the frequency of maintenance cycles (vegetation management)
- To minimize the need for herbicidal control measures

3.0 Existing Site Conditions

Location:

The proposed solar project is located in Anahola, in the district of Kawaihau on the island of Kaua'i. The property is bounded on the north, west, and south by undeveloped agricultural lands and to the east by Kūhio Highway.

Climate:

Anahola has a mild year-round climate as cool trade winds from the northeast prevail throughout the year with occasional Kona winds originating from the southwest direction.

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Temperatures at the site range from 60 to 85 degrees annually and the average annual rainfall is approximately 48 inches. See the chart below for monthly rainfall averages.

Annual Average Total Precipitation (in.)											
Period of Record : 10/1/1949 to 10/31/2000											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6.23	4.42	5.08	4.79	3.26	1.55	2.46	2.39	2.03	4.52	5.64	6.32
								Average Annual Total:			48.7
Source: Western Regional Climate Center, wrcc@dri.edu											

3.1 Existing Vegetation

The site was formerly used for the cultivation of sugar cane and is currently primarily vegetated with introduced species and is open pasture. During a site visit the following inventory of plants were found either on or near the project site:

***African tulip tree**
Spathodea campanulata
Growth Habit: Tree
Height: up to 40ft.
Growth Rate: Rapid

***Guinea Grass**
Panicum maximum
Growth Habit: Grass
Height: 3-12ft.
Growth Rate: Rapid

Kikuyu grass
Cenchrus clandestinus
Growth Habit: Grass
Height: 3-5”
Growth Rate: Med.

California grass
Urochloa mutica
Growth Habit: Grass
Height: up to 3ft.
Growth Rate: Rapid

***Haole Koa**
Leucaena leucocephala
Growth Habit: Small Tree
Height: 6-12ft.
Growth Rate: Med to Fast

St. Augustine grass
Stenotaphrum secundatum
Growth Habit: Grass
Height:6-12”
Growth Rate: Med. to Fast

***Cane grass**
Cenchrus purpureus
Growth Habit: Grass
Height:
Growth Rate: Rapid

Hilo grass
Paspalum conjugatum
Growth Habit: Grass
Height: 12-18”
Growth Rate: Med. to Fast

***Lantana**
Lantana Camara
Growth Habit: Shrub
Height: 3-4ft.
Growth Rate: Med. to Fast

***Christmas berry**
Schinus terebinthifolius
Growth Habit: Tree
Height: 15-20ft.
Growth Rate: med. to fast

***Java plum**
Syzygium cumini
Growth Habit: Tree
Height: 20-30ft.
Growth Rate: Med. to Fast

Wide-leaved carpet grass
Axonopus compressus
Growth Habit: Grass
Height: 6-12”
Growth Rate: Med. to Fast

***Target Vegetation:** Vegetation to be controlled or removed

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4.0 Identification of Target and Non-target Vegetation

Target Vegetation:

Vegetation that interferes with solar access, maintenance and emergency repairs must be removed or controlled to prevent it from reestablishing itself sufficiently to interfere with site operations. These species include any of the tree or shrub species as well as grass species that exceed 18". Examples include, but are not limited to African Tulip, Christmas Berry, Guinea Grass, Haole Koa, Java Plum and Lantana. Other vegetation that may cause adverse effects to the efficient operation of the solar array is climbing vines and should be eradicated. These species may include but are not limited to Cat's-claw Vine, Wood Rose Vine and the Trumpet Vine.

Non-target Vegetation:

Vegetation that is generally encouraged includes herbaceous growth that matures at less than 18" in height, unless it is categorized as a climbing vine, and accepts periodic mowing. Examples include, but are not limited to Bermuda Grass, Rye Grass, Hilo Grass, Kikuyu grass, St. Augustine Grass, and Wide-leaved carpet grass.

5.0 Summary of new site conditions

Approximately 43% (approx. 23 acres) of the site will be shaded under solar panel arrays and be primarily void of vegetation, 20% (approx. 11 acres) of the site will be between the solar panel arrays (rows) and be vegetated with non-target species and introduced grass species, and 37% (approx. 19 acres) of the site will be exposed to full sun (2% gravel road and 35% vegetated border and storm water retention basins) and with the exception of the gravel road will be vegetated with non-target species and introduced low growing grasses to compete with other vegetation that currently exists on the site that is allowed to remain. In general the proposed graded areas and constructed storm water detention basins will receive a hydroseed treatment. Hydroseeding (or hydraulic mulch seeding, hydro-mulching) is a planting process which utilizes a slurry of seed and mulch. The slurry is transported in a tank, either truck- or trailer-mounted and sprayed over prepared ground. As the VMP is implemented, the reoccurrence of target species will become less prevalent, and non-target species will dominate the site.

5.1 Effect of Solar Array on Plant Growth

Shaded areas under the arrays will impact vegetation on the site due to reduced moisture and sunlight. Although there will be increased shading and dryer soil conditions directly beneath the panel arrays, vegetation can become established if not properly controlled. During precipitation events drip lines between the panels in the arrays will allow water to reach the area under the panel arrays. This moist soil condition can allow vegetation to become established along these drip lines and over time will reach maturity if not properly controlled.

6.0 Establishing New Plant Species

New plant species outside the limits of grading will consist primarily of naturally occurring vegetation (non-target species plus target-species such as Guinea Grass that contributes toward soil stabilization and can be controlled by mowing), and introduced low growing grasses. Areas that are within the limits of grading will consist of low growing drought tolerant grasses that assist in the reduction of airborne dust and soil erosion. These species will be planted utilizing a hydroseeding process and include, but are not limited to Ryegrass and Bermuda Grass. Initially the Ryegrass will establish itself and assist in reducing airborne dust

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and soil erosion while allowing the Bermuda Grass to fill in. Once established, the Bermuda Grass will provide long term soil stabilization and accept a regular maintenance program.

6.1 New plant species water needs

Newly introduced grass species will require a temporary irrigation system in order to become fully established. Germination of the grass seed can take from 7-14 days and requires increased water as shown in the table below. To fully establish and stabilize new grasses requires continued watering and, depending on the weather, this continued watering can be required for an additional 3-6 months after the grass seeds have germinated. After permanent grasses are established, no further watering is needed. The chart below shows a maximum daily water usage from a temporary sprinkler system that would be needed to establish introduced grasses.

		Stage of Development	
		Germinate	Stabilize
Construction Phase	Seeded Acreage	Gal/day	Gal/day
Phase 1	8.5	80,325	26,775
Phase 2	8.5	80,325	26,775
Phase 3	3	28,350	9,450

To supply the temporary water needed to establish new grass species on the project site two water sources will be available for use. The primary water source will be an onsite well that will be permitted and drilled inside the project boundaries. The onsite well will provide sufficient water needed for 100% of the irrigation needs. The well will be similar to other typical local wells of approximately 400 feet deep. The well pumping system will employ a typical 20hp three phase electrical motor supplied from electric service onsite. The well will be drilled, cased, pump tested and permitted to meet local Kauai County Well Construction standards. The sole use of the well will be to provide water to irrigate and establish plants and grasses on the project site.

Water from the well will be used to supply temporary irrigation sprinklers set up in the newly seeded areas. Temporary sprinkler systems will be installed in newly seeded areas and remain in place during the germination and stabilize time periods to establish new grasses. Once the new grasses are established the temporary sprinkler systems will be removed. The onsite well will remain in place and used on an as needed basis only for irrigation in the future.

A backup water source at an existing KIUC power station with sufficient extra capacity has also been identified to support water needs if needed. The backup water source is surface water from the Kapaia Reservoir. There is a 16" buried pipe from the reservoir to the KIUC Kapaia Power Station. The plant currently draws 0.3 MGD from the pipe for its operations. There is adequate space to load a water truck next to the pipeline so that trucks could fill up throughout the day. The distance between the power station and the proposed solar farm is 13 miles, one way. This source would only be used as a backup only.

In order to reduce water needs onsite the use of a temporary biodegradable erosion control tackifier product may be applied to limited areas prior to establishing permanent grasses. Small newly graded areas on the site that do not have vehicle traffic present are areas that will be considered for the application of erosion control tackifier. The tackifier product is applied to the ground similar to a hydroseeding process and is used to aid in protecting the ground from short term erosion.

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Tackifier applications can last from 1-3 months and provide sufficient stabilization of the soil to reduce water needs for the establishment of temporary grasses such as rye grass. Biodegradable tackifier products can be removed with water applied to that area. The amount of water savings is dependent on the amount of area suitable to the use of a tackifier product.

7.0 Vegetation Management

Vegetation Management involves caring for and/or controlling vegetation that grow within the project boundaries. The ultimate goal is to eliminate tall growing grasses, woody trees and shrubs and other noxious weed species such as climbing vines and allowing desirable vegetation to remain. If managed properly, non-target vegetation can become self-sustaining over time and require less maintenance. When combined with other control measures, herbicide use can be minimized or eliminated over time. Vegetation Management tools include:

- Mowing and string trimming
- Hand removal of target species in difficult to access areas
- Mulch cover
- Weed barrier fabric
- Selectively using herbicides
- Re-vegetation with low growing plant species

7.1 Vegetation Management Control Methods

Mechanical and herbicidal controls work together to support the establishment and viability of naturally occurring and introduced low growing vegetation. A combination of hand cutting, mowing, string trimming, selective pruning, selective foliar treatment, low volume basal treatments, mulching, weed barrier fabric, stump removal and cut stump treatments will be the primary methods of vegetation control. Treatment methods used will vary depending on the target species composition and density, site access, and topography.

Timing all herbicide applications and avoiding fixed schedules is important to maximize control while minimizing herbicide use. The advantage of a flexible VMP program is the ability to apply the appropriate mechanical and herbicidal control methods to meet the given site conditions. Selective herbicide application treatment methods effectively remove vegetation that would otherwise compete and dominate the non-target species. In addition to mechanical and herbicidal control methods, applying a weed barrier fabric or a thick layer of course grade mulch in the area underneath the solar arrays can deter vegetation from becoming established for a period of time after which a new application will be required. Weed barrier fabric or mulch can prevent vegetation from becoming established by thoroughly covering the soil and depriving weed seeds of the light they need to germinate, and preventing them from rooting directly into the soil. The effective longevity of the weed barrier fabric or mulch depends on the parent material from which the mulch is derived as well as the exposure to moisture and sunlight.

7.1.1 Mechanical Control Methods

Mowing

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- Mowing is the mechanical cutting of vegetation using sickle, flail or rotary cutting equipment and may be used at any time of the year except during heavy rainfall periods
- Selection of specific equipment is based on terrain, target vegetation size and equipment availability. Commercial grade mowers commonly used in the industry will be suitable for vegetation management on this site.
- Mowing may be restricted by steep slopes, target vegetation size, soil moisture content and weather conditions
- Once the Target Vegetation is removed or controlled, mowing will be the primary mode of vegetation control (approx. 29 acres) with the exception of target vegetation that exceeds the ability of the equipment to operate and difficult to access areas such as under solar panel arrays, detention basins, and steep slopes

String Trimming

- String trimming consists of using a powered hand held device that uses a flexible monofilament line instead of a blade for cutting grass and other non-woody vegetation. This will be primarily used in difficult to access areas such as underneath the panel arrays, near and around the panel mounting anchors and steep slopes.

Hand Cutting

- Hand cutting is used in situations where mowing is not practical and includes the mechanical cutting of target species using chain saws, brush saws, loppers, hand pruners, machetes, or other hand operated pruning devices.
- Hand cutting may be conducted at any time of the year
- Target species are to be physically removed (including roots) or cut as close as possible to the ground

Mulch

- These practices involve the application of barrier materials to form a temporary, protective soil cover, and can be implemented as a pre-made decomposable fabric or applied as a loose material.
- Mulch produced from the debris generated in cutting operations (slash) and will be disposed of by chipping or mulching machinery and scattered uniformly over the site at depths not exceeding 6” in depth. Slash will not to be placed in areas targeted for hydroseed treatment.
- Mulch bark chips, shredded bark and other green waste by products of the tree maintenance industry are commonly used as mulches. Typical effective life-cycle of a quality mulch layer to suppress weeds is from 1-3 years after which time it will need to be re-applied. They may be applied by hand or with a mulch blower. The mulch should be free of mold, dirt, sawdust and not be in a state of decomposition.
- The proposed civil plan includes grubbing each phase area of the project site and the grubbed material will remain on site as mulch. This material will remain in place as it is cut and will serve as the first application of mulch under the solar panels. It is estimated that enough grubbed material will be available to provide a uniform 4” layer of mulch under the arrays.
- Future applications of mulch should include a uniform 4” layer under the solar arrays. Approximately 12,000 cubic yards of mulch will be required for this operation.

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Weed Barrier Fabric

- Weed barrier fabric is a geotextile fabric usually made from synthetic materials such as polypropylene which have added UV resistant properties. The fabric is a semi-permanent barrier which suppresses weed growth and shields the bare soil surface from erosion.
- Application of a rolled weed barrier is anticipated to only be needed between the steel foundation posts under the arrays. The front and back edges of the solar arrays will not need a weed barrier as mechanical mowing and string trimming will be employed in these areas.
- Weed barrier fabric is typically manufactured in 300 foot long rolls and custom widths. The fabric that may be used for this project could have an 8 foot width to match the spacing between the steel posts. Approximately 80,000 linear feet of weed barrier fabric is estimated to be needed for this control method.
- The barrier fabric is installed beneath the arrays by rolling out the material and staking it to the ground at regular intervals. In addition, an herbicidal pre-emergent can be applied to the soil before the weed barrier is applied to prevent weeds from germinating under the barrier.
- Typical weed barrier fabric life-cycles range from 3-7 years based on the manufacturers specifications after which time sections that degrade will need to be re-applied. These ratings are based on the product being in direct sunlight for the duration of its use. Because the weed barrier for this project will be under the solar arrays and not in direct sunlight it is estimated that the weed barrier will last closer to 10 years.

7.1.2 Herbicidal Controls

Herbicide applications include foliar basal and cut stump surface treatments. Herbicides are applied as mixtures consisting of herbicide formulation(s), adjuvants, carriers and additives. The selection of and timing of herbicide applications, materials, and mixture rates are to follow the manufacturer's recommendations and local regulations. The following are the more common criteria for the classification of herbicides.

Pre-emergent herbicides are applied to the soil to prevent the germination and growth of seedling plants usually as applied through soil uptake. Typically these herbicides have no foliar activity, though some are effective on existing vegetation. These herbicides can be classified as "soil active."

Post-emergent herbicides are applied to existing vegetation. Uptake to the plant is through the foliage, including through the stem. With a few exceptions, post-emergent herbicides have little or no viable soil activity. These herbicides can be classified as "foliar active."

Individual herbicides have different levels of effectiveness on target vegetation species and under different conditions. No herbicide is equally effective on all target species and certain herbicides are more effective on certain target species than others. The applicator shall follow manufacturer guidelines, all regulatory rules that apply, and utilize best management practices for the use of herbicides on site.

Specifically for the Anahola Solar Project, a combined use of pre-emergent and post-emergent herbicides could be used. A pre-emergent could be applied to the ground beneath the solar arrays before the mulch or weed barrier is applied. Post-emergent herbicides may be used on an as needed basis to control localized weed growth around the steel posts.

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8.0 Vegetation Management Plan Phasing

The VMP will be executed in three primary phases explained below. The project site consists of three primary areas with grubbing and grading areas less 10 acres each. Each project area will go thru the VMP Phase 1 separately as explained below. Prior to moving on to the next project area, the current area going through the VMP Phase 1 process outlined below will meet established soil erosion stabilization standards.

Once the entire site is finished with construction, VMP Phases 2&3 outlined below will be followed for the entire project site.

PHASE I (CONSTRUCTION)

- Removing and Chipping large woody Target Species over 1" in diameter
- Removing Target Species stumps and basal clumps
- Scattering chips uniformly over site a depth no greater than 4". Areas which have been graded for the access paths will be hydoseeded and will not be mulched.
- Application of herbicide to remaining target species as required (foliar basal and stump treatment)
- Areas under the arrays will be treated with the final solution of a weed barrier fabric or mulch.
- Install both temporary and permanent vegetative grasses to prevent dust emission and silt runoff
- Install temporary sprinkler system concurrently with plantings. The estimated water usage of this temporary sprinkler system will depend on the stage of development of the planting and the construction phase. See section 7 for details on sprinkler system water usage.

PHASE II (POST-CONSTRUCTION)

- Mow site on a monthly basis or as required to maintain vegetation a height no greater than 18"
- Apply herbicide to Target Species as required
- Uniformly lay out weed barrier fabric or spread course grade mulch under panel arrays at a thickness of 4" to suppress weed germination.

PHASE III (ONGOING MAINTENANCE)

- A monthly vegetation management plan will be established throughout the life of the plant to control vegetation. A combination of mowing, hand cutting, string trimming, and herbicides will be used to control vegetation.
    - > Establish a mowing program that considers local weather patterns and growing seasons to maintain grass height below 12-18 inches.
    - > Perform regular hand and string trimmer maintenance in difficult to access areas

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- Use of herbicides on an as needed basis only to control target vegetation occurring in difficult to access areas and spot treatment of reoccurring woody tree and shrub species.

- For areas with weed barrier fabric: Perform an annual inspection of the weed barrier fabric for damage to the fabric and weed growth on top of or through breaks in the fabric. Any weeds shall be removed and any breeches in the fabric shall be patched.
- For areas with mulch: inspect the mulch layer quarterly and immediately after any significant wind and rain event for proper specified depth. Maintain a four inch thick layer of course grade mulch in order to deter establishment of vegetation.

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D. AGENCY CONSULTATION

PLANNING SOLUTIONS

January 19, 2012

Ms. Cynthia Stiles, Assistant State Soil Scientist
USDA-NRCS Pacific Islands Area
300 Ala Moana Blvd. Room 4-118
Honolulu, HI 96850-0050 USA

Subject: USDA Form AD-1006 Farmland Conversion Impact Rating for Anahola Solar Project on Behalf of the Rural Utility Service

Dear Ms. Stiles:

Thank you for speaking with me this morning about the submission process for Form AD-1006. As we discussed, I am sending you a partially complete draft of the form. To provide background, Kaua'i Island Utility Cooperative (KIUC), Kaua'i's electrical utility provider, is preparing an Environmental Report (ER) for submission to the Rural Utility Service (RUS). Planning Solutions, Inc. is assisting KIUC in preparing the ER for submission to the RUS. The ER is in support of a proposed 55-acre photovoltaic electrical generation facility and substation in Anahola, Kaua'i, Hawai'i, and the RUS will use it as the basis of an Environmental Assessment which it will prepare.

The proposed Anahola Solar Project will involve the conversion of agricultural lands to non-farmland use, and will use federal funds. According to the U.S. Department of Agriculture, Soil Conservation Service and the College of Tropical Agriculture at University of Hawai'i's Agricultural Lands of Importance to the State of Hawai'i maps, the site is located on "Prime" agricultural lands. Because of this, and pursuant to the requirements of the Farm Policy Protection Act, we have prepared a Farmland Conversion Impact Rating (AD-1006) document and support materials for review and input by the NRCS.

We are also including a GIS shapefile of the Anahola Service Center project footprint to assist in your analysis.

If you have any questions, or would like any additional information, please contact me at (808) 550-4483.

Sincerely,

Makena White
Planning Solutions, Inc.

Attachments:
(1) Form AD-1006
(2) Map of Land Use Within One Mile of Solar Project
(3) Shapefile of Anahola Solar Project Footprint

cc: Steve Rymsha, KIUC (electronic only)
Brad Rockwell, KIUC (electronic only)

Ward Plaza, Suite 330 • 210 Ward Avenue • Honolulu, Hawaii 96814-4012
Phone: 808 550-4483 • Fax: 808 550-4549 • www.psi-hi.com

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 1/31/12
Name Of Project Anahola Solar Project	Federal Agency Involved Rural Utility Service
Proposed Land Use Electrical Utility	County And State County of Kauai, State of Hawaii
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 1/18/12

Does the site contain prime, unique, statewide or local important farmland? Yes ☑ No ☐ (*If no, the FPPA does not apply -- do not complete additional parts of this form).*

Acres Irrigated	Average Farm Size
19595	203

Major Crop(s)	Farmable Land In Govt. Jurisdiction	Amount Of Farmland As Defined in FPPA
Not farmed	Acres: 98000 % 28	Acres: 92000 % 26

Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By NRCS
State of HI, LESA	None	2/16/12

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	55.0			
B. Total Acres To Be Converted Indirectly	0.0			
C. Total Acres In Site	55.0	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland	55.0			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.0			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	34.5			
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	91	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use	15	14			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	0			
4. Protection Provided By State And Local Government	20	20			
5. Distance From Urban Builtup Area	15	0			
6. Distance To Urban Support Services	15	10			
7. Size Of Present Farm Unit Compared To Average	10	0			
8. Creation Of Nonfarmable Farmland	10	0			
9. Availability Of Farm Support Services	5	2			
10. On-Farm Investments	20	0			
11. Effects Of Conversion On Farm Support Services	10	0			
12. Compatibility With Existing Agricultural Use	10	0			
TOTAL SITE ASSESSMENT POINTS	160	56	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	91	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	56	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	147	0	0	0

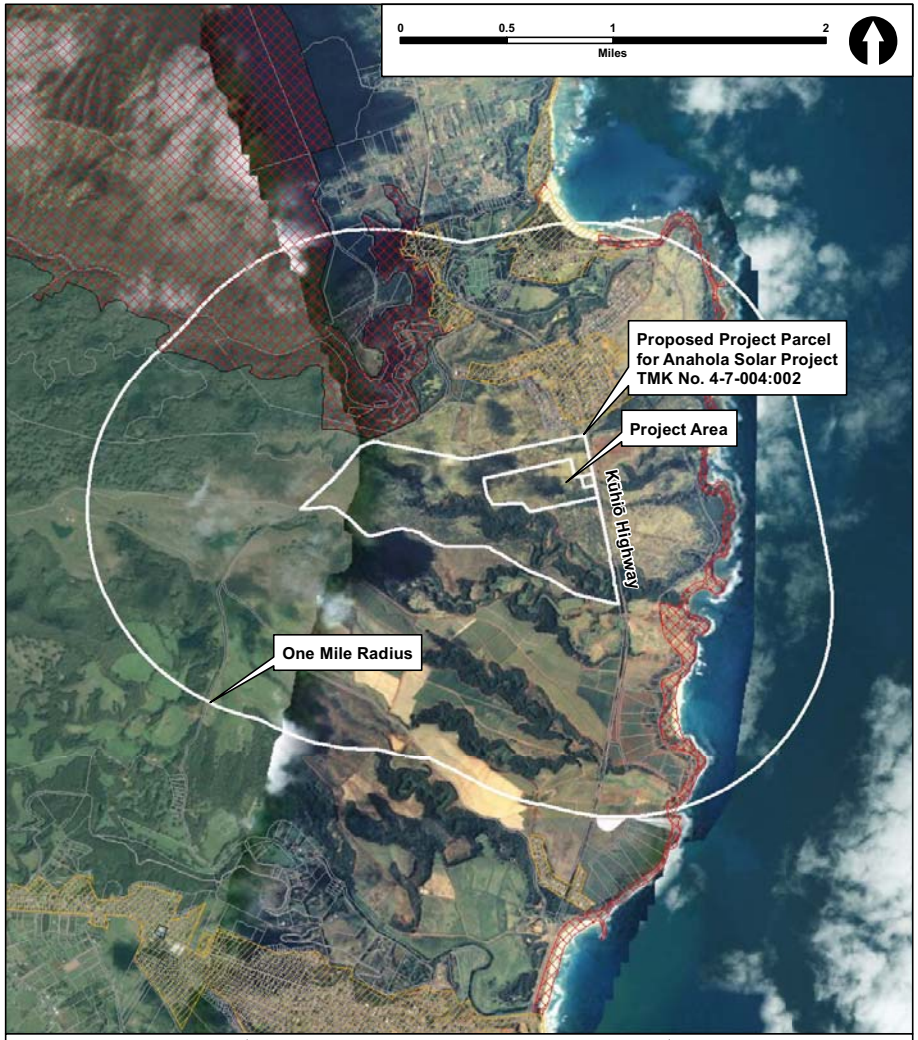
Site Selected: Site A	Date Of Selection 2/17/12	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection: Please see attached document providing criteria for each site assessment score.

(See Instructions on reverse side)

Form AD-1006 (10-83)

This form was electronically produced by National Production Services Staff



Justification of AD-1006 Part IV Scoring for Anahola Solar Project (Photovoltaic Electrical Generation)

The following provides an explanation of the scoring applied to each of the Site Assessment Criteria, pursuant to 7 CFR §658.5(b).

1. Area in Nonurban Use

A review of the State of Hawai'i GIS State Land Use Districts shapefile, aerial photography of the site, and multiple site visits indicate that approximately 85 percent of the surrounding area within one mile of the proposed project site is currently in non-urban use. This is consistent with the largely Agricultural and Conservation zoning of that land. **– 14 points**

2. Perimeter in Nonurban Use

There is no urban usage along the perimeter of the proposed project. There is a road adjacent to one edge of the project site but the usage across the road is nonurban and thus does not qualify as an urban use. **– 10 points**

3. Percent of Site Being Farmed

No portion of the project site has been farmed in any of the last ten years. **– 0 points**

4. Protection Provided By State and Local Government

An examination of the State of Hawai'i GIS land use shapefile indicates that the site is entirely within the State Agricultural land use district (see Criterion 8C of the Site Assessment Scoring Guide). KIUC's consultation with the County of Kaua'i Planning Department indicates the site is zoned for agriculture (see Criterion 4 of the Site Assessment Scoring Guide). **– 20 points**

5. Distance from Urban Built-up Area

The nearest built-up urban area is Anahola Village, the nearest point of which is approximately 750 feet away from the project site. **– 0 points**

6. Distance to Urban Support Services

There is no electrical, sewer, or water service on the project site but some exist within half a mile. An examination of Figure 3-1 in the County of Kaua'1, Department of Water, *Water Plan 2020* document indicates that the nearest municipal water service is in Anahola Village, the closest portion of which is approximately 750 feet away. The nearest electrical utility facilities are KIUC's power lines that run along Kūhiō Highway, directly east of the project site. The nearest sewer facilities are in Wailua-Kapa'a approximately 3 miles away. **– 10 points**

7. Size of Present Farm Unit Compared to Average

The proposed project is 55 acres in size, as compared with the USDA's estimated average farm size in Kaua'i County of 203 acres. This represents a project size of less than 50% of the average. – **0 points**

8. Creation of Non-farmable Farmland

The total area of the project parcel is 422 acres; 55 acres will be used for the proposed project, leaving a remaining 367 acres. Of those 367 acres, none will be rendered non-farmable by interrupting land patterns of use or access. – **0 points**

9. Availability of Farm Support Services
The site does not have any farm support services present and has been out of agricultural use for at least a decade. Some farm support services, such as a farmer's market, are available in the nearby community of Anahola. – **2 points**

10. On-Farm Investments
The site has no substantial or well-maintained on farm investments such as barns or other forms of storage structures, terraces, orchards, drainage, or irrigation facilities. **– 0 points**

11. Effects of Conversion on Farm Support Services
Because there has been no agricultural use of this land for at least 10 years, the conversion of this land to alternative energy production will not cause any reduction in the demand for farm support services in the region. – **0 points**

12. Compatibility with Existing Agricultural Use
The type and intensity of use proposed for the Anahola Solar Project would not be incompatible with agriculture and it not likely to contribute to the eventual conversion of the surrounding farmland to nonagricultural uses. – **0 points**

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X-Forefront-Antispam-Report: CIP:199.135.140.16;KIP:(null);UIP:(null);IPV:NLI;H:mail.usda.gov;RD:none;EFVD:NLI
From: "Stiles, Cynthia - NRCS, Honolulu, HI" <cynthia.stiles@hi.usda.gov>
To: Makena White <makena@psi-hi.com>
Subject: RE: NRCS completed form AD-1006
Thread-Topic: NRCS completed form AD-1006
Thread-Index: AcztBL6K2lV7KALCSqmj9s8z9dmszgAzM/0AAPVNwtA=
Date: Wed, 22 Feb 2012 21:22:57 +0000
Accept-Language: en-US
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X-MS-TNEF-Correlator:
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X-OriginatorOrg: hi.usda.gov
X-Nonspam: None
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Hello Makena – I am so sorry to have been out of town when you called. I just got back into the office (and through my reams of e-mails) just today. The form and justifications look fine to me. We merely record-keep on this information and the completion of the form shows that your company is performing 'due diligence' on behalf of the project.

The electronic copies are satisfactory for my record-keeping, as I keep all correspondence and files in my computer for later archiving. Cheers, Cindy

Cynthia A. Stiles, Ph.D
Assistant State Soil Scientist - Pacific Islands Area
300 Ala Moana Blvd, Rm 4-118
Honolulu, HI 96850-0050
(808)541-2600 ext. 129
cynthia.stiles@hi.usda.gov

From: Makena White [mailto:makena@psi-hi.com]
Sent: Friday, February 17, 2012 2:09 PM
To: Stiles, Cynthia - NRCS, Honolulu, HI
Cc: Rockwell, Brad W.; Rymsha, Steven; julia@psi-hi.com; pwhite@psi-hi.com
Subject: Re: NRCS completed form AD-1006

Aloha Cindy,

I am returning to you, as attachments to this email the completed AD-1006 Farmland Conversion Impact Rating form for the Anahola Solar Project and the associated scoring justifications which you requested. Please take a look at these two documents and let me know if you have any questions.

In the past I have conducted submissions to the NRCS via email; if you would prefer hard copy I would be happy to provide them to you. Thank you very much for your time and assistance in preparing these documents.

Mahalo,
Makena White

Planning Solutions, Inc.
210 Ward Avenue, Suite 330
Honolulu, Hawaii 96814
(808) 550-4538

At 01:43 PM 2/16/2012, you wrote:

Makena: Here is a digital copy of the AD-1006 with completed NRCS sections (II and IV). I will be sending a hard copy letter out to you with this same form and a cover letter tomorrow. Feel free to proceed with your scoring (Pt VI and VII) with this electronic copy I have provided. Please contact me if you have further questions on the form. Cheers, Cindy

Cynthia A. Stiles, Ph.D
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cynthia.stiles@hi.usda.gov


smime7.p7s

PLANNING SOLUTIONS

June 22, 2012

Mr. Loyal Mehrhoff
Field Supervisor
U.S. Fish and Wildlife Service
300 Ala Moana Blvd, Room 3-122
Honolulu, HI 96813

Subject: Kaua'i Island Utilities Cooperative
Anahola Solar Facility & Service Center Project — Anahola, Kaua'i, Hawai'i

Dear Mr. Mehrhoff:

The Kaua'i Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, which will involve the construction of a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kaua'i, Hawai'i (the Project). RUS may fund the proposed Project, thereby making it an action subject to the National Environmental Policy Act, and all applicable federal environmental law and regulation. In order to fulfill the agencies' responsibilities under the Endangered Species Act, RUS has designated KIUC and its consultant, Planning Solutions, Inc., as its non-Federal representative initiating informal Section 7 consultation pursuant to 50 CFR 402.08 "Designation of a Non-Federal Representative" (see attached June 14, 2012 letter from RUS).

KIUC has proposed the Project to provide clean, renewable, and affordable power to the people of Kaua'i, and reduce KIUC's dependence on imported fossil fuels. The proposed Project will be located on 60-acres of Department of Hawaiian Home Lands (DHHL) owned land, within which the photovoltaic facility, substation, service center, access roads, and storage yards will be located. KIUC proposes to construct a low-profile photovoltaic module system; panels would be mounted on pipe frames anchored by concrete piers (12-inch diameter, and 36 to 60 inches deep). Power generated by the panels would be collected at pull boxes and transmitted to a substation near the highway. The substation would occupy a 2-acre area adjacent to the highway; it would contain transformers, switches, controls, batteries, and other electrical equipment that would allow KIUC to feed power into the existing electrical power lines along Kūhiō Highway. The 5-acre service center would contain offices, storage areas, and other facilities that would support KIUC operations in this part of the island.

We respectfully request your review of the enclosed materials including, the biological survey, map of the project area, and the description of the proposed Project (Attachments 2, 3, and 4) within thirty (30) days of your receipt of this correspondence. If you have any questions or wish to further discuss this project, please contact me at (808) 550-4483.

Sincerely,

Perry J. White

Attachments:
(1) RUS June 14, 2012 Letter
(2) Map of Project Area
(3) Description of Proposed Action
(4) Biological Survey (DVD copy)

cc: Brad Rockwell, KIUC
Emily Orler, USDA RUS

Ward Plaza, Suite 330 • 210 Ward Avenue • Honolulu, Hawaii 96814-4012
Phone: 808 550-4483 • Fax: 808 550-4549 • www.psi-hi.com

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

June 14, 2012

Mr. Loyal Mehrhoff
Field Supervisor
U.S. Fish and Wildlife Service
300 Ala Moana Blvd, Room 3-122
Honolulu, HI 96813

Subject: Kaua'i Island Utilities Cooperative
Anahola Solar Facility & Servie Center Project — Anahola, Kaua'i, Hawai'i

Dear Mr. Mehrhoff:

The Kaua'i Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, which will involve the construction of a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kaua'i, Hawai'I (the Project). RUS may fund the proposed Project, thereby making it an action subject to the National Environmental Policy Act, and all applicable federal environmental law and regulation. In order to fulfill the agencies responsibilities under the Endangered Species Act, RUS hereby designates KIUC and its consultant, Planning Solutions, Inc., as its non-Federal representative initiating informal Section 7 consultation pursuant to 50 CFR 402.08 "Designation of a Non-Federal Representative".

If you have any questions or wish to further discuss this project, please contact Ms. Emily Orler, RUS Environmental Protection Specialist, at (202) 720-1414 or emily.orler@wdc.usda.gov.

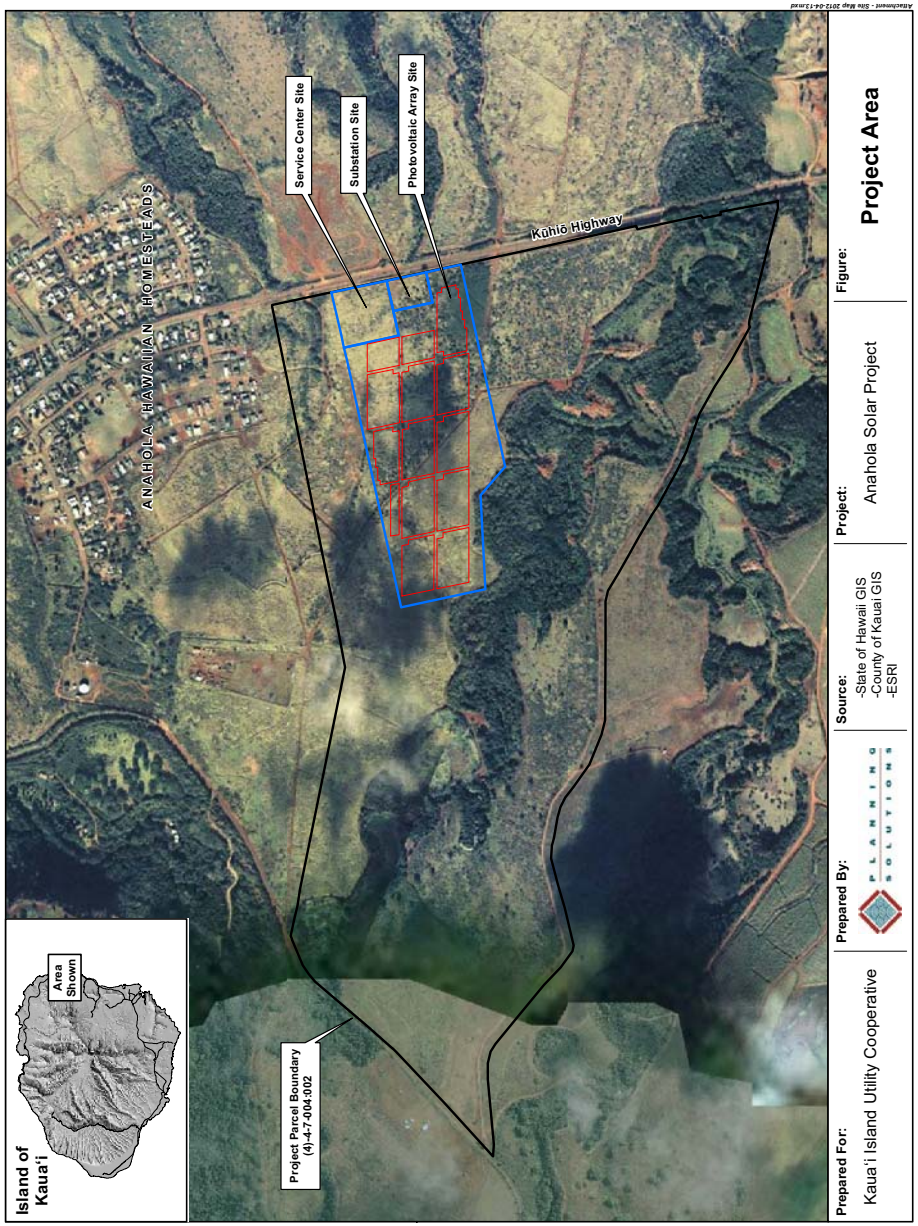
Sincerely,

Mark S. Plank

Mark S. Plank
Director, Engineering & Environmental Staff
USDA Rural Development, Utilities Programs

cc: Brad Rockwell, KIUC
Perry White, PSI

1400 Independence Ave, SW • Mail Stop 1571 • Washington, DC 20250-1571
Web: http://www.usda.gov/rus/water/ees/environ.htm



Attachment 2: Anahola Solar Project - Description of the Proposed Action

Kauai Island Utility Cooperative, through its subsidiary KIUC Renewable Solutions One, LLC ("KRS One") is planning to develop, operate, and maintain a 12 Megawatt (MW) photovoltaic facility, including a dedicated substation with interconnections to the island-wide electrical grid, and an attached service center. The proposed facilities would occupy 60 acres on the easternmost portion of a large, 422-acre parcel (TMK [4] 4-7-004:002) in Anahola, Kaua'i, Hawai'i (see Attachment 1). The parcel, which is owned by the Department of Hawaiian Home Lands (DHHL), was formerly used for sugarcane cultivation but is currently unused.

The Anahola Solar Project is expected to produce 23,525 megawatt-hours (MWh) of clean, renewable electricity per year. This represents 5.2 percent of KIUC's total electrical generation in 2010. The project components are:

1. Fifty-three acres of photovoltaic (PV) panels, inverters, and transformers providing up to 12 MW of electrical energy to KIUC's electrical grid.
2. An adjacent 2-acre substation, which will be used for control equipment for the solar farm and to boost the power from the 12 kilovolts (kV) delivered by the PV system to the 57/69 kV voltage of KIUC's electrical transmission system.
3. A service center occupying the remaining 5 acres of the 60-acre project area, which will include operational, and maintenance capacity, as well as a community meeting center and customer service office.
4. A network of shore conduits and cables which will link the PV facility to the substation and the substation with the broader KIUC transmission system.

PLANNING SOLUTIONS

June 25, 2012

Mr. Loyal Mehrhoff
Field Supervisor
U.S. Fish and Wildlife Service
300 Ala Moana Blvd, Room 3-122
Honolulu, HI 96813

Subject: Kaua'i Island Utilities Cooperative
Anahola Solar Facility & Service Center Project — Anahola, Kaua'i, Hawai'i

Dear Mr. Mehrhoff:

The Kaua'i Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, which will involve the construction of a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kaua'i, Hawai'i (the Project). RUS may fund the proposed Project, thereby making it an action subject to the National Environmental Policy Act, and all applicable federal environmental law and regulation. The project site is owned by the State of Hawai'i Department of Hawaiian Home Lands (DHHL). The Department has leased it to the non-profit Homestead Community Development Corporation (HCDC), which will lease the property to KIUC upon completion of the required environmental documentation.

DHHL and the Rural Utility Service (RUS) are preparing a joint environmental document in accordance with State and Federal Regulations. In the case of DHHL, this involves preparation of an Environmental Assessment (EA) in accordance with the provisions of Chapter 343, Hawai'i Revised Statutes and Title 11, Chapter 200 of the Hawai'i Administrative Rules (HAR §11-200). In the case of the Rural Utilities Service, this means preparing an Environmental Assessment in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The two agencies envision a joint document fulfilling both State and Federal requirements, and this consultation is being carried out accordingly. Enclosed is a map of the proposed location of the construction activity (Attachment 1), a description of the work involved (Attachment 2), and the biological survey (Attachment 3).

We respectfully request that you review the enclosed materials and your Wetland Inventory Maps to determine if wetlands will be impacted. I would appreciate it if you would provide a response, including any recommendations you may have to minimize or avoid impacts to wetlands, within thirty (30) days of your receipt of this correspondence. If you have any questions or wish to further discuss this project, please contact me at (808) 550-4483.

Sincerely,

Perry J. White

Attachments:
(1) Map of Project Area
(2) Description of Proposed Action
(3) Biological Survey Report

cc: Emily Orler, RUS
Brad Rockwell, KIUC

Ward Plaza, Suite 330 • 210 Ward Avenue • Honolulu, Hawaii 96814-4012
Phone: 808 550-4483 • Fax: 808 550-4549 • www.psi-hi.com

PLANNING SOLUTIONS

June 25, 2012

Mr. George P. Young, P.E., Chief
Regulatory Branch
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawai'i 96858-5440

Subject: Kaua'i Island Utilities Cooperative
Anahola Solar Facility & Service Center Project — Anahola, Kaua'i, Hawai'i

Dear Mr. Young:

The Kaua'i Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, which will involve the construction of a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kaua'i, Hawai'i (the Project). RUS may fund the proposed Project, thereby making it an action subject to the National Environmental Policy Act, and all applicable federal environmental law and regulation. The project site is owned by the State of Hawai'i Department of Hawaiian Home Lands (DHHL). The Department has leased it to the non-profit Homestead Community Development Corporation (HCDC), which will lease the property to KIUC upon completion of the required environmental documentation.

DHHL and the Rural Utility Service (RUS) are preparing a joint environmental document in accordance with State and Federal Regulations. In the case of DHHL, this involves preparation of an Environmental Assessment (EA) in accordance with the provisions of Chapter 343, Hawai'i Revised Statutes and Title 11, Chapter 200 of the Hawai'i Administrative Rules (HAR §11-200). In the case of the Rural Utilities Service, this means preparing an Environmental Assessment in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The two agencies envision a joint document fulfilling both State and Federal requirements, and this consultation is being carried out accordingly. Enclosed is a map of the proposed location of the construction activity (Attachment 1) and a description of the work involved (Attachment 2).

We respectfully request that you review the enclosed map of the project area and description of the proposed Project. I would appreciate a response within thirty (30) days of your receipt of this correspondence for possible impacts to 100-year floodplains, wetlands, and other important natural resources that occur in the project area. If you have any questions or wish to further discuss this project, please contact me at (808) 550-4483.

Sincerely,

Perry J. White

Attachments:
(1) Map of Project Area
(2) Description of Proposed Action

cc: Emily Orler, RUS
Brad Rockwell, KIUC

Ward Plaza, Suite 330 • 210 Ward Avenue • Honolulu, Hawaii 96814-4012
Phone: 808 550-4483 • Fax: 808 550-4549 • www.psi-hi.com

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

July 6, 2012

Regulatory Branch

File Number **POH-2012-00178**

Perry J. White
Ward Plaza, Suite 330
210 Ward Avenue
Honolulu, HI 96814-4012

Dear Mr. White:

This responds to your letter dated June 25, 2012 requesting review comments for the proposed Anahola Solar Facility & Service Center Project, Anahola, Island of Kauai, Hawaii. We have assigned this project the reference number **POH-2012-00178**. Please cite this reference number in any future communications with this office regarding this project.

We have completed our review of the submitted documents pursuant to Section 10 of the Rivers and Harbors Act of 1899 (Section 10) and Section 404 of the Clean Water Act (Section 404). Section 10 requires that a Department of the Army (DA) permit be obtained from the U.S. Army Corps of Engineers (Corps) prior to undertaking any construction, dredging, or other activity occurring in, over, or under or affecting navigable waters of the U.S. For tidal waters, the shoreward limit of the Corps jurisdiction extends to the Mean High Water Mark. Section 404 requires that a DA permit be obtained for the discharge (placement) of dredged and/or fill material into waters of the U.S., including wetlands. For tidally influenced waters, in the absence of adjacent wetlands, the shoreward limit of the Corps jurisdiction extends to the High Tide Line, which in Hawai'i may be approximated by reference to the Mean Higher High Water Mark. For non-tidal waters, the lateral limits of the Corps jurisdiction extend to the Ordinary High Water Mark or the approved delineated boundary of any adjacent wetlands.

Based on the information provided, the project site appears to be absent of navigable waters subject to the Corps jurisdiction. Therefore, Section 10 authorization may not be required. However, there is insufficient information provided to determine if the proposed project will involve activities under Section 404. Fill material, permanent or temporary, may include, but is not limited to: rock, dirt, sandbags, silt fences or concrete. To avoid unintentional violation to federal regulation and law, we advise you to contact our office prior to conducting any activity that may result in the discharge or dredged and/or fill material. Section 404 authorization may be required for this action.

When developing the Environmental Assessment, we recommend you conduct a thorough aquatic resource survey describing information regarding any potential water bodies, including wetlands, drainage ditchers, gulches, stream, etc., on-site, especially those that may be impacted by the proposed project. The survey should include descriptions of aquatic features proposed for impact, flow duration, and the flow path of each feature into navigable waters. It is the responsibility of the applicant to provide information regarding possible impacts to 100-year

floodplains, wetlands, and other important natural resources that occur within the project area, not the Corps.

We recommend you contact the Corps to determine if any of the proposed work constitutes a "discharge of fill" and submit an application with associated drawings that meet our drawing recommendations found at *http://www.poh.usace.army.mil/EC-R/EC-R.htm*. Click on "Apply for Permit" on the right-hand side, and then click on "Rec – Sect 404 Clean Water Act Drawings." Providing photographs of the parcel would also expedite our review. As a reminder, only the Corps has the authority to determine if any of these features are or are not waters of the U.S. and, potentially subject to regulations. A request for an approved Jurisdictional Determination can be submitted prior to, or concurrently with, an application for the proposed work.

Thank you for giving us the opportunity to review this proposal and providing us with the opportunity to comment. Should you have any questions, please contact Ms. Michelle Lazaro at (808) 835-4307, or through email at *Michelle.K.Lazaro@usace.army.mil*. You are encouraged to provide comments on your experience with the Honolulu District Regulatory Branch by accessing our web-based customer survey form at *http://per2.nwp.usace.army.mil/survey.html*.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

PLANNING
SOLUTIONS

July 17, 2012

Ms. Michelle Lazaro
Regulatory Branch
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawai'i 96858-5440

Subject: Army Corps of Engineers Section 404 Consultation:
Anahola Solar Project, Anahola, Kaua'i, Hawai'i (POH-2012-00178)

Dear Ms. Lazaro:

Thank you for your July 6, 2012 letter concerning Kaua'i Island Utility Cooperative's (KIUC) proposed Anahola Solar Project and for subsequently speaking with us over the telephone. We appreciate the time you spent reviewing our letter and enclosed materials. At your request, we are writing to provide you with additional information confirming that there are no navigable waters of the United States within the project site. It is my understanding that this will allow you to complete your Clean Water Act Section 404 (U.S.C. §1344) review.

As can be seen from the map reproduced in Attachment 1, the project area is approximately 0.5 miles from the nearest shoreline, far from tidally influenced waters. The U.S. Fish and Wildlife Service Wetlands Inventory Map for the project area (see Attachment 2) confirms that there are no wetlands present in or near the site.

No portion of the construction or operation of the proposed facilities will involve discharging, dumping, or depositing any dredged or fill materials into waters of the United States. None of the plans for the proposed project involve any activity which will create any additional runoff from the site during the construction or operation of the project. The project engineers anticipate that construction will require disturbance of more than one acre of land and will, therefore, be seeking a NPDES Construction Permit (NOI-C) for the activities.

In view of the above, we ask that you review the enclosed information and make a determination that a permit will not be required for the proposed project. If you have any further questions, please call me at (808) 550-4538.

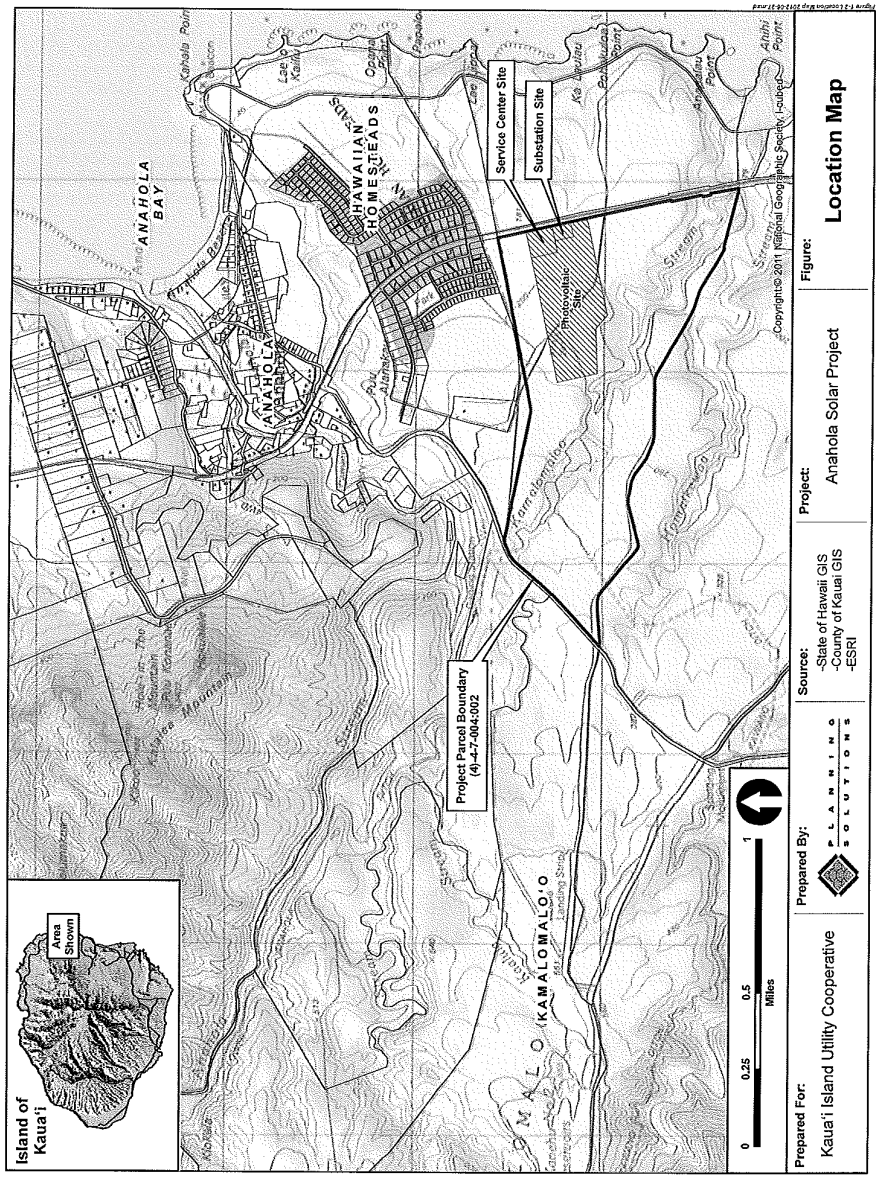
Sincerely,

Perry White

Attachments: 1. Anahola Solar Project Location Map
2. Anahola Solar Project USFWS Wetlands Inventory Map

cc: Mr. Brad Rockwell, KIUC
Ms. Emily Orler, USDA Rural Utility Service

Ward Plaza, Suite 330 • 210 Ward Avenue • Honolulu, Hawaii 96814-4012
Phone: 808 550-4483 • Fax: 808 550-4549 • www.psi-hi.com



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

July 23, 2012

Regulatory Branch

File Number **POH-2012-00178**

Perry White
Ward Plaza, Suite 330
210 Ward Avenue
Honolulu, HI 96814-4012

NO PERMIT REQUIRED

Dear Mr. White:

This responds to your letter dated July 17, 2012 providing our office with additional details regarding the proposed Anahola Solar Facility & Service Center Project, Anahola, Island of Kauai, Hawaii. We have assigned this project the reference number **POH-2012-00178**. Please cite this reference number in any future communications with this office regarding this project.

We have completed our review of the submitted documents pursuant to Section 10 of the Rivers and Harbors Act of 1899 (Section 10) and Section 404 of the Clean Water Act (Section 404). Section 10 requires that a Department of the Army (DA) permit be obtained from the U.S. Army Corps of Engineers (Corps) prior to undertaking any construction, dredging, or other activity occurring in, over or under, or affecting navigable waters of the U.S. For tidal waters, the shoreward limit of the Corps jurisdiction extends to the Mean High Water Mark. Section 404 requires that a DA permit be obtained for the discharge (placement) of dredged and/or fill material into waters of the U.S., including wetlands. For tidally influenced waters, in the absence of adjacent wetlands, the shoreward limit of the Corps jurisdiction extends to the High Tide Line, which in Hawai'i may be approximated by reference to the Mean Higher High Water Mark. For non-tidal waters, the lateral limits of the Corps jurisdiction extend to the Ordinary High Water Mark or the approved delineated boundary of any adjacent wetlands.

Based on the additional information you have submitted, the project area does not consist of any navigable waters subject to the Corps jurisdiction. Additionally, the proposed solar facilities do not appear to involve the placement and/or discharge of dredged and/or fill material into waters of the U.S.; including wetlands. Therefore, **a DA permit is not required.**

This determination does not relieve you of the responsibility to obtain any other permits, licenses, or approvals that may be required under County, State, or Federal law for your proposed work.

Thank you for giving us the opportunity to review this proposal and providing us with the opportunity to comment. Should you have any questions, please contact Ms. Michelle Lazaro at (808) 835-4307, or through email at *Michelle.K.Lazaro@usace.army.mil*. You are encouraged to

provide comments on your experience with the Honolulu District Regulatory Branch by accessing our web-based customer survey form at *http://per2.nwp.usace.army.mil/survey.html*.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

PLANNING SOLUTIONS

June 25, 2012

Mr. William Aila, Chairperson
Department of Land and Natural Resources
State of Hawai'i
1151 Punchbowl Street
Honolulu, Hawai'i 96813

Subject: Kaua'i Island Utilities Cooperative
Anahola Solar Facility & Service Center Project — Anahola, Kaua'i, Hawai'i

Dear Mr. Aila:

The Kaua'i Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, which will involve the construction of a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kaua'i, Hawai'i (the Project). RUS may fund the proposed Project, thereby making it an action subject to the National Environmental Policy Act, and all applicable federal environmental law and regulation. The project site is owned by the State of Hawai'i Department of Hawaiian Home Lands (DHHL). The Department has leased it to the non-profit Homestead Community Development Corporation (HCDC), which will lease the property to KIUC upon completion of the required environmental documentation.

DHHL and the Rural Utility Service (RUS) are preparing a joint environmental document in accordance with State and Federal Regulations. In the case of DHHL, this involves preparation of an Environmental Assessment (EA) in accordance with the provisions of Chapter 343, Hawai'i Revised Statutes and Title 11, Chapter 200 of the Hawai'i Administrative Rules (HAR §11-200). In the case of the Rural Utilities Service, this means preparing an Environmental Assessment in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The two agencies envision a joint document fulfilling both State and Federal requirements, and this consultation is being carried out accordingly. Enclosed is a map of the proposed location of the construction activity (Attachment 1) and a description of the work involved (Attachment 2).

We respectfully request your review of the enclosed materials for possible project-related impacts to wetlands and other important natural resources. I would appreciate receiving your response within thirty (30) days of your receipt of this correspondence. If you have any questions or wish to further discuss this project, please contact me at (808) 550-4483.

Sincerely,

Perry J. White

Attachments:
(1) Map of Project Area
(2) Description of Proposed Action

cc: Emily Orler, RUS
Brad Rockwell, KIUC

Ward Plaza, Suite 330 • 210 Ward Avenue • Honolulu, Hawaii 96814-4012
Phone: 808 550-4483 • Fax: 808 550-4549 • www.psi-hi.com

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

July 2, 2012

MEMORANDUM

TO: **DLNR Agencies:**
X 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 – ~~Oahu~~ Kauai District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Kaua`i Island Utilities Cooperative, Anahola Solar Facility & Service Center Project
LOCATION: Anahola, Kaua`i, Hawai`i
APPLICANT: Planning Solutions for Department of Hawaiian Home Lands and USDA Rural Utilities Service

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by July 24, 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 Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

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

Signed:
Print Name: MAHINA MIKASA
Date: July 9, 2012

JUL 5'12

DLNR KOLO RCVD

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

July 27, 2012

Planning Solutions
Attn: Perry J. White
Ward Plaza, Suite 330
210 Ward Avenue
Honolulu, Hawaii 96814-4012 via email: pwhite@psi-hi.com

Dear Mr. White,

SUBJECT: Kaua`i Island Utilities Cooperative, Anahola Solar Facility & Service Center Project – Anahola, Kaua`i, Hawai`i

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 (1) Land Division – Kauai District; and (2) Engineering Division, on the subject matter. No other comments were received as of our suspense date. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at 587-0439. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)

72174

PLANNING SOLUTIONS

June 25, 2012

RECEIVED
LAND DIVISION
2012 JUN 29 A 10:21

RECEIVED
'12 JUN 27 A10:59

DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

Mr. William Aila, Chairperson
Department of Land and Natural Resources
State of Hawai'i
1151 Punchbowl Street
Honolulu, Hawai'i 96813

Subject: Kaua'i Island Utilities Cooperative
Anahola Solar Facility & Service Center Project — Anahola, Kaua'i, Hawai'i

Dear Mr. Aila:

The Kaua'i Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, which will involve the construction of a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kaua'i, Hawai'i (the Project). RUS may fund the proposed Project, thereby making it an action subject to the National Environmental Policy Act, and all applicable federal environmental law and regulation. The project site is owned by the State of Hawai'i Department of Hawaiian Home Lands (DHHL). The Department has leased it to the non-profit Homestead Community Development Corporation (HCDC), which will lease the property to KIUC upon completion of the required environmental documentation.

DHHL and the Rural Utility Service (RUS) are preparing a joint environmental document in accordance with State and Federal Regulations. In the case of DHHL, this involves preparation of an Environmental Assessment (EA) in accordance with the provisions of Chapter 343, Hawai'i Revised Statutes and Title 11, Chapter 200 of the Hawai'i Administrative Rules (HAR §11-200). In the case of the Rural Utilities Service, this means preparing an Environmental Assessment in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The two agencies envision a joint document fulfilling both State and Federal requirements, and this consultation is being carried out accordingly. Enclosed is a map of the proposed location of the construction activity (Attachment 1) and a description of the work involved (Attachment 2).

We respectfully request your review of the enclosed materials for possible project-related impacts to wetlands and other important natural resources. I would appreciate receiving your response within thirty (30) days of your receipt of this correspondence. If you have any questions or wish to further discuss this project, please contact me at (808) 550-4483.

pwhite@psi-hi.com

Sincerely,

Perry J. White

Attachments:
(1) Map of Project Area
(2) Description of Proposed Action

cc: Emily Orler, RUS
Brad Rockwell, KIUC

Ward Plaza, Suite 330 • 210 Ward Avenue • Honolulu, Hawaii 96814-4012
Phone: 808 550-4483 • Fax: 808 550-4549 • www.psi-hi.com

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

July 2, 2012

RECEIVED
LAND DIVISION
2012 JUL 11 A 10:33
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

TO: **DLNR Agencies:**
X 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 ~~Oahu~~ Kauai District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Kaua`i Island Utilities Cooperative, Anahola Solar Facility & Service Center Project
LOCATION: Anahola, Kaua`i, Hawai`i
APPLICANT: Planning Solutions for Department of Hawaiian Home Lands and USDA Rural Utilities Service

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by July 24, 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 Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

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

Signed: [signature]
Print Name: MARVIN MIKASA
Date: July 9, 2012

RECEIVED 12:05

JUL 6 '12
DLNR KDLO RCVD

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

RECEIVED 12:23 ENGINEERING

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

July 2, 2012

RECEIVED
LAND DIVISION
2012 JUL 13 P 2:23
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

TO: **DLNR Agencies:**
X 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 – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Kaua`i Island Utilities Cooperative, Anahola Solar Facility & Service Center Project
LOCATION: Anahola, Kaua`i, Hawai`i
APPLICANT: Planning Solutions for Department of Hawaiian Home Lands and USDA Rural Utilities Service

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by July 24, 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 Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

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

Signed: [signature]
Print Name CARTY CHNAG, CHIEF ENGINEER
Date: 7/12/12

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/SteveMolmen
RE: AnaholaSolarFacility&ServiceCenter
Kauai.121

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.

(X) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone X. The Flood Insurance Program does not have any regulations for developments within Flood Zone X.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) Please note that 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.

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 or Ms. Ardis Shaw-Kim at (808) 768-8296 of t he City and County of Honolulu, Department of Planning and Permitting.
( ) Mr. Frank DeMarco at (808) 961-8042 of the County of Hawaii, Department of Public Works.
( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.
( ) Mr. Wynne Ushigome at (808) 241-4890 of the County of Kauai, Department of Public Works.

( ) The applicant should include water demands and infrastructure required to meet project needs. Please note that projects within State lands requiring water service from the Honolulu Board of Water Supply system will be required to pay a resource development charge, in addition to Water Facilities Charges for transmission and daily storage.

( ) The applicant 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 Ms. Suzie S. Agraan of the Planning Branch at 587-0258.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 7/12/12

PLANNING SOLUTIONS

June 22, 2012

Mr. Jesse K. Souki, Director
Office of Planning
Department of Business, Economic Development, and Tourism
State of Hawai'i
P.O. Box 2359
Honolulu, Hawai'i 96804

Subject: Draft Environmental Assessment for Anahola Solar Project
Tax Map Keys: (4) 4-7-004:002 — Anahola, Kaua'i, Hawai'i

Dear Mr. Souki:

The Kaua'i Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, which will involve the construction of a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kaua'i, Hawai'i (the Project). RUS may fund the proposed Project, thereby making it an action subject to the National Environmental Policy Act, and all applicable federal environmental law and regulation. The project site is owned by the State of Hawai'i Department of Hawaiian Home Lands (DHHL). The Department has leased it to the non-profit Homestead Community Development Corporation (HCDC), which will lease the property to KIUC upon completion of the required environmental documentation.

DHHL and the Rural Utility Service (RUS) are preparing a joint environmental document in accordance with state and federal regulations. In the case of DHHL, this involves preparation of an Environmental Assessment (EA) in accordance with the provisions of Chapter 343, Hawai'i Revised Statutes and Title 11, Chapter 200 of the Hawai'i Administrative Rules (HAR §11-200). In the case of the RUS, this means preparing an Environmental Assessment in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The two agencies envision a joint document fulfilling both State and Federal requirements, and this consultation is being carried out accordingly. Enclosed is a map of the proposed location of the construction activity (Attachment 1) and a description of the work involved (Attachment 2).

We respectfully request your review of the enclosed map of the project area and description of the proposed Project within thirty (30) days of your receipt of this correspondence for possible impacts to the Coastal Zone Management Program. If you have any questions or wish to further discuss this project, please contact me at (808) 550-4483.

Sincerely,

Perry J. White

Attachments:
(1) Map of Project Area
(2) Description of Proposed Action

cc: Emily Orler, RUS
Brad Rockwell, KIUC

Ward Plaza, Suite 330 • 210 Ward Avenue • Honolulu, Hawaii 96814-4012
Phone: 808 550-4483 • Fax: 808 550-4549 • www.psi-hi.com

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

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

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-13672

July 25, 2012

Mr. Perry J. White
Planning Solutions
Ward Plaza, Suite 310
210 Ward Avenue
Honolulu, Hawaii 96814-4012

Dear Mr. White:

Subject: Anahola Solar Facility and Service Center
TMK: (4) 4-7-004: 002, Anahola, Kauai, Hawaii
Pre-Draft Environmental Assessment

Thank you for the opportunity to provide comments on the Pre-Draft Environmental Assessment for the subject project. It is our understanding that the Kauai Island Utility Cooperative (KIUC) is proposing to develop the Anahola Solar Facility and Service Center on approximately 60 acres of a 422-acre parcel owned by the Department of Hawaiian Home Lands in Anahola, Kauai. The project will include a 12 Megawatt (MW) photovoltaic facility, dedicated substation with interconnection to the island's grid, underground conduits and cables, and an adjacent service center.

The Office of Planning has reviewed the material provided in your letter dated June 22, 2012, and has the following comments to offer:

1. The entire state is defined to be within the Coastal Zone Management Area (Hawaii Revised Statutes (HRS) Section 205A-1 - definition of "coastal zone management area"). The Draft Environmental Assessment should include a discussion of the proposed project's consistency with the objectives and policies set forth in HRS Section 205A-2.

2. A federal consistency review with our office is not required for this project, as the only Rural Utility Service (RUS) grant program subject to Hawaii CZM federal consistency review is the RUS Water and Waste Disposal Systems for Rural Communities Program.

Thank you for the opportunity to comment on the Pre-Draft Environmental Assessment for the proposed project.

Should you have questions or require clarification, please do not hesitate to contact Leo Asuncion, CZM Program Manager, at 587-2875.

Sincerely,

Jesse K. Souki
Director

PLANNING SOLUTIONS

June 22, 2012

Mr. Paul J. Conry, Administrator
Division of Forestry and Wildlife
Department of Land & Natural Resources
State of Hawai'i
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Subject: Kaua'i Island Utilities Cooperative
Anahola Solar Facility & Service Center Project — Anahola, Kaua'i, Hawai'i

Dear Mr. Conry:

The Kaua'i Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, which will involve the construction of a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kaua'i, Hawai'i (the Project). RUS may fund the proposed Project, thereby making it an action subject to the National Environmental Policy Act, and all applicable federal environmental law and regulation. In order to fulfill the agencies' responsibilities under the Endangered Species Act, RUS has designated KIUC and its consultant, Planning Solutions, Inc., as its non-Federal representative initiating informal Section 7 consultation pursuant to 50 CFR 402.08 "Designation of a Non-Federal Representative".

KIUC has proposed the Project to provide clean, renewable, and affordable power to the people of Kaua'i, and reduce KIUC's dependence on imported fossil fuels. The proposed Project will be located on 60-acres of Department of Hawaiian Home Lands (DHHL) owned land, within which the photovoltaic facility, substation, service center, access roads, and storage yards will be located. KIUC proposes to construct a low-profile photovoltaic module system; panels would be mounted on pipe frames anchored by concrete piers (12-inch diameter, and 36 to 60 inches deep). Power generated by the panels would be collected at pull boxes and transmitted to a substation near the highway. The substation would occupy a 2-acre area adjacent to the highway; it would contain transformers, switches, controls, batteries, and other electrical equipment that would allow KIUC to feed power into the existing electrical power lines along Kūhiō Highway. The 5-acre service center would contain offices, storage areas, and other facilities that would support KIUC operations in this part of the island.

We respectfully request your review of the enclosed materials including, the biological survey, map of the project area, and description of the proposed Project (Attachments 2, 3, and 4) within thirty (30) days of your receipt of this correspondence. If you have any questions or wish to further discuss this project, please contact me at (808) 550-4483.

Sincerely,

Perry J. White

Attachments:
(1) Map of Project Area
(2) Description of Proposed Action
(3) Biological Survey (DVD copy)

cc: Brad Rockwell, KIUC
Emily Orler, USDA RUS

Ward Plaza, Suite 330 • 210 Ward Avenue • Honolulu, Hawaii 96814-4012
Phone: 808 550-4483 • Fax: 808 550-4549 • www.psi-hi.com

X-IronPort-Anti-Spam-Result:
AqkJAFK7/0/YILW1jWdsb2JhbAAuFAOCSpN6oXwBAQEBCQkLCRIJIIIgAQEBBBlbWgICAQgRBAEBCx0HGwQTFAkIAgQTCBqHagGbC4EhCgJ5AQEibh2lb
X-Forefront-Antispam-Report: CIP:199.135.140.11;KIP:(null);UIP:(null);IPV:NLI;H:mail.usda.gov;RD:none;EFVD:NLI
X-SpamScore: -14
X-BigFish: VPS-14(zzbb2dI98dI9371Ic85fhf01M148cI11f6Nzz1202hzz8275bh8275dhz2dh2a8h668h839h8e2h8e3hd25hf0ah107ahbe9i)
From: "Stiles, Cynthia - NRCS, Honolulu, HI" <cynthia.stiles@hi.usda.gov>
To: Makena White <makena@psi-hi.com>
Subject: RE: AD-1006 No. 2 for Anahola Solar Project
Thread-Topic: AD-1006 No. 2 for Anahola Solar Project
Thread-Index: AQHNX8NTGANOEwg1XE2pM898P7+R65ck0IEwgAABa5GAAG3YMIAAzeMDgACw6BA=
Date: Fri, 13 Jul 2012 06:18:36 +0000
Accept-Language: en-US
X-MS-Has-Attach:
X-MS-TNEF-Correlator:
x-originating-ip: [150.120.88.5]
X-OriginatorOrg: hi.usda.gov
X-Nonspam: None
X-Brightmail-Tracker: AAAAAQAAAlk=

Makena – I have reviewed your justification and concur on the scoring you have done on Section VI and the selection of your site. Thanks for making sure I had the proper files to complete the form with you. Thanks also for the thoughtful justification documentation. It makes for a proper archive document should anyone have questions in the future. CAS

Cynthia A. Stiles, Ph.D
Assistant State Soil Scientist - Pacific Islands Area; SSSA Div S-5 (Pedology) Chair
300 Ala Moana Blvd, Rm 4-118
Honolulu, HI 96850-0050
(808)541-2600 ext. 129
cynthia.stiles@hi.usda.gov

From: Makena White [mailto:makena@psi-hi.com]
Sent: Thursday, July 12, 2012 9:39 AM
To: Stiles, Cynthia - NRCS, Honolulu, HI
Cc: pwhite@psi-hi.com; julia@psi-hi.com
Subject: RE: AD-1006 No. 2 for Anahola Solar Project

Aloha Cindy,

I have completed Sections VI and VII of our AD-1006 and attached it to this email, along with a justification form describing the analysis which went supports the scoring process in Section VI.

Please don't hesitate to call me if you require anything further from our office to complete your analysis. I can be reached by phone at (808) 550-4538.

Mahalo,
Makena White
PSI

At 09:26 PM 7/11/2012, you wrote:

Yes – that's the next step. Thanks and looking forward to getting this completed for you - Cindy

Cynthia A. Stiles, Ph.D
Assistant State Soil Scientist - Pacific Islands Area; SSSA Div S-5 (Pedology) Chair
300 Ala Moana Blvd, Rm 4-118
Honolulu, HI 96850-0050
(808)541-2600 ext. 129
cynthia.stiles@hi.usda.gov

From: Makena White [mailto:makena@psi-hi.com]
Sent: Wednesday, July 11, 2012 2:53 PM
To: Stiles, Cynthia - NRCS, Honolulu, HI
Subject: RE: AD-1006 No. 2 for Anahola Solar Project

Aloha Cindy,

Thank you very much for turning that around so quickly; I appreciate it. Just to check with you on the next step and make sure my memory serves me; I will fill out Section VI and VII and send it back to you with a justification sheet? Is that correct? If you would confirm that I will get it to you by the end of the week.

Mahalo,
Makena White
PSI

At 02:48 PM 7/11/2012, you wrote:

Hello Makena – Here it is – Cheers and thanks for your patience - Cindy

Cynthia A. Stiles, Ph.D
Assistant State Soil Scientist - Pacific Islands Area; SSSA Div S-5 (Pedology) Chair
300 Ala Moana Blvd, Rm 4-118
Honolulu, HI 96850-0050
(808)541-2600 ext. 129
cynthia.stiles@hi.usda.gov

From: Makena White [mailto:makena@psi-hi.com]
Sent: Wednesday, July 11, 2012 2:15 PM
To: Stiles, Cynthia - NRCS, Honolulu, HI
Subject: RE: AD-1006 No. 2 for Anahola Solar Project

Aloha Cindy,

Attached to this email is the AD-1006 for the additional piece of land we have discussed previously. Please let me know if I can provide you with anything further.

Mahalo,
Makena White
PSI
Content-Type: application/pdf;
name="USDA AD-1006 Farmland Conversion Impact Rating Form 2012-06-27.pdf"
Content-Description: USDA AD-1006 Farmland Conversion Impact Rating Form
2012-06-27.pdf
Content-Disposition: attachment; filename="USDA AD-1006 Farmland Conversion"
Impact Rating Form 2012-06-27.pdf"; size=37774;
creation-date="Thu, 12 Jul 2012 00:32:51 GMT";
modification-date="Thu, 12 Jul 2012 00:48:01 GMT"

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 6/30/12
Name Of Project Anahola Solar Project	Federal Agency Involved Rural Utility Service
Proposed Land Use Electrical Utility	County And State County of Kauai, State of Hawaii
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 6/30/12

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).*	Yes ☑	No ☐	Acres Irrigated 19595	Average Farm Size 203
Major Crop*(s)* Not presently farmed	Farmable Land In Govt. Jurisdiction Acres: 98000	% 28	Amount Of Farmland As Defined in FPPA Acres: 92000	% 26
Name Of Land Evaluation System Used State of HI LESA	Name Of Local Site Assessment System None		Date Land Evaluation Returned By NRCS 7/10/12	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	5.0			
B. Total Acres To Be Converted Indirectly	0.0			
C. Total Acres In Site	5.0	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	5.0			
B. Total Acres Statewide And Local Important Farmland	5.0			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.0			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	34.5			
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	91	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use	15	13			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	0			
4. Protection Provided By State And Local Government	20	20			
5. Distance From Urban Builtup Area	15	0			
6. Distance To Urban Support Services	15	10			
7. Size Of Present Farm Unit Compared To Average	10	0			
8. Creation Of Nonfarmable Farmland	10	0			
9. Availability Of Farm Support Services	5	2			
10. On-Farm Investments	10	0			
11. Effects Of Conversion On Farm Support Services	10	0			
12. Compatibility With Existing Agricultural Use	10	0			
TOTAL SITE ASSESSMENT POINTS	160	55	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	91	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	55	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	146	0	0	0

Site Selected: Site A	Date Of Selection 7/12/12	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection: See attached justification form.

(See Instructions on reverse side) **Form AD-1006 (10-83)**

This form was electronically produced by National Production Services Staff

Justification of AD-1006 Part IV Scoring for Anahola Solar Project (Photovoltaic Electrical Generation)

The following provides an explanation of the scoring applied to each of the Site Assessment Criteria, pursuant to 7 CFR §658.5(b).

1. Area in Nonurban Use

A review of the State of Hawai'i GIS State Land Use Districts shapefile, aerial photography of the site, and multiple site visits indicate that approximately 80 percent of the surrounding area within one mile of the proposed project site is currently in non-urban use. This is consistent with the largely Agricultural and Conservation zoning of that land. **– 13 points**

2. Perimeter in Nonurban Use

There is no urban usage along the perimeter of the proposed project. There is a road adjacent to one edge of the project site but the usage across the road is nonurban and thus does not qualify as an urban use. **– 10 points**

3. Percent of Site Being Farmed

No portion of the project site has been farmed in any of the last ten years. **– 0 points**

4. Protection Provided By State and Local Government

An examination of the State of Hawai'i GIS land use shapefile indicates that the site is entirely within the State Agricultural land use district (see Criterion 8C of the Site Assessment Scoring Guide). KIUC's consultation with the County of Kaua'i Planning Department indicates the site is zoned for agriculture (see Criterion 4 of the Site Assessment Scoring Guide). **– 20 points**

5. Distance from Urban Built-up Area

The nearest built-up urban area is Anahola Village, the nearest point of which is approximately 750 feet away from the project site. **– 0 points**

6. Distance to Urban Support Services

There is no electrical, sewer, or water service on the project site but some exist within half a mile. An examination of Figure 3-1 in the County of Kaua'1, Department of Water, *Water Plan 2020* document indicates that the nearest municipal water service is in Anahola Village, the closest portion of which is approximately 750 feet away. The nearest electrical utility facilities are KIUC's power lines that run along Kūhiō Highway, directly east of the project site. The nearest sewer facilities are in Wailua-Kapa'a approximately 3 miles away. **– 10 points**

7. Size of Present Farm Unit Compared to Average

The area under evaluation is 5 acres in size, as compared with the USDA's estimated average farm size in Kaua'i County of 203 acres. This represents a project size of less than 50% of the average. – **0 points**

8. Creation of Non-farmable Farmland

The total area of the project parcel is 422 acres; 5 acres will be used for the proposed service center, leaving a remaining 417 acres. Of those 417 acres, none will be rendered non-farmable by interrupting land patterns of use or access. – **0 points**

9. Availability of Farm Support Services

The site does not have any farm support services present and has been out of agricultural use for at least a decade. Some farm support services, such as a farmer's market, are available in the nearby community of Anahola. – **2 points**

10. On-Farm Investments

The site has no substantial or well-maintained on farm investments such as barns or other forms of storage structures, terraces, orchards, drainage, or irrigation facilities. **– 0 points**

11. Effects of Conversion on Farm Support Services

Because there has been no agricultural use of this land for at least 10 years, the conversion of this land to an electrical utility service center will not cause any reduction in the demand for farm support services in the region. – **0 points**

12. Compatibility with Existing Agricultural Use

The type and intensity of use proposed for the Anahola Solar Project would not be incompatible with agriculture and it not likely to contribute to the eventual conversion of the surrounding farmland to nonagricultural uses. – **0 points**

HISTORIC PRESERVATION DIVISION
DEPARTMENT OF LAND AND NATURAL RESOURCES

601 Kamokila Boulevard, Suite 555
Kapolei, HI 96806

November 20, 2012

Ms. Emily Orler
U.S. Department of Agriculture
Rural Development/Rural Utilities Service
1400 Independence Ave, SW
Mail Stop 1571
Washington, DC 20250
emily.orler@wdc.usda.gov

LOG NO: 2012.3000
DOC NO: 1211SL20
Archaeology

Dear Ms. Orler:

SUBJECT: Chapter 6E-8 and National Historic Preservation Act (NHPA) 106 Consultation – KIUC Anahola Solar Facility and Service Center Project Kamalomaloʻo Ahupuaʻa, Puna District, Kauaʻi Island TMK: (4) 4-7-004:002

Thank you for the opportunity to respond to your request for concurrence on the U.S. Department of Agriculture, Rural Utilities Service (RUS) finding of no adverse effect to historic properties and to review the draft reports titled (1) *Archaeological Inventory Survey with Backhoe Trenching near Anahola, in Kamalomaloʻo Ahupuaʻa, Puna District, Kauaʻi Island TMK: (4) 4-7-004:002* (Sholin and Dye, May 2012) and (2) *Cultural Impact Assessment Native Hawaiian Traditions, Customary Practices and Perspectives of Kamalomaloʻo and Anahola Ahupuaʻa Moku o Kawaihau, Kauaʻi Island Anahola Solar Project* (Native Kauaʻi LLC, August 2012). This submittal was received by the Kapolei office of SHPD on October 12, 2012. The Kauaʻi Island Utility Cooperative (KIUC) plans to seek financial assistance from the RUS to construct the Anahola Solar Facility & Service Center project in Anahola, Kauaʻi. KIUC proposes to construct the 12 MW photovoltaic electric generation facility, substation, service center, access roads, and storage yards on 60 acres of land owned and administered by the State of Hawaiʻi Department of Hawaiian Home Lands (DHHL). DHHL may issue a lease for the project, which requires preparation of an environmental assessment (EA).

KIUC commissioned T. S. Dye & Colleagues, Archaeologists, Inc. (T.S. Dye) to conduct an archaeological inventory survey (AIS) of the 60-acre area of potential effect (APE) in accordance with Section 106 of the NHPA and 36 CFR §800.3(a). The AIS involved background research, a 100% pedestrian survey, and excavation of ten backhoe trenches. The survey identified two surface historic properties consisting of historic-era raised agricultural irrigation ditches (SIHP 50-30-08-2160). No subsurface or traditional Hawaiian historic properties were found. The AIS report recommends Site 2160 as eligible for inclusion on the National Register of Historic Places under Criterion D for its informational content. In addition, it states that all pertinent information related to Site 2160 has been recorded and recommends no further work.

RUS also commissioned Native Hawaii, LLC to conduct a cultural impact assessment (CIA) pursuant to Hawaiʻi Revised Statutes (HRS) Chapter §13-343, which mandates consideration of a proposed project's effects on traditional practices and beliefs. The CIA, which included background research and interviews with members of the Native Hawaiian community, did not identify any ongoing Native Hawaiian cultural resources or practices within the project area.

Based on these findings, RUS requests concurrence for a determination of eligibility and a finding of effect, pursuant to 36 CFR §800.4 for Site 2160. In addition, RUS determined that because all pertinent information has been recorded for Site 2160 and no further work is recommended, the project will have no adverse effect to historic properties.

SHPD concurs with the determination of eligibility pursuant to 36 CFR 800.4, but does not concur that the AIS documentation completed is adequate to support a finding of no adverse effect to historic properties.

We determine that the AIS report does not meet the requirements specified in the *Secretary of the Interior's Standards for Archeological Documentation* or in the *Hawaii Administrative Rules* (HAR) governing archaeological inventory surveys. We have included an attachment that identifies the issues and concerns that are in need of revision prior to the acceptance of this report pursuant to HAR §13-276-5. To aid in review of the subsequent revision please include a cover letter that specifies the changes made to this document and their page numbers.

Please contact Susan Lebo at (808) 692-8019 or at Susan.A.Lebo@hawaii.gov if you have any questions or concerns regarding this letter.

Aloha,

Theresa K. Donham
Deputy State Historic Preservation Officer
Historic Preservation Division

Attachment

Comments and Questions: *Archaeological Inventory Survey with Backhoe Trenching near Anahola, in Kamalomaloʻo Ahupuaʻa, Puna District, Kauaʻi Island TMK: (4) 4-7-004:002* (Sholin and Dye, May 2012).

(1) Figure 3 requires revising to show the location w/label of the ditch and mention in the figure caption.

(2) Figure 6 requires revising to show the locations of the two raised agricultural ditches (Site 2160) labeled in Legend and figure caption but not visible in report copy submitted to SHPD.

(3) Description of Site 2160 requires revising to include details about the construction materials, construction methods, plantation association, age, and integrity. For example, is the stone-lined canal interior made with basalt? limestone? are the stones cobble or boulder size or both? are the stones natural or dressed? is the construction dry-laid or mortared? is the top of the stone-lined canal flush with the earthen mounds or berms? what are the dimensions (L, W, H) of the stone-lined canal interior? is the entire length of these ditches within the APE? if not, what portion is represented within the APE? how common is this style of irrigation ditches in the ahupuaʻa? in the district? which plantation are they associated with? what information has been obtained to indicate when they were constructed? what is the integrity of these ditches? of the stone-lined canal interior? are these features connected to other features on the landscape, either inside or outside the APE? and so forth.

(3) Documentation of Site 2160 needs to include site map and/or plan view, and profiles, as well as detailed photographs. These maps and figures need to provide a permanent record of Site 2160, particularly in light of the potential loss of these features as a result of the proposed undertaking.

(4) Supportive data need to be presented to support both the effect determination and the mitigation recommendation. Their presence on several historic maps is insufficient documentation, as is the limited description provided in the report. Documentation, as well as the effect determination and mitigation recommendation for Site 2160 need to include historic context (see #2), are these ditches unique? common? how many of this type have been documented? preserved? if none, then what is basis for recommending these NR eligible features not be preserved? If these features are connected to other features on the landscape, even if only outside the APE, what effect will the undertaking have on their larger associations and context? and so forth.

(5) If Site 2160 will be destroyed/lost due to the undertaking, then archaeological monitoring is recommended to further document construction of the two irrigation features, including subsurface construction data, cross-sections of the ditches. In addition, consideration should be made for recycling the stones for use in rehabilitation and/or restoration projects as a possible mitigation measure (e.g., restoration of stone walls associated with Kūhīo highway widening project).

United States Department of Agriculture
Rural Development | Rural Utilities Service

March 4, 2013

Theresa K. Donham
Deputy State Historic Perservation Officer
Historic Preservation Division
Department of Land and Natural Resources
601 Kamokila Boulevard, Sutie 555
Kapolei, HI 96806

RE: KIUC Anahola Solar Facility and Service Center Project
Kamalomaloʻo Ahupuaʻa, Puna District, Kauaʻi Island (TMK: (4) 4+7004:002)
Log No: 2012.3000/Doc No: 1211SL20

Dear Ms. Donham,

The Kauaʻi Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kauaʻi, Hawai'i (the Project). RUS may fund the Project, thereby making it an undertaking subject to review under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470(f), and its implementing regulations (36 CFR Part 800). KIUC has proposed to construct the Project on land owned and administered by the State of Hawaiʻi Department of Hawaiian Home Lands (DHHL) in Anahola, Kauaʻi. DHHL may issue a lease for the Project, which requires the preparation of an Environmental Assessment (EA) pursuant to Hawaiʻi Revised Statutes (HRS) § 343-5 and Hawaiʻi Administrative Rules (HAR) § 11-200-5.

By letter dated October 10, 2012, RUS submitted an archaeological inventory survey (AIS) and a cultural impact assessment (CIA) respectively entitled the *Archaeological Inventory Survey with Backhoe Trenching near Anahola, in Kamalomaloʻo Ahupuaʻa, Puna District, Kauaʻi Island TMK: (4) 4–7–004:002* and *Cultural Impact Assessment Native Hawaiian Traditions, Customary Practices and Perspectives of Kamalomaloʻo and Anahola Ahupuaʻa Moku o Kawaihau, Kauaʻi Island* to the Hawaii State Historic Preservation Officer (SHPO) for review. The AIS identified two (2) historic-era raised agricultural ditches and areas of sugarcane fields within the Project's Area of Potential Effects (APE), which was defined as the 60-acre parcel that will be leased from DHHL. The AIS recommended Site number 50–30–08–2160 (Site 2160), the ditches and sugarcane areas as potentially eligible for listing on the National Register of Historic Places (NRHP) under Criterion D, but proposed that Site 2160 had been sufficiently documented. No

other cultural materials were identified in the field testing. The CIA did not identify any ongoing Native Hawaiian cultural resources or practices within the project site. Based on an analysis of the reports, RUS elected to treat Site 2160 as eligible for listing on the NRHP for the purposes of Section 106 review, and proposed a finding of no adverse effect to historic properties because all pertinent information for Site 2160 had been recorded.

In the SHPO's November 20, 2012 response, you stated that the AIS failed to provide sufficient information to substantiate the proposed determination of eligibility and finding of the effect. Your letter included proposed edits to the AIS and requested additional information about Site 2160 to better address questions of eligibility and effect. The SHPO raised no concerns regarding the content or recommendations of the CIA. RUS consulted with the SHPO in our effort to better understand and possibly resolve these concerns. As a result of this consultation, RUS required KIUC to edit the AIS and improve the documentation regarding Site 2160. Based on a review of the revised AIS (enclosed), RUS is providing the attached response to the comments and questions posed in the SHPO's November 20, 2012 letter.

Based on an analysis of the revised AIS, RUS proposes a finding of ***no historic properties affected*** because the ditches which comprise Site 2160 no longer possess sufficient integrity. Please provide your concurrence or objection within thirty (30) days of your receipt of this proposed finding pursuant to 36 CFR § 800.3(c)(4). Please contact Emily Orler, Environmental Protection Specialist, at emily.orler@wdc.usda.gov if you have any questions about the proposed finding of effect.

Sincerely,

Mark S. Plank

Mark S. Plank
Director, Engineering & Environmental Staff
USDA Rural Utilities Service

Enclosure

cc: Brad Rockwell, KIUC
Perry White, Planning Solutions, Inc.

Attachment

Responses to SHPO's Comments and Questions:
Archaeological Inventory Survey with Backhoe Trenching near Anahola, in Kamalomalo'o Ahupua'a, Puna District, Kaua'i Island TMK: (4) 4-7-004:002 (Sholin and Dye, May 2012).

(1) Figure 3 requires revising to show the location w/label of the ditch and mention in the figure caption.

Figure 3 and it's caption are revised to show the locations of the raised agricultural ditches. See Page 10.

(2) Figure 6 requires revising to show the locations of the two raised agricultural ditches (Site 2160) labeled in Legend and figure caption but not visible in report copy submitted to SHPD.

Figure 6 is revised to show the locations of the raised agricultural ditches. See Page 15.

(3a) Description of Site 2160 requires revising to include details about the construction materials, construction methods, plantation association, age, and integrity. For example, is the stone-lined canal interior made with basalt? limestone? are the stones cobble or boulder size or both? are the stones natural or dressed? is the construction dry-laid or mortared? is the top of the stone-lined canal flush with the earthen mounds or berms? what are the dimensions (L, W, H) of the stone-lined canal interior? is the entire length of these ditches within the APE? if not, what portion is represented within the APE? how common is this style of irrigation ditches in the ahupua'a? in the district? which plantation are they associated with? what information has been obtained to indicate when they were constructed? what is the integrity of these ditches? of the stone-lined canal interior? are these features connected to other features on the landscape, either inside or outside the APE? and so forth.

The description of the ditches has been supplemented; the revised AIS now documents the ditches' construction materials, dimensions, and historical context. As documented in the revised AIS narrative and supportive photographs, both ditches have been disturbed in modern history and lack integrity. Ditch 1is approximately 5-6-meters wide and 330-meters long and is constructed of earthen linear mound embankments with discontinuous sections of dry-laid basalt cobbles. Two sections of the ditch also contain culverts; the northern culvert was constructed of metal pipe incased with basalt cobble and concrete mortar masonry, and the southern culvert was constructed of metal pipe and formed basalt gravel and concrete aggregate. The concrete contemporary construction methodology and a dated concrete sluice fitting from 11/11/1966 support that Ditch 1 was compromised in the modern era (less than 50 years ago) and lacks historical integrity. Ditch 2 is also composed of earthen linear mounds and has similar dimensions to Ditch 1(5-6-meters wide and 400-meters long), but was less formal. Basalt cobbles, similar to what had been included in Ditch 1, were found stacked beyond Ditch 2. In addition, plastic irrigation piping buried in the mounds was common throughout Ditch 2. Based on the modern construction techniques (plastic piping) and the assemblages of basalt cobbles, it appears that Ditch 2 has been disturbed (dredged and re-excavated) in recent history and lacks historical integrity. See Pages 26-27.

(3b) Documentation of Site 2160 needs to include site map and/or plan view, and profiles, as well as detailed photographs. These maps and figures need to provide a permanent record of Site 2160, particularly in light of the potential loss of these features as a result of the proposed undertaking.

As stated in response to comments 1 &2, the mapping included in the report has been updated to demonstrate the locations of the ditches. In addition, five new images have been added to the report that provide a detailed record of the ditches.

(4) Supportive data need to be presented to support both the effect determination and the mitigation recommendation. Their presence on several historic maps is insufficient documentation, as is the limited description provided in the report. Documentation, as well as the effect determination and mitigation

recommendation for Site 2160 need to include historic context (see #2), are these ditches unique? common? how many of this type have been documented? preserved? if none, then what is basis for recommending these NR eligible features not be preserved? If these features are connected to other features on the landscape, even if only outside the APE, what effect will the undertaking have on their larger associations and context? and so forth.

As stated in the response to comment 3, the revised descriptions of the features provided on Pages 26-27 provide additional information about the historical context based on their construction materials and the evidence of modern disturbance. The photographs also provide further evidence beyond the narrative explanation that the features lack integrity. As has been shared by the SHPO during consultation, very little is known at this time about the ditches in the region; therefore, there is limited information from which to compare the uniqueness of these ditches. As described in the text and the photographs of the revised AIS, the ditches within the APE have been significantly disturbed in modern history and lack integrity. For this reason, RUS does not agree with the recommendations about National Register of Historic Places (NRHP) eligibility and finding of effect contained in the revised AIS, believing them to reflect an incorrect application of 36 CFR Part 800. Instead, RUS believes that Site 2160 is not eligible for listing on the NRHP, because of its compromised integrity. RUS believes that Site 2160 lacks the "quality of significance" and sufficient "integrity" that are required for listing on the NRHP, as set forth in 36 CFR Part 60.4. Further, though the features of Site 2160 may provide information about Hawaiian agriculture and modern manipulation of the land, RUS does not believe that the information to be "important to prehistory or history." RUS believes that the features of Site 2160 have been sufficiently documented on historic mapping and within this report.

(5) If Site 2160 will be destroyed/lost due to the undertaking, then archaeological monitoring is recommended to further document construction of the two irrigation features, including subsurface construction data, cross sections of the ditches. In addition, consideration should be made for recycling the stones for use in rehabilitation and/or restoration projects as a possible mitigation measure (e.g., restoration of stone walls associated with Kūhīo highway widening project).

As discussed in the conference call held on Wednesday, January 30th, the site features will in fact be destroyed by the construction of the Project. Further documentation of Site 2160 has been completed through the revision of the AIS; therefore, RUS does not believe that monitoring of the construction would yield any additional information about the features. RUS concurs with the report's recommendation that no additional archeological work is recommended.

HISTORIC PRESERVATION DIVISION
DEPARTMENT OF LAND AND NATURAL RESOURCES

601 Kamokila Boulevard, Suite 555
Kapolei, HI 96806

March 25, 2013

Ms. Emily Orler
U.S. Department of Agriculture
Rural Development/Rural Utilities Service
1400 Independence Ave, SW
Mail Stop 1571
Washington, DC 20250
emily.orler@wdc.usda.gov

LOG NO: 2013.2321
DOC NO: 1303SL26
Archaeology

Dear Ms. Orler:

SUBJECT: Chapter 6E-8 and National Historic Preservation Act (NHPA) 106 Consultation – KIUC Anahola Solar Facility and Service Center Project Kamalomaloʻo Ahupuaʻa, Puna District, Kauaʻi Island TMK: (4) 4-7-004:002

Thank you for the opportunity to respond to your request for concurrence on the U.S. Department of Agriculture, Rural Utilities Service (RUS) finding of no adverse effect to historic properties and to review the revised draft report titled *Archaeological Inventory Survey with Backhoe Trenching near Anahola, in Kamalomaloʻo Ahupuaʻa, Puna District, Kauaʻi Island TMK: (4) 4-7-004:002* (Sholin and Dye, February 2013). This submittal was received by the Kapolei office of SHPD on March 4, 2013. The Kauaʻi Island Utility Cooperative (KIUC) plans to seek financial assistance from the RUS to construct the Anahola Solar Facility & Service Center project in Anahola, Kauaʻi. KIUC proposes to construct the 12 MW photovoltaic electric generation facility, substation, service center, access roads, and storage yards on 60 acres of land owned and administered by the State of Hawaiʻi Department of Hawaiian Home Lands (DHHL). DHHL may issue a lease for the project, which requires preparation of an environmental assessment (EA) pursuant to Hawaiʻi Revised Statutes (HRS) §343-5 and Hawaiʻi Administrative Rules (HAR) §11-200-5.

KIUC commissioned T. S. Dye & Colleagues, Archaeologists, Inc. (T.S. Dye) to conduct an archaeological inventory survey (AIS) of the 60-acre area of potential effect (APE) in accordance with Section 106 of the NHPA and 36 CFR §800.3(a). The AIS involved background research, a 100% pedestrian survey, and excavation of ten backhoe trenches. The survey identified two surface historic properties consisting of historic-era raised agricultural irrigation ditches (SIHP 50-30-08-2160). No subsurface or traditional Hawaiian historic properties were found. The AIS report recommends Site 2160 as eligible for inclusion on the National Register of Historic Places under Criterion D for its informational content. In addition, it states that all pertinent information related to Site 2160 has been recorded and recommends no further work. Based on these findings, RUS requests concurrence for a determination of eligibility and a finding of effect, pursuant to 36 CFR §800.4 for Site 2160. In addition, RUS determined that because all pertinent information has been recorded for Site 2160 and no further work is recommended, the project will have no adverse effect to historic properties.

SHPD concurs with the determination of eligibility pursuant to 36 CFR §800.4. Site 2160 exhibits integrity of location, setting, function, and contributes to research themes associated with Hawaii's plantation history. Additions or modifications in sluice gates were incorporated in 1966, but did not alter the original function. The site, however, has deteriorated in condition over the past century. SHPD concurs with the assessment that sufficient information has been recorded, with the recommendation of no further work, and the determination that **no historic properties will be adversely affected** by the proposed undertaking.

The revised AIS report addresses the concerns and issues identified in our previous correspondence (November 20, 2012; Log No. 2012.3000, Doc. No. 1211SL20). The AIS report now meets the requirements specified in the

Secretary of the Interior's Standards for Archeological Documentation and in HAR §13-276-5 governing archaeological inventory survey reports. The AIS report is accepted by SHPD. Please send one hardcopy of the document, clearly marked FINAL, along with a copy of this review letter and a text-searchable PDF version on CD to the Kapolei SHPD office.

Please contact me at (808) 692-8019 or at Susan.A.Lebo@hawaii.gov if you have any questions or concerns regarding this letter.

Aloha,

Susan A. Lebo

Susan A. Lebo, PhD
O'ahu Lead Archaeologist
Historic Preservation Division

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Ms. Blossom Feiteira
President
Association of Hawaiians for Homestead Lands
1050 Queen Street, Suite 200
Honolulu, HI 96814

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

Dear Ms. Blossom:

The Kaua'i Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, which will include a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kaua'i, Hawai'i (the Project). RUS may fund the Project, thereby making it an undertaking subject to review under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470(f), and its implementing regulations (36 CFR Part 800), and an action subject to the National Environmental Policy Act (NEPA), 42 U.S.C. Parts 4321-4347, the Council on Environmental Quality's (CEQ) Implementing Procedures, 40 CFR Parts 1500-1508, and RUS Environmental Policies and Procedures, 7 CFR Part 1794. KIUC has proposed to construct the Project on land owned and administered by the State of Hawai'i Department of Hawaiian Home Lands (DHHL) in Anahola, Kaua'i. DHHL may issue a lease for the Project, which requires the preparation of an EA pursuant to Hawai'i Revised Statutes (HRS) § 343-5 and Hawai'i Administrative Rules (HAR) § 11-200-5.

KIUC has proposed the Project to provide clean, renewable, and affordable power to the people of Kaua'i, and reduce KIUC's dependence on imported fossil fuels. The Project will be located on 60-acres of DHHL administered land; RUS has defined this 60-acre area, within which the photovoltaic facility, substation, service center, access roads, and storage yards will be located, as the Area of Potential Effect (APE). KIUC proposes to construct a low profile photovoltaic module installation system; panels would be mounted on pipe frames anchored by concrete piers (12 inch diameter, and 36-60 inches deep). Power generated by the panels would be collected at pull boxes and transmitted to a substation near the highway. The substation would occupy a 2-acre area adjacent to the highway; it would contain transformers, switches, controls, batteries, and other electrical equipment that would allow KIUC to feed power into the existing electrical power lines along Kūhiō Highway. The 5-acre service center would contain offices, storage areas, and other facilities that would support KIUC operations in this part of the island.

KIUC acquired T. S. Dye & Colleagues, Archaeologists, Inc. (T.S. Dye) to complete the cultural resource inventory of the APE, entitled *Archaeological Inventory Survey with Backhoe Trenching near Anahola, in Kamalomalo'o Ahupua'a, Puna District, Kaua'i Island TMK: (4) 4–7–004:002 (May 2012)*. The survey includes preliminary records search and field survey, which consistedof ten (10) test trenches throughout the proposed APE. No traditional Hawaiian cultural materials were encountered during the inventory survey; however,

historic-era features from the former use of the area as a sugarcane field, including two historic-era raised agricultural irrigation ditches were identified. The State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources has assigned state site number 50-30-08-2160 to the APE to identify the sugarcane field features. The survey recommends the site as eligible for inclusion on the National Register of Historic Places under Criterion D for its informational content. All pertinent information related to site 50–30–08–2160 has been recorded, and no further work is recommended. Therefore, based on the findings of the survey, RUS proposes a finding of *no adverse effect to historic properties*.

In addition to an Archaeological Inventory Survey, Native Hawai'i, LLC was commissioned to conduct a Cultural Impact Assessment pursuant to Hawai`i Revised Statutes (HRS) Chapter 13-343, which mandates consideration of a proposed project's effects on traditional Hawaiian practices and beliefs. The survey, entitled *Cultural Impact Assessment Native Hawaiian Traditions, Customary Practices and Perspectives of Kamalomalo'o and Anahola Ahupua'a Moku o Kawaihau, Kaua'i Island,* includes a review of background research and interviews with members of the native Hawaiian community. The CIA did not identify any ongoing native Hawaiian cultural resources or practices located on the project site.

RUS requests your review of the enclosed project materials, determinations of eligibility, and findings of effect. The enclosed materials will also be provided by RUS to the State Historic Preservation Officer and other native Hawaiian organizations (see attached list of NHOs) for comments and recommendations. RUS respectfully requests your review within thirty (30) days of your receipt of this correspondence. Please direct any questions you may have to Emily Orler, RUS Environmental Protection Specialist, at 202-720-1414 or emily.orler@wdc.usda.gov.

Sincerely,

Mark S. Plank

Mark S. Plank
Director
Engineering & Environmental Staff
USDA Rural Utilities Service

Attachments:
(1) Map of Project Area
(2) Description of Proposed Action
(3) Archaeological Inventory Survey for Anahola Solar Project
(4) Cultural Impact Assessment for Anahola Solar Project
(5) List of Native Hawaiian Organizations Consulted

cc: Gregg Matsuo, KIUC
Brad Rockwell, KIUC
Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Mr. Austin Nakoa
Chairman
Native Hawaiian Economic Alliance
1050 Queen Street, Suite 200
Honolulu, HI 96814

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

Dear Mr. Nakoa:

The Kaua'i Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, which will include a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kaua'i, Hawai'i (the Project). RUS may fund the Project, thereby making it an undertaking subject to review under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470(f), and its implementing regulations (36 CFR Part 800), and an action subject to the National Environmental Policy Act (NEPA), 42 U.S.C. Parts 4321-4347, the Council on Environmental Quality's (CEQ) Implementing Procedures, 40 CFR Parts 1500-1508, and RUS Environmental Policies and Procedures, 7 CFR Part 1794. KIUC has proposed to construct the Project on land owned and administered by the State of Hawai'i Department of Hawaiian Home Lands (DHHL) in Anahola, Kaua'i. DHHL may issue a lease for the Project, which requires the preparation of an EA pursuant to Hawai'i Revised Statutes (HRS) § 343-5 and Hawai'i Administrative Rules (HAR) § 11-200-5.

KIUC has proposed the Project to provide clean, renewable, and affordable power to the people of Kaua'i, and reduce KIUC's dependence on imported fossil fuels. The Project will be located on 60-acres of DHHL administered land; RUS has defined this 60-acre area, within which the photovoltaic facility, substation, service center, access roads, and storage yards will be located, as the Area of Potential Effect (APE). KIUC proposes to construct a low profile photovoltaic module installation system; panels would be mounted on pipe frames anchored by concrete piers (12 inch diameter, and 36-60 inches deep). Power generated by the panels would be collected at pull boxes and transmitted to a substation near the highway. The substation would occupy a 2-acre area adjacent to the highway; it would contain transformers, switches, controls, batteries, and other electrical equipment that would allow KIUC to feed power into the existing electrical power lines along Kūhiō Highway. The 5-acre service center would contain offices, storage areas, and other facilities that would support KIUC operations in this part of the island.

KIUC acquired T. S. Dye & Colleagues, Archaeologists, Inc. (T.S. Dye) to complete the cultural resource inventory of the APE, entitled *Archaeological Inventory Survey with Backhoe Trenching near Anahola, in Kamalomalo'o Ahupua'a, Puna District, Kaua'i Island TMK: (4) 4–7–004:002 (May 2012)*. The survey includes preliminary records search and field survey, which consistedof ten (10) test trenches throughout the proposed APE. No traditional Hawaiian cultural materials were encountered during the inventory survey; however,

historic-era features from the former use of the area as a sugarcane field, including two historic-era raised agricultural irrigation ditches were identified. The State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources has assigned state site number 50-30-08-2160 to the APE to identify the sugarcane field features. The survey recommends the site as eligible for inclusion on the National Register of Historic Places under Criterion D for its informational content. All pertinent information related to site 50–30–08–2160 has been recorded, and no further work is recommended. Therefore, based on the findings of the survey, RUS proposes a finding of *no adverse effect to historic properties.*

In addition to an Archaeological Inventory Survey, Native Hawai'i, LLC was commissioned to conduct a Cultural Impact Assessment pursuant to Hawai`i Revised Statutes (HRS) Chapter 13-343, which mandates consideration of a proposed project's effects on traditional Hawaiian practices and beliefs. The survey, entitled *Cultural Impact Assessment Native Hawaiian Traditions, Customary Practices and Perspectives of Kamalomalo'o and Anahola Ahupua'a Moku o Kawaihau, Kaua'i Island,* includes a review of background research and interviews with members of the native Hawaiian community. The CIA did not identify any ongoing native Hawaiian cultural resources or practices located on the project site.

RUS requests your review of the enclosed project materials, determinations of eligibility, and findings of effect. The enclosed materials will also be provided by RUS to the State Historic Preservation Officer and other native Hawaiian organizations (see attached list of NHOs) for comments and recommendations. RUS respectfully requests your review within thirty (30) days of your receipt of this correspondence. Please direct any questions you may have to Emily Orler, RUS Environmental Protection Specialist, at 202-720-1414 or emily.orler@wdc.usda.gov.

Sincerely,

Mark S. Plank

Mark S. Plank
Director
Engineering & Environmental Staff
USDA Rural Utilities Service

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cc: Gregg Matsuo, KIUC
Brad Rockwell, KIUC
Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Ms. Jobie Masagatani
Chair Designate
Department of Hawaiian Homelands
P.O. Box 1879
Honolulu, HI 96805

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

Dear Ms. Masagatani:

The Kaua'i Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, which will include a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kaua'i, Hawai'i (the Project). RUS may fund the Project, thereby making it an undertaking subject to review under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470(f), and its implementing regulations (36 CFR Part 800), and an action subject to the National Environmental Policy Act (NEPA), 42 U.S.C. Parts 4321-4347, the Council on Environmental Quality's (CEQ) Implementing Procedures, 40 CFR Parts 1500-1508, and RUS Environmental Policies and Procedures, 7 CFR Part 1794. KIUC has proposed to construct the Project on land owned and administered by the State of Hawai'i Department of Hawaiian Home Lands (DHHL) in Anahola, Kaua'i. DHHL may issue a lease for the Project, which requires the preparation of an EA pursuant to Hawai'i Revised Statutes (HRS) § 343-5 and Hawai'i Administrative Rules (HAR) § 11-200-5.

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Sincerely,

Mark S. Plank

Mark S. Plank
Director
Engineering & Environmental Staff
USDA Rural Utilities Service

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cc: Gregg Matsuo, KIUC
Brad Rockwell, KIUC
Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Mr. Henry Gomes
President
Hawai'i Maoli
P.O. Box 1135
Honolulu, HI 96807

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

Dear Mr. Gomes:

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KIUC has proposed the Project to provide clean, renewable, and affordable power to the people of Kaua'i, and reduce KIUC's dependence on imported fossil fuels. The Project will be located on 60-acres of DHHL administered land; RUS has defined this 60-acre area, within which the photovoltaic facility, substation, service center, access roads, and storage yards will be located, as the Area of Potential Effect (APE). KIUC proposes to construct a low profile photovoltaic module installation system; panels would be mounted on pipe frames anchored by concrete piers (12 inch diameter, and 36-60 inches deep). Power generated by the panels would be collected at pull boxes and transmitted to a substation near the highway. The substation would occupy a 2-acre area adjacent to the highway; it would contain transformers, switches, controls, batteries, and other electrical equipment that would allow KIUC to feed power into the existing electrical power lines along Kūhiō Highway. The 5-acre service center would contain offices, storage areas, and other facilities that would support KIUC operations in this part of the island.

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Sincerely,

Mark S. Plank

Mark S. Plank
Director
Engineering & Environmental Staff
USDA Rural Utilities Service

Attachments:
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cc: Gregg Matsuo, KIUC
Brad Rockwell, KIUC
Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Hokualele Canoe Club
P.O. Box 169
Anahola, HI 96703

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

To whom it may concern:

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Director
Engineering & Environmental Staff
USDA Rural Utilities Service

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Brad Rockwell, KIUC
Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Dr. Kamana'opono M. Crabbe
Chief Executive Officer
Office of Hawaiian Affairs
711 Kapi'olani Boulevard, Suite 500
Honolulu, HI 96813

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

Dear Dr. Crabbe:

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USDA Rural Utilities Service

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Brad Rockwell, KIUC
Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Mr. Kimo Kaloi
Director
Office of Hawaiian Relations
U.S. Department of the Interior
1849 C Street, NW (MS 3543)
Washington, D.C. 20240

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

Dear Mr. Kaloi:

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Brad Rockwell, KIUC
Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Mr. Kamaki Kanahele
Chairman
Sovereign Councils of the Hawaiian Homelands Assembly
P.O. Box 2881
Waianae, HI 96792

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

Dear Mr. Kanahele:

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Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Ms. Kaipo Kincaid
Executive Director
Hui Kākoʻo ʻĀina Hoʻopulapula
767 Kailua Road #212
Kailua, HI 96734

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kauaʻi, Hawaiʻi

Dear Ms. Kincaid:

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USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Kanu I Ka Pono New Century Public Charter School
P.O. Box 12
Anahola, HI 96703-0012

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

To whom it may concern:

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Sincerely,

Mark S. Plank

Mark S. Plank
Director
Engineering & Environmental Staff
USDA Rural Utilities Service

Attachments:
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(2) Description of Proposed Action
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cc: Gregg Matsuo, KIUC
Brad Rockwell, KIUC
Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Ms. Liberta Hussey-Albao
President
Queen Deborah Kapule Hawaiian Civic Club
P.O. Box 164
Kapa'a, HI 96746

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

Dear Ms. Hussey-Albao:

The Kaua'i Island Utility Cooperative (KIUC) intends to seek financial assistance from the USDA Rural Utilities Service (RUS) to construct the Anahola Solar Facility & Service Center Project, which will include a 12 MW photovoltaic electric generation facility, a substation, and a service center in Anahola, Kaua'i, Hawai'i (the Project). RUS may fund the Project, thereby making it an undertaking subject to review under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470(f), and its implementing regulations (36 CFR Part 800), and an action subject to the National Environmental Policy Act (NEPA), 42 U.S.C. Parts 4321-4347, the Council on Environmental Quality's (CEQ) Implementing Procedures, 40 CFR Parts 1500-1508, and RUS Environmental Policies and Procedures, 7 CFR Part 1794. KIUC has proposed to construct the Project on land owned and administered by the State of Hawai'i Department of Hawaiian Home Lands (DHHL) in Anahola, Kaua'i. DHHL may issue a lease for the Project, which requires the preparation of an EA pursuant to Hawai'i Revised Statutes (HRS) § 343-5 and Hawai'i Administrative Rules (HAR) § 11-200-5.

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Sincerely,

Mark S. Plank

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Director
Engineering & Environmental Staff
USDA Rural Utilities Service

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Brad Rockwell, KIUC
Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Ms. Lorraine Rapoza
President
Anahola Hawaiian Homes Association
4523 Ioane Road
Anahola, HI 96703

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

Dear Ms. Rapoza:

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Brad Rockwell, KIUC
Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Ms. Robin Danner
President
Council for Native Hawaiian Advancement
1050 Queen Street, Suite 200
Honolulu, HI 96814

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

Dear Ms. Danner:

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Brad Rockwell, KIUC
Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Mr. Melvin Soong
President
The I Mua Group
422 Iliaina Street
Kailua, HI 96734

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

Dear Mr. Soong:

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Brad Rockwell, KIUC
Perry White, PSI

USDA Rural Development

United States Department of Agriculture
Rural Development | Rural Utilities Service

October 10, 2012

Mr. Soulee LKO Stroud
President
Association of Hawaiian Civic Clubs
P.O. Box 1135
Honolulu, HI 96807

Subject: KIUC Anahola Solar Facility & Service Center Project
Tax Map Keys: (4) 4-7-004:002
Anahola, Kaua'i, Hawai'i

Dear Mr. Stroud:

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Perry White, PSI

PLANNING SOLUTIONS

January 24, 2013

Dr. Loyal Mehrhoff, Field Supervisor
U.S. Department of the Interior
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Room 3-122, Box 50088
Honolulu, Hawai'i 96850

Subject: Kaua'i Island Utilities Cooperative, Anahola Solar Facility & Service Center
Project Section 7 Consultation
Request for Concurrence with "NLAA" Determination
(USFWS Log # 2012/TA/0352)

Dear Dr. Mehrhoff:

The U.S. Department of Agriculture's (USDA) Rural Utilities Service (RUS) has been asked to provide financial assistance to Kaua'i Island Utility Cooperative (KIUC), through its subsidiary KIUC Renewable Solutions One, LLC to develop, operate, and maintain a 12 Megawatt photovoltaic facility, including a supporting substation with interconnections to the island-wide electrical grid, and an adjacent 5-acre service center.

The USDA is seeking concurrence from the USFWS that the project is "not likely to adversely affect (NLAA)" any listed threatened or endangered species discussed below, or modify any federally designated critical habitat within the project site.

Project Overview

The proposed facilities would occupy 60 acres on the easternmost portion of a large, 422-acre parcel (TMK [4] 4-7-004:002) in Anahola, Kaua'i, Hawai'i (see Figure 1). The parcel, which is owned by the Department of Hawaiian Home Lands (DHHL), was formerly used for sugarcane cultivation but is currently fallow.

The Anahola Solar Project is expected to produce 23,500 megawatt-hours of clean, renewable electricity per year. This represents 5.2 percent of KIUC's total electrical generation in 2010. The project components are:

- Fifty-three acres of photovoltaic (PV) panels, inverters, and transformers providing up to 12 MW of electrical energy to KIUC's electrical grid.
- An adjacent 2-acre substation, which will be used for control equipment for the solar farm and to boost the power from the 12 kilovolts (kV) delivered by the PV system to the 57/69 kV voltage of KIUC's electrical transmission system.
- A service center occupying the remaining 5 acres of the 60-acre project area, which will include operational, and maintenance capacity, as well as a community meeting center and customer service office.
- A network of underground conduits and cables will link the PV facility to the substation.
- Two approximately 45-foot high A-frame supports, each mounted with five interconnection wires (ten total) would link the proposed substation with the existing transmission line on the *mauka* side of the Kūhiō Highway right-of-way, 50 feet away (shown in red in Figure 2). These structures—and the wires coming off them—would be the tallest in the substation; they would

Ward Plaza, Suite 330 • 210 Ward Avenue • Honolulu, Hawaii 96814-4012
Phone: 808 550-4483 • Fax: 808 550-4549 • www.psi-hi.com

each be topped with a lightning protection wire. Other structures and landscaping would be lower, none of them exceeding a height of 25 feet above grade.

Project Consultation History

Representatives of the project submitted a letter and information packet to the Service on June 25, 2012. Included in the packet were maps of the site location, a description of the project, a copy of the biological survey report documenting the findings of the flora and fauna surveys conducted on the site, as well as a letter of agent from the USDA/RUS appointing KIUC and its consultant Planning Solutions, Inc. as its agents in this matter. Following the letter several telephone conversations between the project team and Michelle Bogardus of your office were held, in which the scope of the consultation was discussed, and the likely concerns that the Service would want to see addressed in the consultation were identified.

Potential Impacts to ESA protected Species

Biological surveys conducted on the project sites on January 16, 2012 (Guinther et al, 2012), and a review of pertinent literature and unpublished reports identified the following three listed avian and mammalian species as either likely present on the site, or likely to use resources in the general project area on a seasonal basis, or in the case of the three seabird species, overfly the project sites on a seasonal basis.

Common Name	*Scientific Name*
Hawaiian Petrel	*Pterodroma sandwichensis*
Newell's Shearwater	*Puffinus auricularis newelli*
Band-rumped Storm-Petrel	*Oceanodroma castro*
Hawaiian hoary bat	*Lasiurus cinereus semotus*

The principal potential impacts to the seabird species posed by this project revolve around the possibility that exterior lighting, which will be required at the service center, may attract fledgling seabirds on their inaugural fledgling flight from their inland colonies out to the ocean. As a result of that attraction, fledglings may fallout or possibly collide with structures within the general project area.

The principal potential impact that the project poses to Hawaiian hoary bats is during the clearing and grubbing phases of construction as vegetation is removed. The removal of vegetation within the project site may temporarily displace individual bats, which may use the vegetation as a roosting location. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season, females carrying their pups may be less able to rapidly vacate a roost site as the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage. Very small pups may be unable to flee a tree that is being felled. Potential adverse effects from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 4.6 meters (15-feet), between June 1 through September 15, the period in which bats are potentially at risk from vegetation clearing.

Minimization Measures

The project proposes to implement the following minimization measures to ensure that the development and operation of the project does not result in deleterious impacts to the three listed avian and mammalian species identified in the table presented above.

Species Specific Minimization Measures

Hawaiian Petrel, Newell's Shearwater and Band-rumped Storm-Petrel

In designing the facility a concerted effort was made to design the facility so as to have as few aerial lines as possible – the majority of the lines will be undergrounded, thus reducing the risk of seabirds interacting with the facility infrastructure.

All lights that may be installed as part of the solar facility, substation and associated infrastructure will be shielded to reduce the risk that seabirds may be attracted to and then disoriented by the lighting. During the seabird fallout season (September 15 –December 15) all non-essential lights will be turned off, and KIUC will follow all downed seabird search, data recording, and reporting procedures that they currently follow at their other facilities and which are detailed in their existing Incidental Take Permit conditions.

Hawaiian hoary bat

No clearing or grubbing of woody vegetation taller than 4.6 meters (15 feet) high will be allowed during the bat pupping season, which runs from June 1 through September 15.

NLAA Determination

Based on the above information, the U.S. Department of Agriculture's (USDA) Rural Utilities Service (RUS) has determined that the project is not likely to adversely affect, Hawaiian Petrel, Newell's Shearwater, Band-rumped Storm-Petrel or Hawaiian hoary bat. We respectfully seek your concurrence with this determination. If you have any questions, please feel free to contact Makena White or Reginald David at (808) 550-4538 and (808) 329-9141 respectively. Thank you for your assistance.

Sincerely,

Perry J. White

Attachments:
1. Location Map
2. Plan View of Proposed Substation

cc: Emily Orler, RUS (via e-mail w/o enc)
Brad Rockwell, KIUC (via e-mail w/o enc)
Gregg Matsuo, KIUC (via e-mail w/o enc)
Reginald David, Rana Biological Consulting, Inc. (via e-mail w/o enc)

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:
2013-I-0113

FEB 1 1 2013

Mr. Perry White
Planning Solutions, Inc.
Ward Plaza, Suite 330
210 Ward Avenue
Honolulu, Hawaii 96814

Subject: Informal Consultation for the Kauai Island Utilities Cooperative Anahola Solar Facility and Service Center Project, Kauai

Dear Mr. White:

The U.S. Fish and Wildlife Service (Service) received your letter on January 25, 2012, requesting our concurrence with your determination that the proposed Anahola Solar Facility and Service Center will not adversely affect the federally threatened Newell's shearwater (*Puffinus auricularis newelii*), endangered Hawaiian petrel (*Pterodroma sandwichensis*), and a candidate for listing, the band-rumped storm-petrel (*Oceanodroma castro*), (collectively referred to as Hawaiian seabirds), and the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*). We previously provided comments on this project in a letter dated July 25, 2012 (Service File 2012-TA-0352).

The project is proposed by the Kauai Island Utility Cooperative (KIUC) through its subsidiary KIUC Renewable Solutions One, LLC. KIUC has applied for funding for the proposed project from the U.S. Department of Agriculture (USDA) – Rural Utility Services (RUS). We understand RUS designated KIUC and KIUC's consultant (Planning Solutions, Inc.) as non-federal representatives for this project in a letter dated June 14, 2012.

The 12 megawatt facility, including 53 photovoltaic panels, an adjacent substation, service center, and associated conduits and cables, will be constructed on 60 acres in Anahola [TMK (4) 4-7-004:002]. The facility is anticipated to produce 23,525 megawatt-hours of electricity per year, representing approximately 5.2 percent of KIUC's total electrical generation. Although the majority of the facilities cables and conduits will be installed underground, two sections of cables will be installed above-ground to link the substation with the existing transmission line 50 feet away. These two sections would be approximately 45 feet tall and comprised of five interconnection wires. Both cable sections will run perpendicular to the ocean coastline. This response is in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*).

Hawaiian seabirds
Seabirds fly at night and are attracted to artificially-lighted areas that can result in disorientation and subsequent fallout due to exhaustion or collision. Seabirds are also susceptible to collision with objects that protrude above the vegetation layer when traversing between the ocean and their mountainous breeding areas, such as utility lines, guy-wires, and communication towers. Additionally, once grounded, they are vulnerable to predators and are often struck by vehicles along roadways. Any increase in the use of nighttime lighting, particularly during each year's peak fallout period (September 15 through December 15), could result in additional seabird injury or mortality.

To minimize potential impacts to Hawaiian seabirds, the following measures are included in the implementation of this project:

- All cables, conduits and transmissions lines will be undergrounded except for two 50 foot sections (as described above) which are necessary to connect the substation to the existing transmission line.
- All facility lights will be shielded to minimize the risk of seabirds becoming disoriented.
- External lighting during the seabird fallout season (September 15 through December 15) will be further minimized by turning off all lights not necessary for safety.
- KIUC will implement standard avoidance, minimization, and monitoring measures, as described in their existing Habitat Conservation Plan at this facility.

Hawaiian hoary bat
The Hawaiian hoary bat is a medium-sized [0.5-0.8 ounces (14-22 grams)], nocturnal, insectivorous bat. The Hawaiian hoary bat is known from the islands of Hawaii, Maui, Oahu, Kauai, and Molokai. Population numbers are not known, but Hawaiian hoary bats are observed regularly on Hawaii, Kauai, and Maui. There is a general lack of historic and current data on this subspecies, and its present status and habitat requirements are not well understood. Bats are most often observed foraging in open areas, near the edges of native forests, or over open water, although this may be due to the ease of detection in these habitats. Hawaiian hoary bats roost solitarily in the foliage of trees. Threats to the Hawaiian hoary bat include habitat destruction (elimination of roosting sites), direct and indirect effects of pesticides, disease and entanglement on barbed wire fences. In addition, clearing woody vegetation could harm non-volant juveniles left in roost tree as the female forages. Potential adverse effects from such disturbance can be avoided by not clearing vegetation greater than 15 feet between June 1 and September 15, the period in which juvenile bats are most vulnerable.

To minimize potential impacts to Hawaiian hoary bats, the following is included in the implementation of this project:

- Woody vegetation suitable for bat roosting will not be cleared between June 1 and September 15.

Based on the above avoidance and minimization measures, the Service concurs with your determination that this proposed project may affect, but is not likely to adversely affect the

Newell's shearwater, Hawaiian petrel, band-rumped storm-petrel and Hawaiian hoary bat. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, we recommend you contact our office so that we may assist you in re-assessing project impacts.

We appreciate your efforts to conserve protected species. If you have questions regarding this consultation, please contact Michelle Bogardus, Consultation and Habitat Conversation Planning Program (phone: 808-792-9400; fax: 808-792-9581).

Sincerely,

for Loyal Mehrhoff
Field Supervisor

Cc: Emily Orler, USDA-RUS
Brad Rockwell, KIUC
Gregg Matsuo, KIUC
Reginald David, Rana Biological Consulting, Inc.

E. SOLAR PHOTOVOLTAIC BASICS

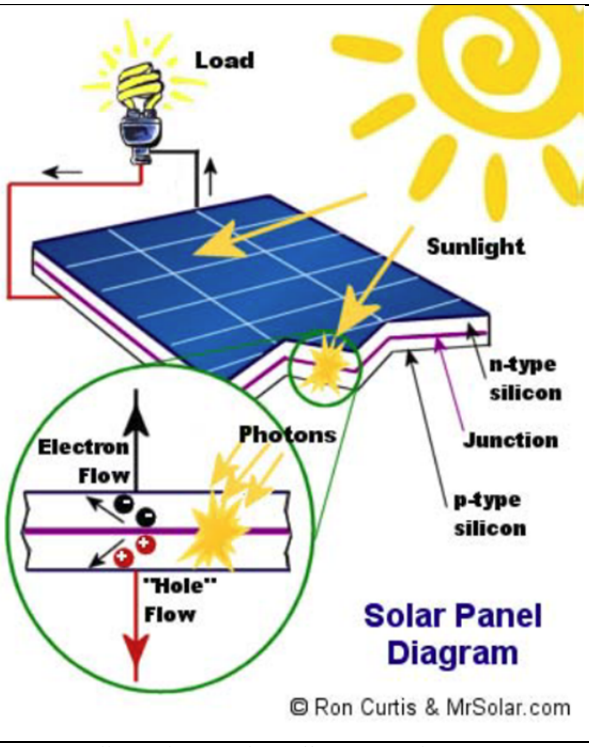
Photovoltaic cells convert a portion of the energy in sunlight into electricity. Typically, photovoltaic cells are made by sandwiching together two thin layers of semiconductor material. The two layers have slightly different chemical compositions that facilitate electron transfer between them. When sunlight energy is absorbed by a solar cell,[72] it causes electrons to "escape" from molecules in one layer of material and move to those in the other layer. This creates an electrical field that can be converted into electricity (see Figure 3).

A number of different types of silicon are used in the manufacture of photovoltaic cells and both the type and manufacturing technologies are evolving rapidly. The photovoltaic cells used in the Anahola Solar Project are manufactured from what is known as polycrystalline silicon, which is composed of many smaller silicon grains of varied crystallographic orientation. Polycrystalline silicon is produced from highly pure molten silicon using a casting process. The silicon is heated to a high temperature and cooled under controlled conditions in a mold. It sets as an irregular poly- or multi-crystal form. The square silicon block is then cut into thin (e.g., 0.3 millimeter, or a little more than 0.01 inch) slices. It reflects the least and absorbs the most light. More chemical processes and fixing of the conducting grid and electrical contacts complete the process. Mass-produced polycrystalline photovoltaic cell modules have an efficiency of 11-15%.

The solar cell is the basic manufactured unit of photovoltaic technology, typically ranging from less than one inch to several inches across, and it includes semiconductor material, a substrate, a protective layer, and wiring to conduct electricity. Cells are assembled into modules, and modules are assembled into larger collections of panels and arrays.

[72] A solar cell is the manufactured unit of PV technology. It typically ranges from less than one inch to several inches across, and it includes semiconductor material, a substrate, a protective layer, and wiring to conduct electricity. Cells are assembled into modules, and modules are assembled into larger collections of panels and arrays.

Figure: Polycrystalline Panel



Source: Online Solar Inc., https://www.mrsolar.com

Individual crystalline silicone (c-Si) solar cells are assembled from thin wafers of silicon that are cut from monocrystalline silicon cylinders (called "rods" or "ingots") or from blocks of cast multicrystalline silicon. Two wafers are slightly altered (or "doped") with small amounts of different impurities to facilitate electron transfer, for example phosphorous in one wafer and boron in another. The wafers are sandwiched together between glass or layers of ethyl vinyl acetate and a polymer laminate to protect the cells. Metal grids and contacts conduct the electrical energy produced, and inverters change the direct current (DC) produced by solar cells to the alternating current (AC) used in power.

Photovoltaic cells are combined into modules (typically several square feet), then into panels or arrays. One significant problem for c-Si production is the loss of material in sawing—as much as 50 percent of the highly refined and increasingly expensive silicon is lost in the process.

F. CULTURAL IMPACT ASSESSMENT

Cultural Impact Assessment

Native Hawaiian Traditions, Customary Practices and Perspectives of
Kamalomalo`o and Anahola Ahupua`a
Moku o Kawaihau, Kaua`i Island

Anahola Solar Project

Prepared for
Kaua`i Island Utility Cooperation
and
Homestead Community Development Cooperation

TMK (4) 4-7-04: 2

prepared and presented by
L. Kēhaulani Kekua and A. `Aikāne Alapa`i
Native Kaua`i LLC
Indigenous Hawaiian Cultural Consultants

August 2012

I ka wā mamua, ka wā mahope

The future is in the past

Hawaiian ancestral knowledge and culture is the umbilicus that connects Hawaiian people to the `āina upon which they are born or where they will choose to live and raise their `ohana. Acquiring a deeper understanding of the past is an essential component to arriving at the right decisions for the purpose of creating a culturally prosperous future that is vital in the evolution of a prideful, flourishing society.

Image KHS-1 View of Kalalea Mountain Range. Kaua`i Historical Society Collection.

It is interesting to note that in Hawaiian, the past is referred to as ka wa mamua, or "the time in front or before." Whereas the future, when thought of at all, is Ka wa mahope, or "the time which comes after or behind." It is as if the Hawaiian stands firmly in the present, with his back to the future, and his eyes fixed upon the past, seeking historical answers for present-day dilemmas. Such an orientation is to the Hawaiian an eminently practical one, for the future is always unknown, whereas the past is rich in glory and knowledge.

Lilikala Kame'eleihiwa, Native Land, Foreign Desires

Table of Contents

Index of Acronyms & Abbreviations

APE(s)	Area(s) of Potential Effect
BC	Boundary Commission
BMA	Bishop Museum Archives
KIUC	Kaua`i Island Utilities Cooperation
DHHL	Department of Hawaiian Home Lands
AHHA	Anahola Hawaiian Homes Association
HHCA	Hawaiian Homes Commission Act
CIA	Cultural Impact Assessment
DEA	Draft Environmental Assessment
EIS	Environmental Impact Study
LC	Land Commission
LCA	Land Commission Awards
RP	Royal Patent
NK	Native Kaua`i LLC
HCDC	Hawaiian Community Development Corporation
USGS	United States Geological Survey
TMK	Tax Map Key
HRS	Hawai`i Revised Statutes

Introduction

At the request of Kaua`i Island Utility Cooperation (KIUC), Native Kaua`i LLC (NK) conducted a Cultural Impact Assessment (CIA) of a 60 acre parcel (TMK (4) 4-7--04: 2 which is located in the Kamalomalo`o Ahupua`a, Kawaihau District on Kaua`i Island (Figures 1 - 2). The project area is situated on Department of Hawaiian Home Lands (DHHL) bounded by Kūhiō Highway to the east; and is surrounded by undeveloped lands on the project area's boundaries facing toward the south, west and north. The Anahola Hawaiian Homestead residential community lies a short distance north of the project area in the neighboring ahupua`a of Anahola.

As the primary developer, KIUC will construct a 12-megawatt AC (14.5 MW DC) solar project on 55 acres , with an estimated 5,000 panels. It will also include a utility service center on 2-acres within the project area. The service center will consist of an administrative office building and a staging site for utility services for East Kaua`i. KIUC has collaborated with the Homestead Community Development Corporation (HCDC) - the non-profit development arm of the Anahola Hawaiian Homes Association.

The project requires compliance with the State of Hawai`i environmental review process [Hawai`i Revised Statutes (HRS) Chapter 13-343, which mandates consideration of a proposed project's effect on traditional Hawaiian practices and beliefs. This cultural impact assessment provides information pertinent to the evaluation of the proposed project's cultural impacts. Additionally, this CIA report provides documentation of the project's consultation efforts under applicable state historic preservation legislation.

Methodology

Methodologies guided by indigenous Hawaiian cultural perspectives and intellect were used to conduct this study. It is always imperative that traditional values of *aloha* and *hō`ihi* (sincerity, love and respect) are ever present in the actions of the research and investigative team that engages with the natural environments, resources, people and communities from which/whom information will be gathered for this work. Special focus and attention is given to the examination of the land, water and atmospheric features that are applicable to the study project area and all lands and environments associated with it.

At the center of our collective focus is the topic of the sun and a project that has been designed to employ its *mana* or energy for the greater benefit of the Kaua`i Island community. It is a viable and necessary priority to curb our dependency on fossil fuels by creating sustainable solutions and opportunities that are "green" and good for the `āina.

At the onset of this project, we entered into this work with much enthusiasm and confidence of already "knowing" this place. Even with a limited window of time to conform to, we knew that very little had been documented to bring forth the values and depth of traditional Hawaiian knowledge and customary practices of Anahola's ancient past. Information and personal experiences that we possessed provided an advantage to accomplish the task of completing this cultural impact assessment study.

Much of the effort in conducting studies such as this is to review and evaluate the land allocated for the project area and any possible adverse influences and consequences relating to indigenous Hawaiian beliefs and practices. However, it would be negligent to limit, reduce or exclude a discussion on two of the most prominent components that are necessary and vital to this development project.

The first is the sun itself, and its foremost status in Hawaiian religious practices and beliefs. The second is the land. Not just the 60-acre parcel dedicated to the development project, but all land and natural resources of the surrounding areas related to the project/project site. This includes the Kamalomalo`o ahupua`a and the neighboring ahupua`a of Anahola that serves as the host community to the project.

In the process of gathering, assembling and documenting information from our research and interviews, we realized there was a need to address and include a chronicle of events and cultural impacts associated with native Hawaiian land, resources and its people that dates back more than192 years of history. Despite the fact that this development project did not contribute to any of this history, we strongly feel that ramifications and impacts that native Hawaiians face today because of it, are still attached to the land. For these reasons, we were pressed by our own conscience and ethics as native Hawaiians and cultural practitioners to present this history as part of the study.

Over the years, much has changed as the population has grown and the number of homes developed in Anahola has quadrupled. While it is no longer

the small native Hawaiian community that I was born and raised in almost 50 years ago, in essence, it is still the same place surrounded and protected by the greatness of Mount Kalalea and the nurturing ocean waters of the Anahola coastline. The winds with their particular characteristics that were known to our ancestors by specific names, still bring us comfort, rain and even challenges during stormy conditions. What is most important, is that Anahola is still a native Hawaiian community descended from a rich and vibrant culture and ancestors who knew this land these islands so intimately. The relationships they held with the natural world as divine and godly, influenced levels of consciousness that dictated every aspect of native Hawaiian life ways and cultural practices.

The Anahola Solar Project offers great potential for the host community of the Anahola Homestead. It also has the possible makings of a cutting edge approach to progressive technology that may provide excellent example to other native Hawaiian communities and landscapes throughout the Hawaiian archipelago. The partnerships that have forged between the member-owned cooperative of KIUC, Department of Hawaiian Home Lands, Hawai`i Community Development Corporation and the Anahola Hawaiian Homestead Association sets a positive precedence for the greater community of Kaua`i Island.

It is the intent of Native Kaua`i, to not only complete this CIA Study as part of the process of the greater environmental impact study requirement, but to produce an inclusive document and source of cultural knowledge and information for the benefit of the native Hawaiian community of Anahola and its residents. For the latter purpose mentioned here, there is much more to expand upon. Native Kaua`i is dedicated to continuing this effort beyond the finalization of this CIA Study.

It is with heartfelt aloha and respect that we extend our gratitude to Mr. Brad Rockwell of KIUC whose leadership and commitment to this project has remained unwavered and sincere to our shared objectives. We express our mahalo to the greater team made up of KIUC staff, consultants and community members who have continued to work diligently in the spirit of laulima or cooperation and partnership to navigate through the multiple processes required of this project. As native Hawaiian consultants and cultural practitioners with inherent ties to the Hawaiian Homestead community of Anahola, we are humbly reminded of the kuleana - both as privilege and responsibility that comes with the duty to perform this work.

Nui ka mahalo iā `oukou me ka ha`aha`a.

Scope of Work

1. Conduct in-depth research and examinations of historical documents, maps, archaic and historic period Hawaiian chants, mo`o `ōlelo or oral traditions, and any references related to or associated with the immediate and surrounding areas

2. Conduct field studies of the project area, as well as adjacent and surrounding areas *ma uka* and *ma kai* (upland and seaward) of DHHL's Anahola regional lands. This will include, but not be limited to the ahupua`a or traditional land divisions of Anahola and Kamalomalo`o.

3. Review existing and new archaeological information pertaining to the project site and all related areas will be perused in our quest to identify and describe cultural resources, traditional land use activities, spiritual and religious beliefs and customary practices.

4 Arrange for, and conduct oral interviews with Native Hawaiian cultural practitioners, elders and families knowledgeable about the historic and traditional practices in the project area and region. Such information may be obtained through individual, group and community meetings, as well as huaka`i or cultural site excursions with selected native Hawaiian kūpuna or elder informants, kumu hula or other experienced and seasoned practitioners and experts who have firsthand knowledge of religious, spiritual, cultural, healing, gathering or subsistence practices.

5. Upon conclusion of tasks 1 - 4, a draft cultural impact assessment will be prepared to report findings of the collective studies, including narrative summaries relating to Native Hawaiian customary practices, resources and land use. Compose a summary of findings and determination of the extent to which applicable resources, including traditional and customary Native Hawaiian rights and practices that will be affected or impaired by the project.

Environmental Setting

Anahola Solar Development Project Area

The Anahola Solar Project is slated to be developed on 60 acres of land that will be leased from the Department of Hawaiian Home Lands in the Kamalomalo`o ahupua`a (Figures 1 - 2) on the island of Kaua`i. It is located on the eastside of the island in the *moku* or district of Kawaihau.

Located between the ahupua`a of Anahola and Keālia, Kamalomalo`o is also a traditional land division that has remained undeveloped and mostly agricultural use. Prior to the overthrow of the Hawaiian Kingdom in 1893, a good portion of these lands were planted in sugar.

Majority of the Kamalomalo`o ahupua`a are designated as Department of Hawaiian Homes Lands property. For this study, an inquiry was made to the DHHL Kaua`i district office to verify the total number of acres that make up the land inventory belonging to the DHHL Trust. We were then referred to contact DHHL Land Agent, Mr. Kaipo Jenkins on O`ahu. In turn, Mr. Jenkins referred us to the web-site (www.hawaii.gov/dhhl/publications/regional-plans) for DHHL's June 2010 Anahola Regional Plan.

At the time of this writing, we were still unable to verify with DHHL, exactly how many acres in the Kamalomalo`o ahupua`a belonged to the Department of Hawaiian Home Lands Trust. Part of this comes from the way in which DHHL has designated and organized their inventory of lands.

However, we did learn from DHHL's statewide Regional Plan is that it identifies 20 designated regions on 6 islands across of the Chain of Hawaiian Islands.

On Kaua`i Island, three regions have been designated to organize DHHL's inventory of lands:
1) West Kaua`i
2) Wailua
3) Anahola

The Anahola Region consists of all DHHL property in Moloa`a, Anahola and Kamalomalo`o.

Technically, the project area is NOT located in the Anahola ahupua`a. However, it is considered and recognized to be part of the DHHL's "Anahola

Region" of lands. The generalization and clustering of traditional places to common districts (i.e. Anahola, Kapa`a, Līhu`e, etc.) has become acceptable, widespread practice in the western framework of identifying and relating to places on Kaua`i. Therein lays an example of how easily a particular traditional Hawaiian land area or division can be incorrectly identified, misunderstood and misinterpreted as a significant place of its own. Both the name and place of Kamalomalo`o has long become unfamiliar to many Kaua`i and Anahola residents. Most people assume and refer to it as "Anahola".

It is important to stress at the onset of this report, that we all have a shared responsibility - for this and any future projects to advocate for the proper use and application of traditional Hawaiian place names and Hawaiian words. Especially so, for this project involves native Hawaiian trust lands and a valuable partnership with the host native Hawaiian homestead community.

The continual use and application of traditional names of places are one of the fundamental ways in which to preserve knowledge and insight of important locations. Within Hawaiian names are contained history, stories, special phenomenon and characteristics about places. They preserve occurrences and observable facts and experiences associated with traditional places known to our kūpuna in times past. Today they are equally, if not more important to the present and future generations of Kaua`i and Hawai`i.

A considerable amount of focus is put toward the research of traditional places, their names and stories when preparing studies such as this. It is ***minamina***, a sad and unfortunate loss when valuable information is lost or forgotten. There is an urgent need to preserve and pass on ancestral knowledge that was widely known just a few generations ago. Kaua`i's unique culture and heritage associated with traditional places are key to nurturing a sense of place and connectivity. It is a vital component to the health and wellbeing of native Hawaiians, as well as the perpetuation of native Hawaiian life ways and culture.

The Hawaiian tradition of name giving is a centuries-old custom that involves process and purpose. In ancient times, personal possessions were few, but highly valued. A name however, was considered amongst ***the most prized*** possessions of all. As with any precious newborn child, names were given only after much careful thought, and observation.

The same is applicable for traditional places as well. Early Hawaiians gave names to mountains, mountain peaks, streams and valleys. They also gave names to forests, plains, taro patches and salt pans, as well as the various winds

and rains that were particular to different locations and regions. Every promontory, reef, fish house and storied place had a name as well. Again, the land and ocean were considered the extended nature family that the Hawaiian people interacted and developed strong bonds with. It is the basis of the expressions - *mālama `āina* and *aloha `āina*, meaning to *"care for and have love for the land"*.

It was not uncommon for names to be inspired or received through supernatural advice of departed ancestors, spirit guardians or gods. Prayer, meditation and ceremony were important to the process of name seeking and name giving. For names received in this manner did not only provide a unique individuality and identity for the receiver. It became a mainstay for the health, well-being and prosperity for the individual, home or place. There is a great sense of responsibility attached with a name once it is bestowed upon a person, place, object or project. Names are not simply "labels". Whether it is name for a person or a name for a place, they are honored and treated with aloha and pride.

What may appear as trifling and unimportant on the surface, are oftentimes filled with profound wonder. Kamalomalo`o and Anahola are such places that continue to hold an abundance of history and inspiration.

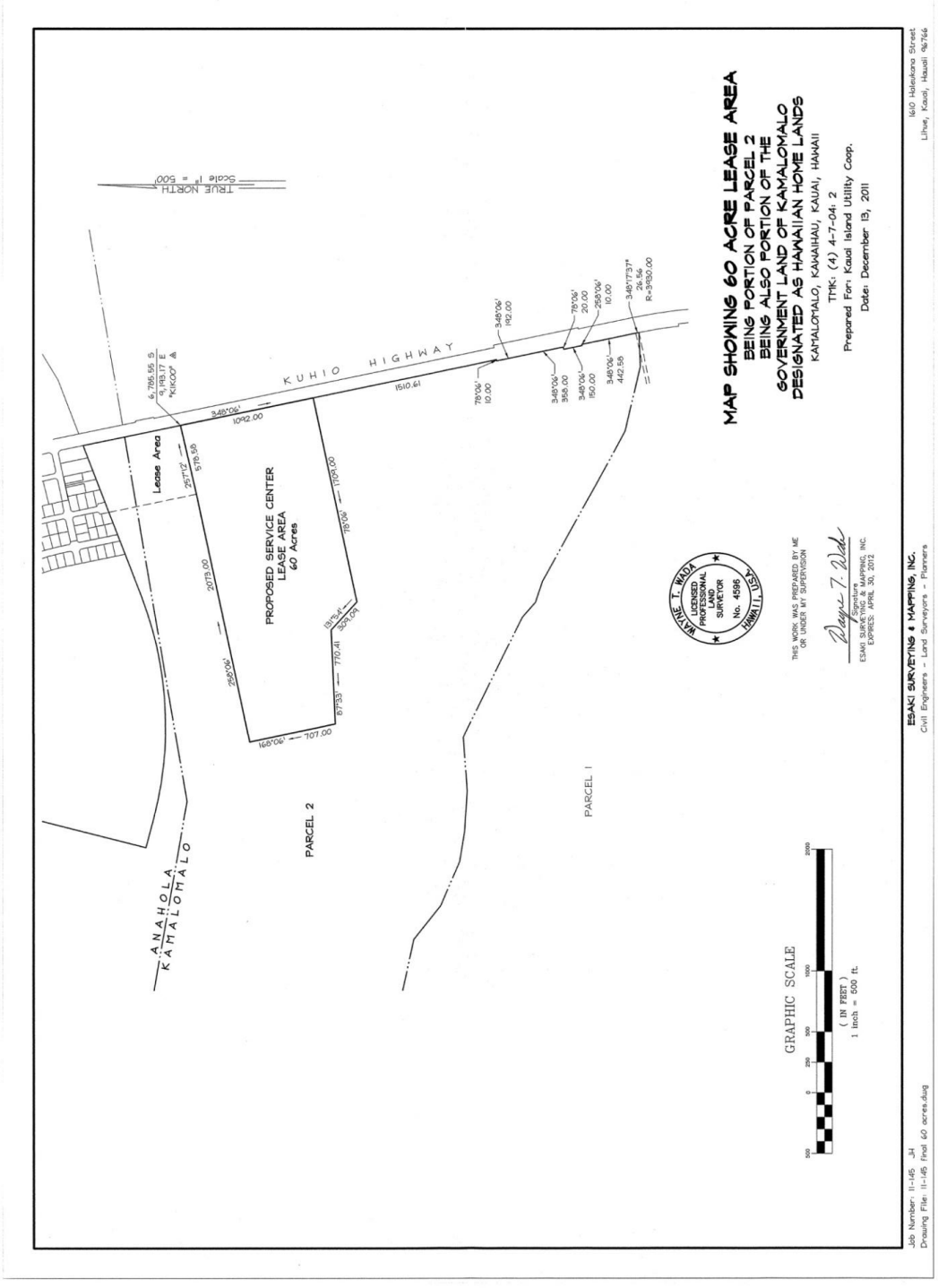


Figure 1. Map showing 60 acre lease area and project location on Department of Hawaiian Home Lands Kamalomalo`o Ahupua`a, Kawaihau District, Kaua`i Island.

Figure 2. Aerial image of DHHL Anahola Region Lands indicating location of project area. Google Maps

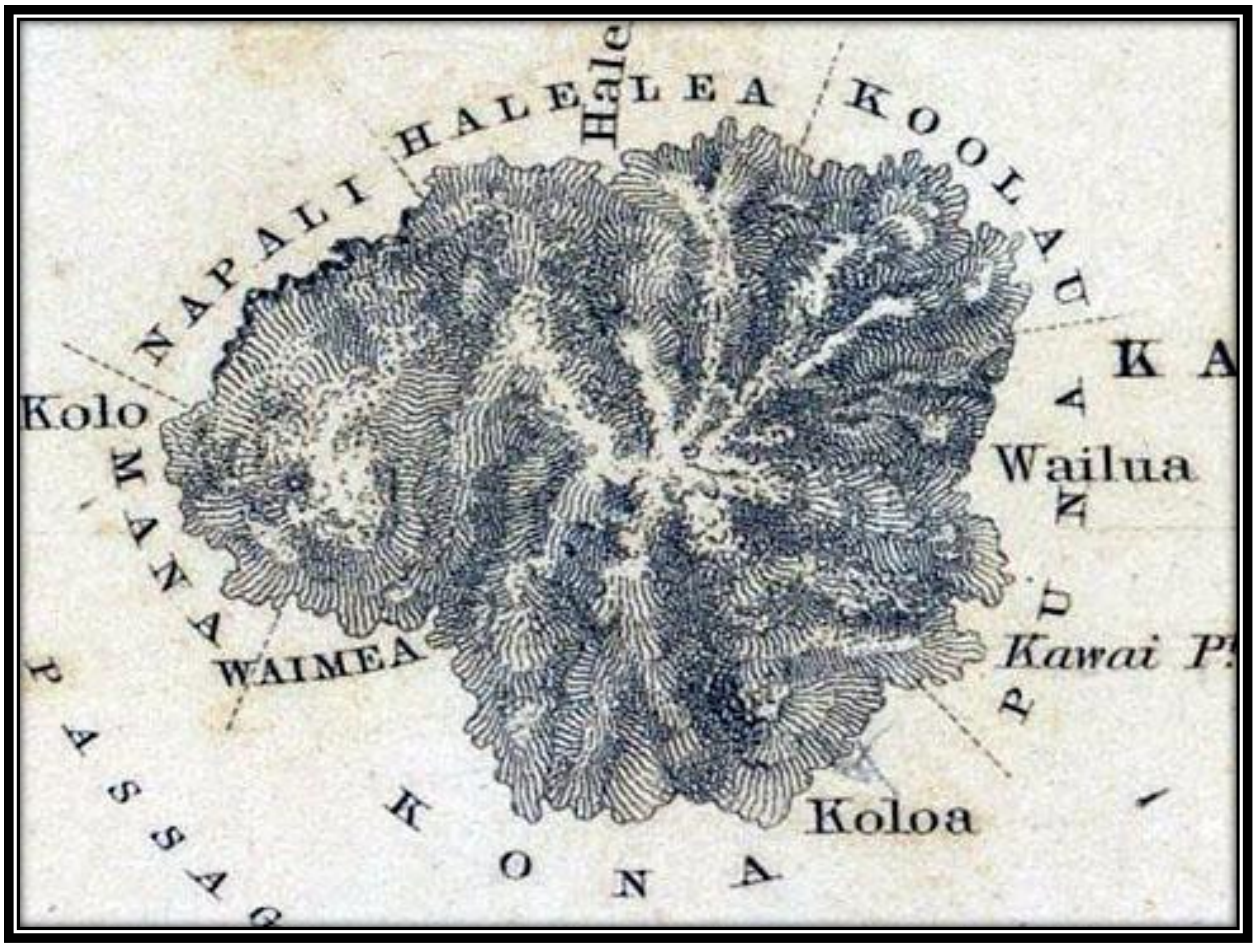


Figure 3. 1845 Map of Kaua`i by Charles Wilkes for U.S. Mapping Expedition. Note that it shows 6 moku or districts including Ko`olau, Halele`a, Nā Pali, Kona and Mānā. Typically, Kaua`i is dividied into 5 moku. Mānā is usually considered as part of the Kona moku.

Geologically, Kaua`i is the oldest of the main inhabited islands in the chain. It is also the northwestern-most island, with O`ahu as its closest volcanic sibling separated by the tempestuous Ka`ie`ie Channel which is more than 72 miles long. In centuries past, Kaua`i's isolation from the other islands kept it safe from outside invasion and unwarranted conflict.

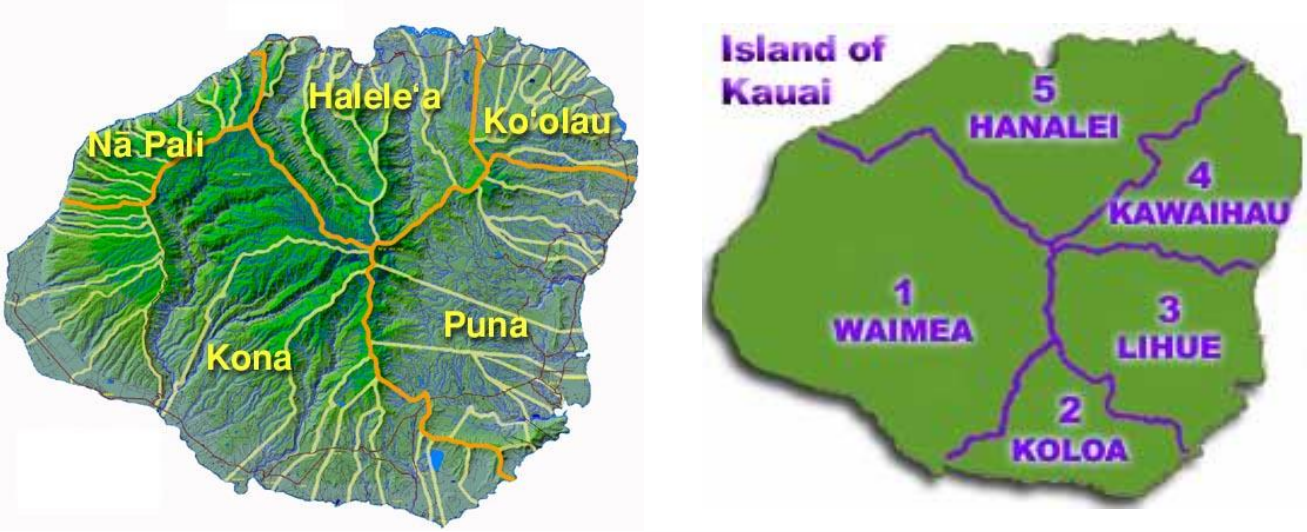
Poetically the island is called, *"Manōkalanipō", or "Kaua`i a Manō"* after the ancient chief who was largely responsible for elevating Kaua`i's ancient society to sophisticated heights of advancement and productivity. For centuries, from the time of Manōkalanipō's reign, through Kamehameha's unsuccessful attempts to invade Kaua`i in 1796 and 1804, Kaua`i remained free from warfare.

In 1810, Kaumuali`i accepted Kamehameha as the supreme ali`i by peacefully ceding Kaua`i to the newly united kingdom of Hawai`i. With honor, Kaumuali`i was encouraged to return to rule on Kaua`i as its tributary chief under Kamehameha I.

In accordance with the ancient land division system, an entire island is referred to as a *mokupuni*. While the word, moku by itself can also mean island, it is a term that is more specifically used to identify a district. Puni means, *controlled, surrounded, to gain control of*. It comes from the word, *aupuni* which is used to describe a government, kingdom, dominion, nation, or population that is governed or under the leadership of a ruler. In ancient times, a mokupuni could include an entire island as well as multiple islands that was ruled by an Ali`i Nui or paramount chief. Historically, the mokupuni of Kaua`i has included the islands of Ni`ihau as well as Lehua.

Kaua`i Island has traditionally been divided into 5 moku including: Ko`olau, Halele`a, Nā Pali, Kona and Puna. The ali`i nui appointed *ali`i `ai moku* or district chiefs to manage the various moku.

Common district names that are universally used across of the Hawaiian archipelago include "Ko`olau" marking the windward sides of the islands; "Kona" - the leeward sides of the islands; and "Puna" - indicating regions where springs and fresh water abound.



Figures 4 & 5 show Kaua`i Island Districts and Boundaries. Fig 4 on the left show the original moku of Ko`olau, Halele`a, Nā Pali, Kona and Puna. Fig 5 on the right show the revised boundaries and judicial land districts of Kawaihau, Hanalei, Waimea, Kōloa and Līhu`e.

The boundaries of the five moku on Kaua`i were changed in the late 1800s to reflect the present day judicial land districts. The Anahola Solar Project Area is located in the Kawaihau district upon land within the Kamalomalo`o ahupua`a.

The host community of the project is located north of Kamalomalo`o in the neighboring ahupua`a of Anahola. Prior to the redesignation of district boundaries, the ahupua`a of Kamalomalo`o belonged to the Puna District. The ahupua`a of Anahola belonged to the moku of Ko`olau.

Traditionally, the districts were further divided into smaller land divisions known as, *ahupua`a* which included the abundance of land and resources from the mountain to the sea. Under the direction of the ali`i `ai moku, the *ali`i `ai ahupua`a* or land division chief was put in charge of governing the ahupua`a. The ali`i `ai ahupua`a appointed *konohiki* who served as the headman of the ahupua`a land division, and was solely responsible for the management of land, water and fishing rights. An ingenious concept, the ancient design of the ahupua`a system continues to be an excellent model for sustainability and land and natural resource management today.

A major element of focus for this CIA is based on the `āina or land that has been allocated for the Anahola Solar Project, as well as surrounding lands and natural resources that are linked to the project area. It is important to readers of this CIA to have a basic understanding of the ancient land division system and the various words, terms and idioms associated with Hawaiian land designation and Hawaiian land use. This is especially helpful in identifying and relating to specific locations and place names that are pertinent to this study.

Kaua`i or Kau`ai?
Proper Pronunciation of Island

There has been on-going discussions and statements by many historians and long-time kama`āina families about the proper pronunciation of the name of this island. *"Kama`āina families"* is a term that are generally used for families descended from the post-contact missionary ancestors who settled in the Hawaiian Islands in the 1800s.

One of the tasks accomplished by the first company of missionaries that arrived in 1820 was to develop an alphabet and written form of the Hawaiian language using vowels and consonants. Out of necessity, many of them learned the language well enough to understand, speak and communicate with native Hawaiians.

This was a major milestone that quickly won the interest and favor of Kamehameha II and Ka`ahumanu who were the ruling chiefs of the time. They saw great value in education and the opportunity to transition from a centuries-old oral culture to a society with acquired skills in reading and writing. Not only in *`ōlelo haole* or English, but in *`ōlelo Hawai`i* or the Hawaiian language as well.

Elder non-Hawaiian kama`āina claim that the correct pronunciation for the island name is Kauai (with no diacritical markings). Phonetically, they pronounce the name as, *"Cow-why"*. Some pronounced the island as*, Kau`ai (Cow-eye)* with the `okina or glottal stop on the second syllable of the word; reasoning that it means, *"season of food and of plenty"* because people never experienced famine due to the bountiful water resources. Contrary to this claim and the fact that Kaua`i is abundant with annual measures of rainfall and fresh water, there are many accounts of sustainability hardships endured in times past.

Native Hawaiian kūpuna that we interviewed for this study were careful to remind that the correct pronunciation is Kaua`i, with the glottal stop between the last two vowels of the island name.

NK researchers also listened to many oral history recordings preserved in the Bishop Museum Archives in Honolulu, O`ahu of interviews with native Hawaiian elders on Kaua`i between 1959 - 1968. Led by Bishop Musem's primary interviewer and Hawaiian expert and scholar, Mary Kawena Pukui, majority of the recorded discussions were conducted in Hawaiian. Native Hawaiian

interviewees from Anahola, Kaua`i included Mrs. Evelyn Ewaliko, Mrs. Daisy Lovell, Elizabeth Ewaliko, David Pālama, Helen Wahinealiʻi Kapule Kapaka, and Mr. David Kahanu. They all pronounce the island name as Kaua`i.

In another recording of a Bishop Museum Interview, Mary Kawena Pukui poses the same question separately to two different kūpuna if Kaua`i is the correct pronunciation. Mrs. Rena Peters confirms that it is.

Mr. David Kahanu of Anahola specifically talks about the correct pronunciation of the island and confirms that he has always and only heard it pronounced as Kaua`i.

In an interview with Kahanu's descendant, Kainani Kahaunaele who too, was born and raised on Anahola homestead lands shared of her gratitude for her kūpuna's recorded testimony as substantial evidence on the proper and correct pronunciation of the island name as Kaua`i. Kahaunaele is a fluent speaker of `ōlelo Hawai`i, is a noted and award-winning *haku mele* - a Hawaiian music composer, as well as a renown recording artist. She holds a BA in Hawaiian Studies from the University of Hawai`i at Hilo, where she is a Hawaiian language lecturer. Her mother, grandfather and `ohana continue to reside as homesteaders in Anahola today.

Confirmation from native Hawaiian kūpuna who are *mana leo* such as Mr. Kahanu is significant and very important. They were raised in fluent speaking households and communities where `ōlelo Hawai`i was their first, and sometimes, only language that was spoken throughout their lifetime. Their recorded testimonies preserving their acquired knowledge and experiences are invaluable resources for present and future generations of Hawai`i Nei.

NK principal, Kēhaulani Kekua shares the following account of her own upbringing by her kumu hula and maternal grandmother, Helen Kaipuwai Kekua Waiau:

> *I was already a young adult when I recall asking my grandmother what the correct pronunciation of our island was. She turned to me with a frown and asked me what my reason was behind my question. We had always pronounced the name as Kaua`i, with the `okina between the a and the i, and so it was a strange inquiry that perturbed her a little. In our household, in hālau and throughout the Anahola community, we had always pronounced it the same way. Kaua`i. I told her that I had attended a lecture that was sponsored by the Kaua`i Historical Society and that the speaker as well as other haole kama`āina in attendance were very adamant about pronouncing it as "cow-why". She told me to chant the opening lines of the first pauku or verse to the ancient chant known as the Hula Kaua`i No Kaumuali`i.*
>
> *"It goes [chanting her example] Maika`i Kaua`i, hemolele i ka mālie..." Then she asked me to chant it using the other purported pronunciations of the island name - both Kauai and Kau`ai. It sounded and felt awkward. It felt wrong and affected the rhythm and flow of the hula itself.*
>
> *The haku mele or composer of the ancient chant had carefully selected specific words and their placements to preserve the traditional understanding and application of the place name. Maika`i meaning excellent, and Kaua`i the name of the island is supposed to rhyme and reflect one upon the other. It was a way in which to elevate the mana and exceptional qualities of this very place. Grandma used the application of chant as an example of one of the primary purposes of hula as a practice and responsibility of maintaining this knowledge. There was no room for doubt or question. This is the way that generations of our `ohana and the native Hawaiian community had always pronounced it.*

Translation of traditional Hawaiian place names

For this study, Native Kaua`i has made special effort to expand upon the various place names associated with the immediate project area as well as the extended land areas that include the ahupua`a of Kamalomalo`o and Anahola. It was important that we not only limit ourselves to the written literature and documents available.

NK investigators made several field visits to various sites to look at land, ocean and atmospheric traits, and spoke with native Hawaiian kūpuna and informant kama`āina who are intimately familiar with the study locations.

Loosely translating Hawaiian place names from the pages of a dictionary is not good enough. One must go and see the lay of the land, see, touch and feel the textures of the native limu or plants that grow at the different places, study and understand the directions and *`ano* or nature or manner of the wind and rain that are *pili* or connected to certain places, etc. All possible meanings are taken into consideration. In many cases, place names are connected not to just or there other, but to multiple meanings.

Dr. Pualani Kanaka`ole Kanahele - eminent Hawaiian scholar and respected master kumu hula, elaborated on her view of the word, *makawalu* and the imperative practice of taking different perspectives and views into account when processing an understanding of Hawaiian words, names and places. Literally, makawalu means, many, much, in great quantities. Sometimes used with implication of chiefly mana or energy. Literally translated it means "*eight eyes*". Makawalu is to take initiative of different perspectives and approaches. It is to see and observe from different angles. It is also to foster the ability to perceive and articulate on the interrelationships and connectedness of mankind and the natural world.

Ancient Ahupua`a System:
Reciprocal Relationships of Land, Environment and Man

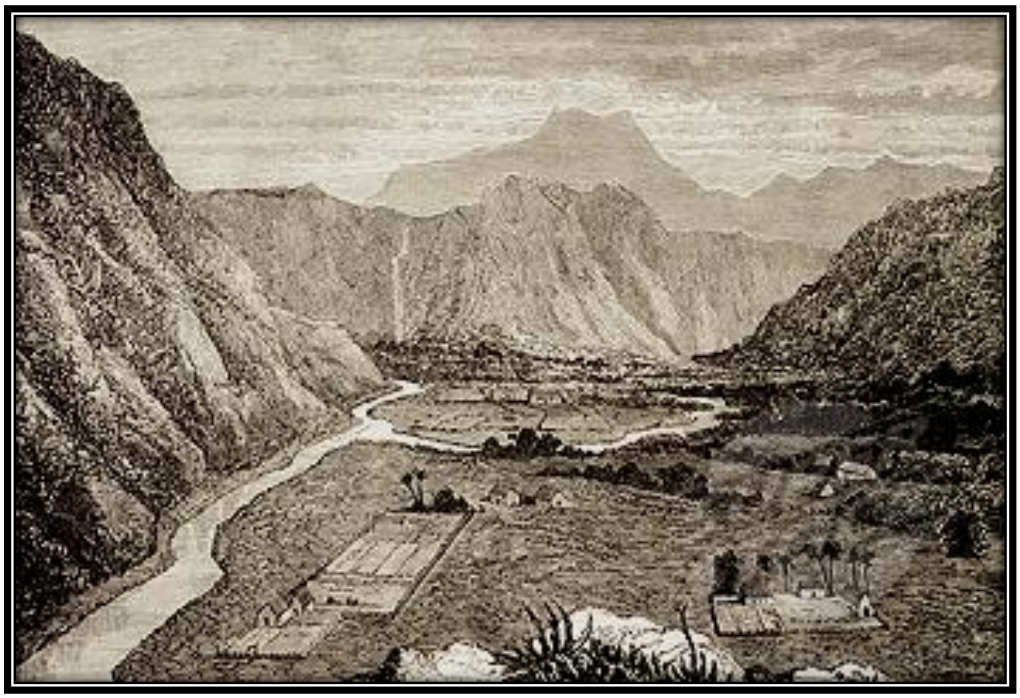


Figure 6. Lithograph, William Ellis C., View of Hawaiian Ahupua`a System. Big Island, Waipio Valley

One of the most remarkable concepts of ancient Hawaiian culture is the basic self-sustaining structure of the ancient Ahupua`a System. Shaped by the island's geography from the mountain to the sea, each ahupua`a was divided following the natural boundaries of the watershed. Abundant rainfall along with mountain aquifers provided fresh, clean water which flowed naturally and freely through realms designated for gods and man respectively. Nourishing and supporting all life forms, water was a sacred resource and manifestation of the god, Kāne to whom life and health was sanctified. The entire community took part in its proper care and conservation of it. The ahupua`a contained all of the resources that was needed to sustain the human community. There was the abundance of fish and seafood from the ocean, fertile lands for planting and farming upon the plains of kula lands, and timber and other resources from the upland forests for the building of structures and canoes.

The success of the ahupua`a was based on a belief system that emphasized Hawaiian spirituality that was extended to the entirety of the natural world which

included the landscapes of land and ocean as well as the atmosphere. Nature forms that supplied nourishment and supplies for survival and existence were viewed as *kinolau* or manifestations of their deities themselves. i.e., specific plants used for healing and subsistence were body forms of certain major and minor gods because of its distinctive quality to cure or sustain.

> **"*Ahupua'a* is holistic…**In Hawaiian culture, you had *kahuna* who knew the forests, knew the trees, knew the geology. The chiefs could draw upon the collective wisdom of the *kahuna* to help determine what was an appropriate construction project. Today, I see a modern *ahupua'a*. It means using the knowledge and tools we have today. "
>
> "Some argue that using an *ahupua'a* system today poses challenges simply because our society is not organized around subsistence, which was the whole premise of the *ahupua'a* system. Others have said, how can you use an *ahupua'a* system in modern Hawai'i when we import 70% of our food? Moreover, the people within the *ahupua'a* shared common resources, but today so many of these are now either degraded or sequestered in private lands."
>
> "But if we look at the underlying values, principles, and practices, those have not changed. Certain accepted features are retained, even in Western law: water as a public trust resource, public access rights to forest, to hiking, to gathering. Those are acknowledged even in modern Western laws, especially in the State of Hawai'i."
>
> Stephen Kubota
> Ahupua`a Action Alliance

Stewardship Versus Ownership

The concept of private land ownership was non-existent in pre-contact Hawai`i. Guided by a holistic worldview, ancient Hawaiian society was based on a subsistence economy that depended on proper stewardship of the land and resources. Tenure upon parcels of land called *kuleana* were extended to the *maka`āināna* or common people to live and raise their families. Everyone shared in the stewardship of the greater ahupua`a which provided for sustainable gathering, fishing and hunting purposes. There was often trading and sharing of resources between families and villages located along the coastal areas and those within the upper regions and valleys. Trading also occurred among various ahupua`a as well.

Stewardship practices were formalized through the kapu system which consisted of protocols and laws pertaining to the religious, political and cultural affairs of the chiefs and people. Overseen by konohiki chiefs and kāhuna (priests), regulations held in accordance with seasons and cycles. Spiritual-based kapu and rules not only governed the use of resources, but also for their conservation and restoration as well. Kānāwai (laws of the land) ensured that resources were shielded from squander and exploitation. Although viewed by foreigners and the outside world as excessively complex and restrictive, it is one of the earliest examples of environmental protectionism.

Paramount chiefs and the hierarchy of kāhuna or priests, were the spiritual conduits to the gods and petitioned for their success and wellbeing. Ali`i assigned konohiki to manage the ahupua`a on their behalf. The relationships were reciprocal and based on loyalty to care for, and increase the productivity of the land. Maka`āināna were not indentured to serve under any particular ali`i. If commoners were mistreated unfairly, or if the ali`i was greedy, they were free to move to another ahupua`a and take up residence under another chief.

I ali`i no ke ali`i i ke kānaka
A chief is a chief because of the people who serve him
This was often used as a reminder to a chief to consider his people
#531 `Ōlelo No`eau

An ali`i's success as a leader was dependent on the maka`āināna. Hence, it was important that the ali`i assured their happiness in order to maintain their loyalty. Ultimately, both commoner and chief held the `āina in deep regard.

He ali`i ka `āina, he kauwā ke kānaka
The land is a chief, man is its servant
Land has no need for man, but man needs the land and works it for a livelihood
#531 `Ōlelo No`eau

Ancient Hawaiians held familial connection with nature and the environment and understood that their relationships were reciprocal. As presented in `ōlelo no`eau #531 above, the land was viewed as chiefly.

Wahi Pana

The research and study of wahi pana was an essential process to this study. Wahi pana are celebrated and storied places that illuminate generations of reciprocal connection and relationships between indigenous Hawaiians and the

land and seascapes and natural resources that supported their existence. For well over two thousand years, native Hawaiians have held intimate bonds with their islands and special places upon them. Wahi pana continue to be integral, living components of a Hawaiian world view today.

Literally, the word "*wahi*" simple means, "*place or location*". *Pana* is defined as "*celebrated and storied*". Another definition of the word, pana is, "*heartbeat or pulse*".

The latter, elevates and distinguishes a place as a wahi pana from any other ordinary location. Nature's forces, combined with the intangible spiritual energy source known to indigenous Hawaiians as mana are prevalent at many wahi pana throughout Hawai`i. Additionally, these wahi have specific stories, purpose and function that have influenced the lives of `ōiwi kānaka or Hawai`i's native people for myriad generations. Transmitted orally from generation to generation, their experiences have been preserved through mo`olelo (legends and stories), mele oli (chants), mele hula (dances) and `oihana Hawai`i (practices), maintaining memory and knowledge of places that should be honored and respected. Wahi pana are excellent teaching tools that continue to be extremely valuable today in its capacity to inform and demonstrate the cultural traditions, practices, values and beliefs of Hawai`i's ancestors and people.

In an essay written by the late Hawaiian scholar Edward Kanahele entitled, "The Significance of Wahi Pana", he shared his view as follows:

> *"For native Hawaiians, a place tells us who we are and who is our extended family. A place gives us our history, the history of our clan, and the history of our ancestors. We are able to look at a place and tie in human events that affect us and our loved ones. A place gives us a feeling of stability and of belonging to our family -those living and those who have passed on. A place gives us a sense of well-being and of acceptance of all who have experienced that place. A wahi pana is, therefore, a place of spiritual power which links Hawaiians to our past and our future."*

Wahi pana vary. They include, but are not limited to sacred sites such as heiau, and ancient burial caves and burial grounds. Alluvial valley floors which were cleared for the construction of elaborate irrigated systems of lo`i terraces, as well as fishing grounds and surf sites in the ocean are wahi pana as well. Mountain peaks, cliffs, valleys, rivers and streams too, have emerged over time as places of cultural importance.

All discernible features in every land division, district and island were given specific names that inspired life and meaning to these places as wahi pana. Every stream, spring, beach, fishing hole, reef, promontory, winds and rains, etc. all have names. These elements of nature provided the foundation for the creative and productive industries of the ancient Hawaiians.

The perpetuation of cultural practices and experiences held in close attachment to wahi pana and the reoccurring elemental phenomena specific to places illustrate the unique relationships of stewardship and kinship by native Hawaiians and the natural environment.

As successive generations of Hawaiians empowered these islands and their sacred and storied places with their prayers, ceremonies and labor, they left their indelible and enduring mark on the landscape; both seen and unseen. Tangible and indefinable sources of mana or spiritual power and energy unique to different places are also a result of generations of relationships that were nurtured between mankind and these special wahi or storied places. These are the multi-faceted qualities that have elevated wahi pana to the realms of Hawaiian consciousness. The land, the sea, the atmosphere and all of the natural resources and phenomena that were held within each of its boundaries were considered as akua, divine and sacred. All of it was godly.

E mālama pono i ka ʻāina; nānā mai ke ola.

Take good care of the land; it grants you life.

Aloha `Āina...Mālama `Āina

At the heart of Hawaiian values is the concept of **Aloha `Āina** and **Mālama 'Aina**, having love for the land and the responsibility to care for the land. Native Hawaiians have had a long-standing relationship to the land.

"Aloha `Āina simply means to love and respect the land, make it yours and claim stewardship for it. Mālama 'aina means to care for and nurture the land so it can give back all we need to sustain life for ourselves and our future generations."

Kūpuna Nani Rogers
Team Leader, Ho`okipa Network

`Ōlelo Hawai`i - The Hawaiian Language

For generations, Hawai`i was immersed as an oral culture with infinite records of historic events, genealogies, ceremonies, traditions and practices that were preserved in chants, prayers, dances, and stories. Everything was committed to memory and passed on orally. Every fraction of life in ancient Hawaiian society was linked to a pantheon of deities which was accessed through a hierarchy that began with personal family gods or `aumākua, as well as gods that were specific to each vocation.

Prior to the arrival of Captain James Cook and the first westerners in 1778, *`ōlelo Hawai`i* or the Hawaiian language was the only language spoken in the Hawaiian islands. In the early 1800s, the language flourished in written form as well, after Calvinist missionaries developed a Hawaiian alphabet using Latin characters. With the enthusiastic support of the chiefs, schools were set up to provide instruction in reading and writing for Hawaiian and missionary children, adults and even business people through the medium of Hawaiian language. In less than two generations from the establishment of a written language, the Hawaiian Nation had the highest literacy rate of any country in the world.

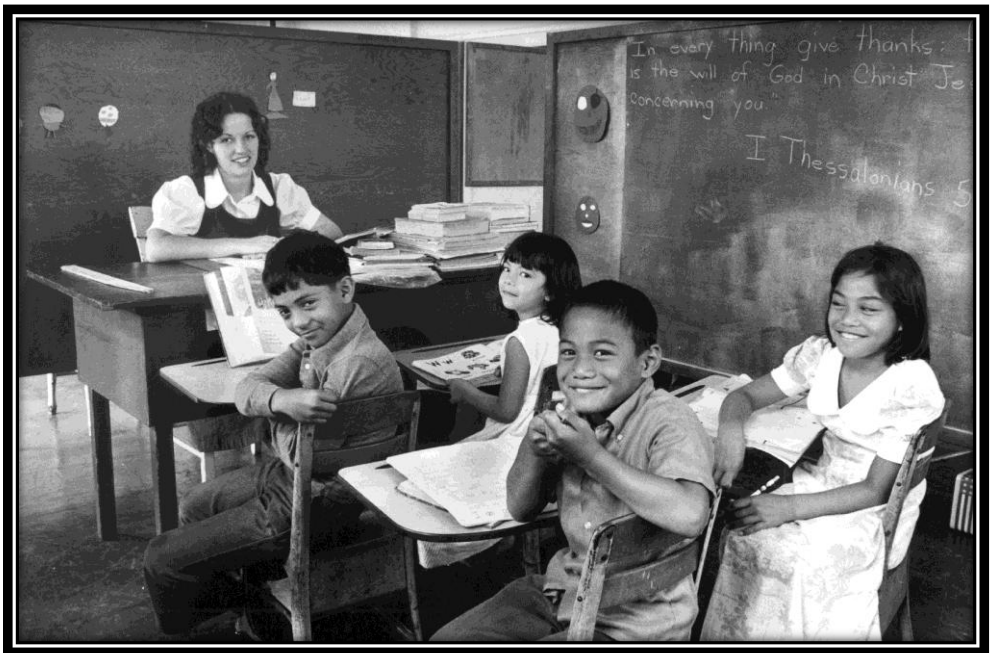


Image KHS-6 Anahola Church School. Kaua`i Historical Society Collection

Hawaiian Language Newspapers

The first newspaper printed in Hawai`i was a student newspaper at Lahainaluna School, called "Ka Lama Hawai`i" (The Hawaiian Luminary) on February 14, 1834. Shortly after, in that same year, the first regularly published newspaper, "Ke Kumu Hawai`i" was established. Missionaries saw these smaller newspapers as an excellent vehicle for teaching and to help with the increase of literacy levels, but it was also a perfect tool for promoting Christian principals. According to Hawaiian Scholar, Esther Mo`okini, *"The paper served a dual purpose of providing reading material for the schools and presenting in an effective manner the views of the missionaries upon religious and moral questions."*

The first regular English language newspaper was founded in 1856, establishing the Pacific Commercial Advertiser as a weekly publication. The Advertiser has published continuously since then, eventually producing a daily edition in 1882. Over the years, the Advertiser has gone through several name changes, including a switch to the Honolulu Advertiser in 1921. Today, the newspaper is known as the Star Advertiser.

In 1861, "Ka Hōkū O Ka Pakipika" (Star of the Pacific) the first Hawaiian language newspaper published by a native Hawaiian by the name of J.K. Kaunamano was established. The press was operated entirely by a staff of native Hawaiian editors and printers who had been educated and trained at Lahainaluna School on Maui, as well as at the Kamehameha Schools for Boys. It was during this period that many articles and mo`olelo in the Hawaiian language flourished. According to University of Hawai`i Professor, Noe Noe Silva, this was an indication that native Hawaiians had spent many years documenting and writing down mo`olelo beforehand, probably for years, while awaiting avenues for their writings to be published.

From 1834 to 1948, more than 100 newspaper publications equaling approximately 125,000 pages of text in the native language were published for Hawai`i's highly literate community. Native Hawaiian authors and historians from throughout the Hawaiian chain contributed multiple genres of mo`olelo, including short stories, genealogies, and lengthy epics such as the mo`olelo of Hi`iakaikapapolopele. The publications served as sources of traditional, cultural, historical and political discussions, including the decline of the native population and the need for Hawaiian sovereignty. Obituaries took the form of extensive kanikau or funerary dirges, which also included tributes of mo`okū`auhau or genealogy chants that honored the deceased. Traditional and introduced

fishing practices, marine ecosystem management and changing legal environments, climatic conditions, storms and so much more found their way into the volumes of Hawaiian language newspapers.

Three years after the overthrow of the Hawaiian Monarchy in 1893, `ōlelo Hawai`i was outlawed as a language of education in Hawai`i. English quickly replaced the use of Hawaiian in schools, as well as in all government and business sectors throughout Hawai`i. Those attempting to use or perpetuate the Hawaiian language at home and in public were punished and chastised. This systematic oppression led to a steep decline in the number of native Hawaiian language speakers. For fear of being reprimanded and even ostracized by society and the authorities, parents and grandparents succumbed to the use of the English language in the raising of their children and families. Many forms of Hawaiian expression, practices and custom were heavily prohibited and punishable by law. Many kumu hula, `olohe, kahuna lā`au lapa`au and other masters of traditional schools of knowledge ceased to teach and practice. Several went underground with their traditions or kept their practices limited to their immediate family members.

By the early 1980s, less than 30 children under the age of 12 could speak Hawaiian. Most were children of parents from Ni`ihau - the only island remaining where Hawaiian language was spoken as the first and preferred language of choice. Parent and grandparent generations elsewhere in Hawai`i had already grown up without knowledge or experience in speaking the Hawaiian language. For majority of the native population in Hawai`i, `ōlelo Hawai`i was as remote and unfamiliar as any other foreign language from another country.

This prompted a group of Hawaiian language educators in 1984 to advocate for the perpetuation of the Hawaiian language. They formed and founded `Aha Pūnana Leo pre-schools with the vision of re-establishing a Hawaiian language speaking population once again.

In 1978, the State of Hawai`i Constitution was amended to recognize Hawaiian as an official language of Hawai`i by law. Today, the language is beginning to flourish once again, with Hawaiian charter schools, pre-schools and public schools providing instruction in `ōlelo Hawai`i.

In Anahola, the Kamehameha Pre-School and the Kanuikapono Charter School, provides instruction and curriculum that strongly emphasizes Hawaiian values, culture and language. Kanuikapono is located on DHHL Residential Homestead Land off of Kukuihale Road.

Mo`olelo: Storied Origins & Traditional Places

Mo`o `Ōlelo is the succession of talk; or the continuation and perpetuation of oral histories and traditions that were passed on in story and chant forms. It is from this that the word mo`olelo is derived - stories, tales, myths, legends and chronicles; records of information that was storied in the memories of Hawai`i's ancient people. Another term that is used is kā`ao - oral traditions and myths that represent the cultural truths, wisdom and experiences of our kūpuna.

Throughout the CIA, examples of traditional Hawaiian mo`olelo are presented to link the reader with traditional places, beliefs and practices associated with the ancestral worldview of Hawai`i's indigenous Hawaiian people. Mo`olelo and kā`ao are not viewed as fanciful fairy tales or fictional stories woven to entertain. Laden with skillful use of metaphors and poetic expressions, they are invaluable sources of information that have preserved a sense of consciousness and inner connection of the *kānaka `ōiwi* with his multidimensional world.

It is estimated that the Hawaiian island chain was first settled upon more than 2000 years ago by Polynesians who arrived from Nukuhiwa (also pronounced Nu`uhiwa) or the Marquesas Islands. Early migration chants and oral traditions provide insight to the discovery and settling upon these islands. One story tells of a man named Hawai`iloa who is credited with first discovering Hawai`i when he set out from a land called, "Ka `āina kai melemele a Kāne, (*The land of the yellow sea of Kāne)* on a long fishing expedition. He sails back to his homeland and returns with his wife and followers, including eight navigators. Because his wife is the only female on this return journey, it is said that all Hawaiians are descended from him. The largest island in the chain - Hawai`i, is named in his honor, while the additional islands of Kaua`i, Maui and O`ahu are named after his children.

From Hawai`iloa, the heritage of long, distant voyaging, non-instrument navigation and way finding is established using phenomenal skills of keen observation and comprehension of stars and constellations in the heavens. He is the primal ancestor of the Hawaiian people who also introduces the astronomical wisdom of the atmosphere and its phenomena, including the weather and climate. He is also an expert of the ancient sciences associated with the physical, geological and biological features of the oceans.

From the union of Papahānaumoku and Wākea - preeminent mākua or parents of the Hawaiian universe is born Hāloa...our very connection to kalo, the sacred staple that has fed and nourished the Hawaiian people since time immemorial.

The genealogical ko`ihonua of Hawai`i's ancestral Earth Mother and Sky Father bring forth the paradigm that bind generations of Native Hawaiian families to this storied progenitor.

Through the traditions of Papa and Wākea, the energy of the Hawaiian family system that includes both nuclear and extended `ohana is born. From this legacy comes the skills and intelligence of the mahi`ai - the native planter that tends to Hāloa, the taro plant and elder brother that continues to sustain families today. Indigenous agriculture and cultivation practices are dependent on acquiring intimate knowledge of water cycles, moon phases and weather phenomena. There is a constant nurturing of familial relationships to land, environment and elements of the Hawaiian universe.

The epic saga of Pelehonuamea describe in detail, the journey of the fire clan aboard the mythical wa`a (canoe) named Honuaiākea. Their quest is to search for a new fire source and a home from which to generate sources of life. It too, is a story of genealogy and migration, establishing cyclical movements of life upon these lands. The sun is a fundamental and reoccurring theme of substance that is essential to physical, spiritual and intellectual wellbeing.

The chants of the mo`olelo of Pele and Hi`iaka provide detailed accounts that speak to the importance of relationships that the indigenous Hawaiian hold in high esteem with `ohana or familial relationships; not just with mankind, but with their environment as well as with that of the atmosphere and the elements. This is a profound expression of connection that taps into the inner sources of life and healing. Through this ancient oral tradition, we are provided with formulas and procedures of Hawaiian protocols and ceremonies that are still applicable for the native Hawaiian in the 21st century.

These are just a few examples of the incalculable volumes of "unwritten literature" - primal sources of Hawaiian chants and the impressive accounts within them chronicle centuries of Hawai`i's fascinating history and culture. Embedded in the narratives of these ancient traditions are valuable details that provide us with a deeper understanding and a closer look at the worldview, life ways and experiences of Hawai`i's people prior to the turbulent changes that unfolded in post-contact times.

The significance and merit of mo`o `ōlelo - what an ingenious tradition of transmitting wisdom, knowledge, history and more through the succession of the voice conveyed through the telling of stories and the perpetuation of the art form of chants and the oral traditions that inspire the essence of indigenous Hawaiian cultural practices and beliefs.

Ancient Chants that Extol the Land & Environment as Relations

References and examples of chants from Hawai`i's ancient repository of oral and literary traditions have been included in this CIA to elaborate upon the traditional beliefs and cultural practices of native Hawaiians. These practices continue to this day. Mele oli, mele pule, mele hula and mo`olelo provide authentic examples of this continuing practices. They also speak to the relationships held between *nā kānaka* - mankind, their environment and their gods.

The ancients viewed facets of nature such as the heavens and earth as a godly and divine pairing of male and female procreative energies. Wākea - the broad, wide expanse of the atmosphere is male. The moisture that gathers and collects in the clouds and sky produces rain, which is also a male force. The earth is female, and is known to Hawaiians as Papahānaumoku, or literally, *Papa that gives birth to islands.*

Adapted from Hawaiian Antiquities by David Malo (p.243) the mele ko`ihonua or genealogical chant on the following page speaks to the birthing of the Hawaiian Islands. Wākea - the male, is embodied in the expanse of the atmosphere and the heavens. Papahānaumoku - the female is Papa who gives birth (hānau) to islands.

Image NK-1.11 Hāloa is embodied in the kalo or taro plant and is revered as an "older brother" of the native Hawaiian people.

This ancient chant was revived into modern day cultural practice as a means of expressing native Hawaiians' familial relationship with the natural world and the `āina or land. Papa and Wākea - Sky Father and Earth Mother, along with their offspring, Ho`ohōkūlani are the divine characters and procreative forces that are also revered for the gift and traditions of the sacred kalo or taro plant. They are viewed and respected as ancestral progenitors of native Hawaiians.

`O Wākea noho ia Papahānaumoku

Hānau ‘o Hawai’i, he moku
Hānau ‘o Maui, he moku

Ho’i hou ‘o Wākea noho ia Ho’ohōkūkalani

Hānau ‘o Moloka’i, he moku
Hānau ‘o Lāna’i, Ka ’ula, he moku

Līlī `ōpū punalua ‘o Papa iā Ho’ohōkūlani
ho’i hou ‘o Papa noho iā Wākea

Hānau ‘o O’ahu, he moku
Hānau ‘o Kaua’i, he moku
Hānau ‘o Ni’ihau, he moku
He ‘ula a’o Kaho’olawe!

Translation:

Wākea lived with Papa, begetter of islands

Begotten was Hawai’i, an island
Begotten was Maui, an island

Wakea made a new departure
And lived with Ho’ohōkūkalani

Begotten was Moloka’i, an island
Begotten was Lāna’i, an island

The womb of Papa became jealous at its partnership with Ho’ohōkūkalani
Papa returned and lived with Wākea

Begotten was O’ahu, an island
Begotten was Kaua’i, an island
Begotten was Ni’ihau, an island
A red rock was Kaho’olawe!

Hānau Ka Lā:
The Sun is Born

Of all of the elemental forms in nature, the lā or sun is the most prominent source of mana. For thousands of generations, native Hawaiians have worshipped the sun as an essential component of their religious and cultural practices. As a deity, the sun is known by the names of Kānehoalani as well as, Ka`onohiokalā. The first, as the sun in its entirety and the latter as the god that lives in the `ōnohi - the center or in the "*eyeball of the sun*". From within sun, Ka`onohiokalā emits the power and life source of energy or mana.

The significance and understanding of *mana* as physical, mental and spiritual nourishment is preeminent in the customs of old Hawai`i. It is essential to the health and wellbeing of the family system and community.

Every fragment of Hawaiian history and culture was documented to memory and orally transmitted from one generation to the next via chants. The births of gods, mankind, celebrated chiefs and more were often the subjects of lengthy, detailed chants.

Amongst them were *mele mo`okū`auhau* or genealogy chants, which are still considered to be one of the most prized family possessions of the native Hawaiian people. Kūpuna or elders were careful to designate individuals in the following generations of their families to be groomed as stewards of the `ohana's genealogy. All knowledge was committed to memory, which included the names, unions and offspring in the family's ancestors. Mo`okū`auhau hold us accountable to our ancestors. It strengthens our cultural identity and inspires the mana of our being.

However, mo`okū`auhau were not limited to families of humans only. Literary accounts of mo`okū`auhau also included family lines of many other nature forms as well. This included, mountains, sharks, water sources and elements of the natural world.

The following is short segment from a chant that names the Kaikahinali`i - the female and Kānehoalani - the male, as the elemental parents of their nature offspring.

`O Kaikahinali`i, ka makuahine;
`O Kānehoalani, ka makuakāne

Nā keiki a lāua, ke one hānau

`O Kamohoalai`i ke kāne, ua hānau `ia i Hapakuela
`O Kahuilaokalani ke kāne, ua hānau `ia i Hapakuela
`O Pelehonuamea ka wahine, ua hānau `ia i Hapakuela

The mother was Kaikahinali`i
The father was Kānehoalani
Their children born to them and the sands of their birth
First born was Kamohoali`i - a male, he was born at Hapakuela
Kahuilaokalani - a male was born, he was born at Hapakuela
Pelehonuamea - a female was born, she too was born at Hapakuela

The lines above provide a genealogical introduction associated with a migration made to the island of Kanaloa (another name for Kaho`olawe). It speaks of natural phenomena and the interrelationships of male and female procreative forces that produce godly offspring.

The mother is Kaikahinali`i who is the originating volcanic source of seismic movements that produces tsunami activity in the ocean. Kānehoalani is the father whose atmospheric form is the sun. Their combined male and female energies give birth to the first three offspring in this genealogy; namely, Kamohoali`i, Kahuilaokalani and Pelehonuamea.

Kamohoali`i *(the supreme principal chief)* is the hiapo - the eldest and the first born who is the leader and principal that guides the migration of the Pele Clan and is responsible for initiating volcanic eruptions. In one of his primordial ocean forms, he is a great shark god. He is the master navigator aboard the Pele Clan's mythical canoe named Honuaiākea *(the expanse of the earth).*

Kahuilaokalani *(the lightning of the heavens)* is also a male who takes on the form of the electrical currents in the atmosphere. Born from the eyes of Haumea, he is manifested through flashing lightning.

Pelehonuamea *(Red-hot magma from the earth)* is female. She is the substance of molten magma and the flow of lava, responsible for the creation of new land.

As the goddess of fire and volcanoes, Pele influences movement upon the earth as well as in the atmosphere. Her discernible attributes include earthquakes, wind, steam, smoke, and fire.

All five of these characters are imperative to the migration of the Pele clan in their quest to search for a new fire source. They all possess mana - physical and spiritual energy to initiate earthquakes, eruptions, lightning, thunder, tsunamis and the flow of magma and lava that eventually cools and hardens. This is the procreative process of male and female nature gods credited with the birthing of new land.

In subsequent chants that follow, the poetic narrative details their movements of pushing further and further to the east. The fire clan pursues their search for Kānehoalani and a place where Pele can create a volcanic home for herself and her siblings to settle. There is strong desire for Pele to reconnect to the fiery source and power of her father, the sun god. It is essential to her ability to create new land.

The chant, *"Kū Mākou E Hele"* details the migration journey aboard the canoe, Honuaiākea. Entering from the northwest end of the Hawaiian Island chain, the Fire clan stops at each of the islands with hopes that Pele will be able to establish a home for them.

The chant begins with their first landing at the island of Nīhoa, a land rugged and inhospitable for living. They move on to the island of Lehua, where they discover that they unintentionally left their brother Kāneapua behind at Nīhoa. It is here, that the chant describes the masterful skills of Kamohoali`i as a steersman and navigator who is challenged to maneuver their canoe to return to Nīhoa where their brother Kāneapua has been left behind. From there they head to Ni`ihau. Kamohoali`i consults Paoa, the divine staff of Ni`ihau's potential for them to build a home there. However, it proves the terrain unfavorable and the fire clan continues on to Kaua`i.

Their stay on Kaua`i is brief at the northern tip of Kīlauea where eventually, Pele's volcanic fires are put out by the raging ocean of her rival sibling and older sister, Namakaokaha`i. From Kīlauea, they head to the south end of Kaua`i where Pele makes another attempt to create a home in the moku district of Kona (today known as the Kōloa district). Again, her fires are put out by the goddess of the sea. Situated on Makaokaha`i Point, the ocean-filled spatter cone dug by Pele is called, Nomilu, named for the deity and the realm of the underworld. This is part of the Kōloa eruption series, Kaua`i's last volcanic activity.

In the chant below, the goddess, Pelehonuamea offers a greeting of love and aloha to Kānehoalani. He is the purest embodiment of the most ultimate and supreme form of the volcano in the heavenly space of the atmosphere.

E Kānehoalani, e Kānehoalani ē,
Aloha kāua!
Kau ka hōkū ho`okahi hele i ke ala loa
Aloha kama kūkū kapa a ka wahine
He wahine lohiau nānā i ka makani
He makani lohi au hā`upu mai o loko ē!

O Kānehoalani, O Kānehoalani
Greetings to us!
Relying upon the star we traveled the long trail!
Greeting to the child of the kapa beating woman!
An inactive woman, observing the wind,
An inert wind, smoldering within!

Kau ka hōkū ho`okahi hele i ke ala loa

This particular line indicates the role of the sun as a navigational aid for the migrating fire clan. The sun is the one star (hōkū) whose daily sunrise keeps them on course, due east. Pele acknowledges the long journey and pathway that it will take and the transition from solar to lunar cycles with the goddess Hina, the "*kapa beating woman of the moon*".

Eventually, the fire clan reaches their destination on Hawai`i Island at the cape known as, Kumukahi *(First Beginnings)*. It is the eastern-most point of the Hawaiian archipelago where the first rays of sunlight touch upon the land when it rises. Pele is successful in creating a volcanic home for herself and her siblings and settles in at Halema`uma`u - a pit within the larger summit caldera of Kīlauea.

Kumukahi is named after an ancient hero of Kahiki who first landed there. Contrary to the common thought that Kahiki is *Tahiti* in the Hawaiian language, it is described in mo`olelo and chants as a far away, distant land from whence the ancient gods originated from. Kahiki is also an indication of the sun's point of entry which lies in the east. Hiki meaning to get to or to reach a place; arrive, appear and arise, as of the sun.

Kahiki was also the term used to identify the five stratums that divided the sky. The use of these terms is also important in religious ceremonies as a means to establish the perimeters of sacred ceremonial space which extended to, and included the greater atmosphere of the universe. The dome of heaven was seen as a structure in itself, with walls that rested upon the earth. The different kahiki represent the boundaries of this paradigm.

Kahiki-moe - Horizon. Literally, prostrate Kahiki
Kahiki-kū - sky just above the horizon. Literally, upright Kahiki.
Kahiki-ka-papa-nu`u - the next layer. Literally, Kahiki the elevated stratum.
Kahiki-kapu-i-Hōlani-ke-kū`ina - the sky directly overhead.
Literally, sacred Kahiki at Hōlani the meeting place.

Legend tells of Kumukahi and his wives, represented by volcanic pillars along the coast who tossed the sun back and forth. The mo`olelo describes the fundamental nature of the movement of the sun between the solstices as it moves from one extremity to the other from north to south.

Another account by Martha Beckwith describes a red stone at the extreme end of the cape that represents the Kūmukahi, a god with healing powers who can take the form of a kōlea or plover. Two further stones represent his wives, who "manipulate the seasons by pushing the sun back and forth between them at the two solstices" (Beckwith 1970 [1940], p.119).

Image NK-22 Clouds mimick the silhouette of land and rock formations at Cape Kumukahi, Hawai`i at sunrise.

MELE HO`ĀLA are chants that are used for pre-dawn preparations and ceremonies. It provides for proper address of the elements, the cardinal points and boundaries of the greater universe. Most importantly, it is a chant that is offered in greeting and worship of the sun. It is also a chant that was used to gently awaken a chief or chiefess from his or her slumber.

Image NK-12 Pre-dawn, awaiting the sunrise at Keanapalau, Kamalomalo`o Ahupua`a

The rising of the sun symbolizes a new life and rebirthing of consciousness, inspiration and growth. The sun is a fundamental and sacred life source that sits at the center of native Hawaiian beliefs and practices. It was commonplace to initiate the start of the day in prayer, meditation and chant as a means to personally engage and commune with the sun.

Chanting continues to be a primary course of communicating with the natural world and elements such as the sun. The thought and intention embedded in the poetry of the chant/prayer, coupled with the energy and vibration of the chanters voice is at the very basis of the simplest expression of sun worship. initiates and petitions the boundaries of the universe to awaken and rise up as well. `Āpapa is also used to denote rank and status of gods and chiefs; thus exalting the sun and the elements of the heavens as the epitome of divine order.

The opening lines of the mele ho`āla below calls upon the different Kahiki, to set up the foundation for the new day.

Mele Ho`āla

E ala, e Kahiki-kū;	*Arise now, Kahiki-kū;*
E ala, e Kahiki-moe;	*Arise now, Kahiki-moe;*
E ala, e ke `āpapa nu'u:	*Arise now, the stratum of the heights;*
E ala, e ke `āpapa lani.	*Arise now, the stratum of the heavens.*
Eia ka ho`āla nou, e ka lani la, e-e!	*This is to awaken you, O chiefly one of the heavens!*
E ala oe!	*Awaken and arise!*
E ala, ua ao, ua malamalama.	*Awaken, it is day, it is light.*
Aia o ka pe'a ma, la, i luna;	*There is the sacred house of the sun above*
Ua hiki mai ka maka o Unulau	*The eye of the sun has arrived over the sea of Unulau*
Ke hoolale mai la ke kupa holowa'a o Ukumehame,	*The seafarers of Ukumehame are hastened*
Ka lae makani kaohi-wa'a o Papawai,	*By the Papawai wind that detains canoes*
Ka lae makani o Anahenahe la, e-e!	*And the Anahenahe wind that blows at the promontory*
E ala oe!	*Awaken and arise thee!*
E ala, ua no, ua malamalama;	*Awaken, day is come and is brightened by the light*
Ke o a'e la ke kukuna o ka La i ka ili o ke kai;	*The sun rays pierce into the surface of the sea*
Ke hahai a'e la, e like me Kumukahi	*It pursues as did the god Kumukahi*
E hoaikane ana me Makanoni;	*In companionship with Makanoni*
Ka papa o Apua, ua lohi i ka La.	*The surface of Apua is lighted by the sun*
E ala oe!	*Awaken and arise thee!*
E ala, ua ao, ua malamalama;	*Awaken, day is come and brightened by the light*
Ke kau aku la ka La i Kawaihoa	*The sun stands over Kawaihoa*
Ke koli`i aku la ka La i ka ili o ke kai;	*Gradually disappearing over the ocean surface*
Ke ānai maila ka `iwa ānai-maka o Lei-no-ai,	*The iwa fascinates the eyes drawing attention of Leinoai!*
I ka luna o Makaikiolea,	*On the cliff of Makaikiolea*
I ka poli wale o Lehua lā.	*Held in the embrace of Lehua*
E ala oe!	*Awaken and arise thee!*

Image NK-23 Sunrise at Kumukahi. The natural rock formations Makanoni and Ha`eha`e appear at first light in the morning sky.

Kumukahi is the setting in another chant named, "Kolo Māpu Le`a I Ke Ahiahi" which is another mele that was composed in honor of Kamehameha III - Kauikeouli. It cites two large stones in the following lines:

Ka hikina o ka lā i Ha`eha`e
Ho`opuna ho`i i Makanoni
The entrance of the sun at Ha`eha`e
Making its nest, too, at Makanoni

Named Ha`eha`e and Makanoni, these natural stone markers are used to track the movement of the sun and its entry point upon the horizon throughout the year. They are especially significant during the vernal and autumnal equinoxes as well as the summer and winter solstices. With Ha`eha`e to the north and Makanoni to the south marking the extremities of the sun.

On Kaua`i Island, a similar pair of large stones sit upon the ridge of Kuamo`oloaakāne in Wailua at the ancient heiau site named Pōhaku `Ele`ele. They are used in the same capacity of measuring time and sun observations.

The sun is associated with all forms of procreation and birth, and is especially significant in the birthing of Hawai`i's high-ranking ali`i.

"Hānau Ka Lā A Na`u" is a birth chant that was composed in honor of Kauikeaouli (1813 - 1854),a royal son born to Kamehameha I and the high chiefess of Maui, Keōpūolani.

King Kamehameha III - Kauikeouli

The chiefess was challenged with a very difficult labor, with Kauikeaouli stillborn at birth. The Kahuna Nui or High Priest Kamalo`ihi (also known as Kapihe) was born at Keauhou Bay, on Hawai‘i island. He was the second son of King Kamehameha I and his highest ranking wife, Queen Keōpūolani of Maui. The precise date of his birth is not known. Early historians suggested June or July 1814, but the generally accepted date is August 11, 1813. (Cummings, 1973) He was of the highest *kapu* lineage.

Kauikeaouli was about 16 years younger than his brother Liholiho, who ruled as Kamehameha II starting in 1819. He was named *Kauikeaouli Kaleiopapa Kuakamanolani Mahinalani Kalaninuiwaiakua Keaweawe ‘ulaokalani (placed in the dark clouds the red trail by which the god descends from heaven)* after his maternal grandfather Kīwala‘ō. He was promised to Kuakini in *hānai*, but at birth he appeared to be delivered stillborn, so Kuakini did not wish to take him.

However, Chief Kaikio‘ewa summoned his *kaula* (prophet) Kapihe who declared the baby would live. Kauikeaouli was cleansed, laid on a rock, fanned, prayed over and sprinkled with water until he breathed, moved and cried. The prayer of Kapihe was to *Ka‘ōnohiokalā*, the ancient god of the sun. The rock is preserved as a monument at Keauhou Bay.

Mele Hānau No Kauikeaouli

O hānau ka lā a nāʻū,
O nāʻū ka lā o Kupanole.
ʻO Kupanole ka lā kōhia,
Kōhia ka lā iā Hina.
ʻO ke kukuna o ka lā paʻa
ʻO ka peʻa o Hilinamā, o Hilinehu,
ʻO ka lālā o ke kamani,
ʻO ka hui o ke kamani ʻula.
ʻO ka ʻēheu o Halulu, Ke haʻina mai lā, haʻi
Ke hakia mai la e ka lā,
E ke keiki hele lani ā Kea.
ʻO Wākea ka i lalo, o ka lā ka i luna,
ʻO ke keiki ia ā Kea i hoʻokauhua ai.
ʻO ia hoʻi o ka lā, hānau ka lā.

Translation:
The sun was born to be mine,
Mine the sun of Kupanole.
At Kupanole the sun held back,
The sun held back for Hina's sake.
Rays of the sun made secure
the boundaries of Hilinamā, of Hilinehu,
joined the branch of a kamani tree
To the linked branches of the red kamani.
To the linked branches of the red kamani.
The wings of Halulu were broken, broken.
They were severed by the sun,
by the sky-voyaging sun of Kea.
Wākea was below, above was the sun,
The sun child born to Kea.
He it was, the sun child: the sun brought to birth.

Image NK-24. Members of Hālau Palaihiwa O Kaipuwai gather for sunrise ceremonies at Kumukahi, Hawai`i.

E ala ē
Ka lā i ka hikina
I ka moana
Ka moana hohonu,
Pi`i ka lewa
Ka lewa nu`u,
I ka hikina, aia ka lā
E ala ē!

Awaken, arise
The sun in the east
From the ocean,
The depths of the ocean
Climbing to the heavens
The highest reach of the heavens
In the east, there is the sun
Arise!

Cultural & Religious Practices Associated with the Sun

In pre-contact Hawai`i, the sun played a major role in all aspects of daily Hawaiian life. It was a divine source of energy for growth and inspiration - both physically and spiritually. Even more importantly, the sun provided the life support that was essential for survival. The following are examples of traditional pule or prayer that continue to be used by contemporary practitioners today. the first is a formal address to the sun to petition for life and health of the fisherman's family.

<u>No Ka Lanai's - for the Fisherman</u>

O ko`u lā ho`i ia ko ke kanaka lawai`a
I lākou i ke aho me ka mākau
E ka lā ē! E ola i a`u!
I ka`u wahine, i ku`u keiki, i ko`u mau mākua
`Amama. Ua noa.

My day of course is that of the fisherman
Provided with line and hook
O Sun, give me life!
And to my wife, my children, my parents.
`Amama. It is free of tabu.

No Nā Po`e Hula - for the Hula Practitioner

Ho`opuka i ka lā ma ka hikina,	*The sun enters rising in the east*
me ka huaka`i hele no Kumukahi	*beginning its journey from Kumukahi*
Ha`a mai nā `iwa me Hi`iaka…	*Dancing with Hi`iaka are the `iwa birds…*
Me Kapō, Laka i ka ulu wehiwehi	*Along with Kapō`ulakina`u and Laka in the verdant growth of the forests*
Ne`e mai nā iwa ma ku`u alo	*Moving into my presence are the graceful `iwa*
Me ke alo kapu o ke āiwaiwa	*And to the sacred presence of the most divine*
Ho`i no e ke kapu me nā ali`i	*Let the sacred ways be returned to the chiefs,*
E ola mākou a mau loa lā!	*And that life be bestowed upon us forever more!*

This mele ka`i or entrance chant is widely used by hula schools throughout Hawai`i and elsewhere in the formal presentation of hula performance. It purposely cites the rising of the sun in the east and its mana to inspire growth and wisdom. The `ōlapa emulate the sun's movement, arriving in successive procession in the company of the gods. The point of entry is marked in the east - marking the threshold from where the sun has risen for millennia in ushering in a new day for health and life. Mele ka`i are coupled with mele ho`i or exit chants that are directed to the west where the sun sets and brings closure to the day.

No Nā Po`e A Pau
For everyday use to honor and seek guidance from ancestors

Nā `aumākua mai ka lā hiki ka lā kau	*Ancestors from the rising to the setting sun*
Mai ka ho`oku`i a ka hālāwai	*From the zenith to the horizon*
Nā `aumākua ia ka hina a kua Ia ka hina alo	*Ancestors who stand at our back and front*
Ia ka`a akau i ka lani	*You who stand at our right hand*
‘O kiha i ka lani	*A breathing in the heavens*
‘Owē i ka lani	*An utterance in the heavens*
Nūnulu i ka lani	*A clear, ringing voice in the heavens*
Kāholo i ka lani	*A voice reverberating in the heavens*
Eia nā pulapula a ‘oukou ‘o ka po`e o Hawai`i	*Here are your descendants,*
E mālama ‘oukou ia mākou	*Safeguard and protect us*
E ulu i ka lani	*That we may flourish in the heavens*
E ulu i ka honua	*That we may flourish on earth*
E ulu i ka pae ’āina o Hawai’i	*That we may flourish in the Hawaiian islands*
E hō mai i ka ‘ike	*Grant us knowledge*
E hō mai i ka ikaika	*Grant us strength*
E hō mai i ke akamai	*Grant us intelligence*
E hō mai i ka maopopo pono	*Grant us understanding*
E hō mai i ka ‘ike papalua	*Grant us insight*
E hō mai i ka mana.	*Grant us power*
‘Amama ua	*The prayer is lifted, it is free.*

Hānau Ka Lā: The Sun is Born

No Nā Po`e A Pau
For everyday use to greet the new day and chant up the sun

E ala ē
Ka lā i ka hikina
I ka moana
Ka moana hohonu,
Pi`i ka lewa
Ka lewa nu`u,
I ka hikina, aia ka lā
E ala ē!

Awaken, arise
The sun in the east
From the ocean,
The depths of the ocean
Climbing to the heavens
The highest reach of the heavens
In the east, there is the sun
Arise!

Kāhālāwai
Cardinal Points in Association with the Sun
Horizon. Mai ka ho'oku'i a ka hālāwai, from zenith to horizon.

To sit in the quiet of darkness in anticipation of the rising sun is to contemplate the value of measuring a lifetime. Kahālāwai encompasses all of the components that make up the Hawaiian universe. It is also the portal through which the sun (the most outstanding element) arrives and departs every day. Observance, knowledge and the science of tracking the sun's pathway was a significant practice of our Hawaiian ancestors. Contemporary Hawaiians today continue to actively participate in these cultural activities and practices that are associated with sun worship.

Long before the sun actually rises from below the horizon, it will light up the morning sky with different hues of pinks, reds and oranges. There is a phenomenon of a green flash that occurs when the sun rises above the horizon. Hawaiians considered this to be the *hā* or breath of the sun. Hā`ena in Puna on Hawai`i Island and Hā`ena on Kaua`i Island are named for the two places in the inhabited islands of the Hawaiian archipelago where the sun awakens with its first breath in the east, and retires with its last breath toward the northwest completing its daily journey across of the sky.

Sun Observations from Project Area

The Anahola Solar Project area is ideally situated in the sun's east - west corridor of the Kamalomalo`o ahupua`a, ma uka of Kūhiō Highway just south of the Anahola ahupua`a, town and community.

Between the period of April 3 to April 20, 2012, a number of cultural field inspections, sun observations and alignment readings were taken from a contiguous area immediately above of the project site that is simply referred to as, "the corral". It is a flat and leveled area formally used as a corral for ranching. The location provided an excellent point of reference for observations and excellent 360 degree view planes.

From the observation area, the head of Anahola's prominent mountain Kalalea is to the north; the coastline, horizon and threshold for the rising of the sun, moon and star constellations lies in the east; Kalanipu`u and the Mount Hā`upu Mountain range is seen in the distance to the south; and Makaleha and Wai`ale`ale mountains are ma uka to the west.

Using the basic compass rose and azimuth plane, NK investigators collected information and data relating to project area and its alignments to the surrounding natural features and landmarks .

Directly above of the project area to the west is the Makaleha mountain range. From the Anahola Solar Project there is a 270 degrees azimuth alignment to a saddle in the Makaleha mountain range. At this time of the year, the sun is setting 270 degrees to the saddle.

To the right of the saddle is Pu`u Eu, the southernmost boundary of the Anahola ahupua`a. On the left side of this saddle is a peak called Makaleha (not to be confused with the generalized reference of the entirety of the mountain range). 270 degrees west is a very important direction in the Hawaiian culture signifying the place where the sun sets, the completion of a day, the passing of a life, and a place that divides a dimension from light into dark.

Mount Hā`upu is 180 degrees azimuth from the project site. Hā`upu means *to recollect, to recall, and to remember.* The 180 degree bearing falls on the promontory named Kalanipu`u - *"The Royal or Heavenly Hill."* Kalanipu`u is the southernmost promontory of Nāwiliwili bay and is part of the Niumalu ahupua`a. Peaks along the ridgeline of Hā`upu's mountain range play a very important role in ancient Hawaiian traditions associated with navigation. Peak names such as Hōkūlei, Hōkū`ula, Makali`i, Hōkūnui.

90 degrees azimuth is a point called Kalaulau located on the Anahola coastline. Kalaulau is a promontory protruding in to the ocean. North, at its opposite side is a point named Lae Lipoa or "*The promontory of the Lipoa seaweed*." Kalaulau in Hawaiian means, "*The wrapping, the bundle, or the package*." Kalaulau also means "*the brim of a hat, to be pregnant, or the blade of a paddle*."

90 degrees in the Hawaiian culture represents the direction of the rising of the celestial bodies, the sun being the carrier of life, the moon being the magnetic growth to the land, ocean and people, and the stars that rise serving as navigational points to frequently travelled ancestral destinations.

0 degrees azimuth from the project site is a promontory that marks the northernmost point of the Anahola Ahupua`a named Lae Kuaehu. Literally translated in Hawaiian, Lae Kuaehu means "*Promontory of the silent, still, and lonely*." Kua also means back, spine, to carry on ones back, and Ehu meaning *to thrive, produce, and abundance*. North beyond Kua`ehu lies the Ahupua`a of Aliomanu.

These compass readings are treated culturally with an effort to reinvigorate the proper alignments of the native Hawaiian person to the greater universe. It is apparent that ancient Hawaiian people had a firm grasp on the many cycles of the land, ocean, people, and atmosphere, without this knowledge how would one be able to distinguish seasons?, Taboos?, Time? It is essential to know that it is not by default that typically Anahola has lots of sun, but due to the alignment of the Anahola ahupua`a on Kaua`i, is the primary purpose there is an abundance of sunlight.

`Ōlelo No`eau Associated with the Sun

Ancient Hawaiian Proverbs & Poetical Sayings

Aia a wela ke po`o o ke keiki i ka lā.
When the head of the child is warmed by the sun.
When he is old enough to toddle or creep by himself into the sunlight
`Ōlelo No`eau #33

Ka lā i ka Mauliola
The sun at the source of life
Mauliola (Breath of Life) is the god of health
`Ōlelo No`eau #1422

Ka lā koi hana o Lahainaluna
The sun of Lahainaluna urges one to work
Daytime at the Lahainaluna School is occupied with studying and working
`Ōlelo No`eau #1428

Kaula`i nā iwi i ka lā
To bleach the bones in the sun
To talk too freely and unkindly of one's family to outsiders
`Ōlelo No`eau #1618

Ka wahine hele lā o Kaiona, alualu wai li`ulā o ke kaha pua `ōhai
The woman, Kaiona, who travels in the sunshine pursuing the mirage of the place where the`ohai blossoms grow.
**Kaiona was a goddess of Ka`ala and the Waianae Mountains. She was a kind person who helped anyone who lost his way in the mountains by sending a bird, an `iwa, to guide the lost one out of the forest. In modern times Princess Bernice Pauahi Bishop was compared to Kaiona in songs.*
`Ōlelo No`eau #1643

Ko`ele nā iwi o Hua i ka lā
The bones of Hua rattled in the sun
A warning not to talk too much of one's kin. Also, a reminder that trouble is sure to befall those who destroy the innocent. Hua was a chief of Maui who heeded the lies of jealous men and ordered the death of his faithful priest, Luaho`omoe. Before he died, he sent his sons to the mountains for safety, because it was foretold by gods what was to come over the land. After his death, drought and famine came. Many died, including the Chief Hua. There was no one to hide his remains, so his bones were left exposed to the sun and wind. Also expressed Nakeke nā iwi.
`Ōlelo No`eau #1811

Kūkulu kala`ihi ka lā i Mānā
The sun sets up mirages at Mānā
Said of a boastful person who exaggerates
`Ōlelo No`eau #1908

`Oi kau ka lā, e hāna i ola honua
While the sun yet shines do all you can
While there is earthly life (ola honua), do all you can.
`Ōlelo No`eau #2388

Ulu o ka lā
Growth of the Sun
Said of the light of sunrise just as the sun's rim touches the horizon
`Ōlelo No`eau #2870

Ha`alele i ka lā ka mea mahana
Has left the warmth of the sun
Has died.
`Ōlelo No`eau #394

Malō ka wai i ka lā
The water dries up in the sun
Joy withers in the presence of wrath
`Ōlelo No`eau #2126

Nau na ku`i o ka niho o ka lā
The teeth of the sun gnash
Said of a very warm day in which the heat is almost unbearable
`Ōlelo No`eau #2298

Kau ka lā i ka lolo, ho`i ke aka i ke kino
The sun stands over the brain, the shadow retreats into the day
Said of high noon, when the sun is directly overhead and no shadows are seen - an important time for some ancient rites and ceremonies
`Ōlelo No`eau #1611

Mai ka lā hiki a ka lā kau
From the sun's arrival to the sun's rest
Said of a day, from sunrise to sunset. This phrase is much used in prayers. Any mention to the setting of the sun was avoided in prayers for the sick; instead one referred to the sun's rest, thus suggesting rest and renewal rather than permanent departure.
`Ōlelo No`eau #2062

Mai ka lā `ō`ili i Ha`eha`e a hāli`i i ka mole o Lehua.
From the appearance of the sun at Ha`eha`e till it spreads its light to the foundation of Lehua.
Ha`eha`e is a place at Kumukahi, Puna, Hawai`i, often referred to in poetry as the gateway of the sun.
`Ōlelo No`eau #2063

Mai ka lā `ō`ili ana a ka lā i Kumukahi a ka lā iho aku i ka mole `olu o Lehua
From the appearance of the sun at Kumukahi till its descent beyod the pleasant base of Lehua
From the sunrise at Kumukahi, in Puna, Hawai`i, to the sunset beyond islet of Lehua.
`Ōlelo No`eau #2064

Ka moku ka`ili la o Manokalanipō
The sun-snatching island of Manokalanipō
Kaua`i, the north westernmost island of the group, beyond which the sun vanishes at dusk. Manokalanipō was an ancient ruler of Kaua`i.
`Ōlelo No`eau #1488

Mai ka hikina a ka lā i Kumukahi a ka welona a ka lā i Lehua
From the sunrise at Kumukahi to the fading sunlight at Lehua
From sunrise to sunset, Kumukahi, in Puna, Hawai`i, was called the land of the sunrise and Lehua, the land of the sunset. This saying also refers to a life span - from birth to death.
`Ōlelo No`eau #2058

Ka moa i hānai `ia i ka lā, ua `oi ia i ka moa i hānai `ia i ka malu.
A cock fed in the sunlight is stronger than one fed in the shade.
If you want a strong son, raise him with plenty of sunlight.
`Ōlelo No`eau #1484

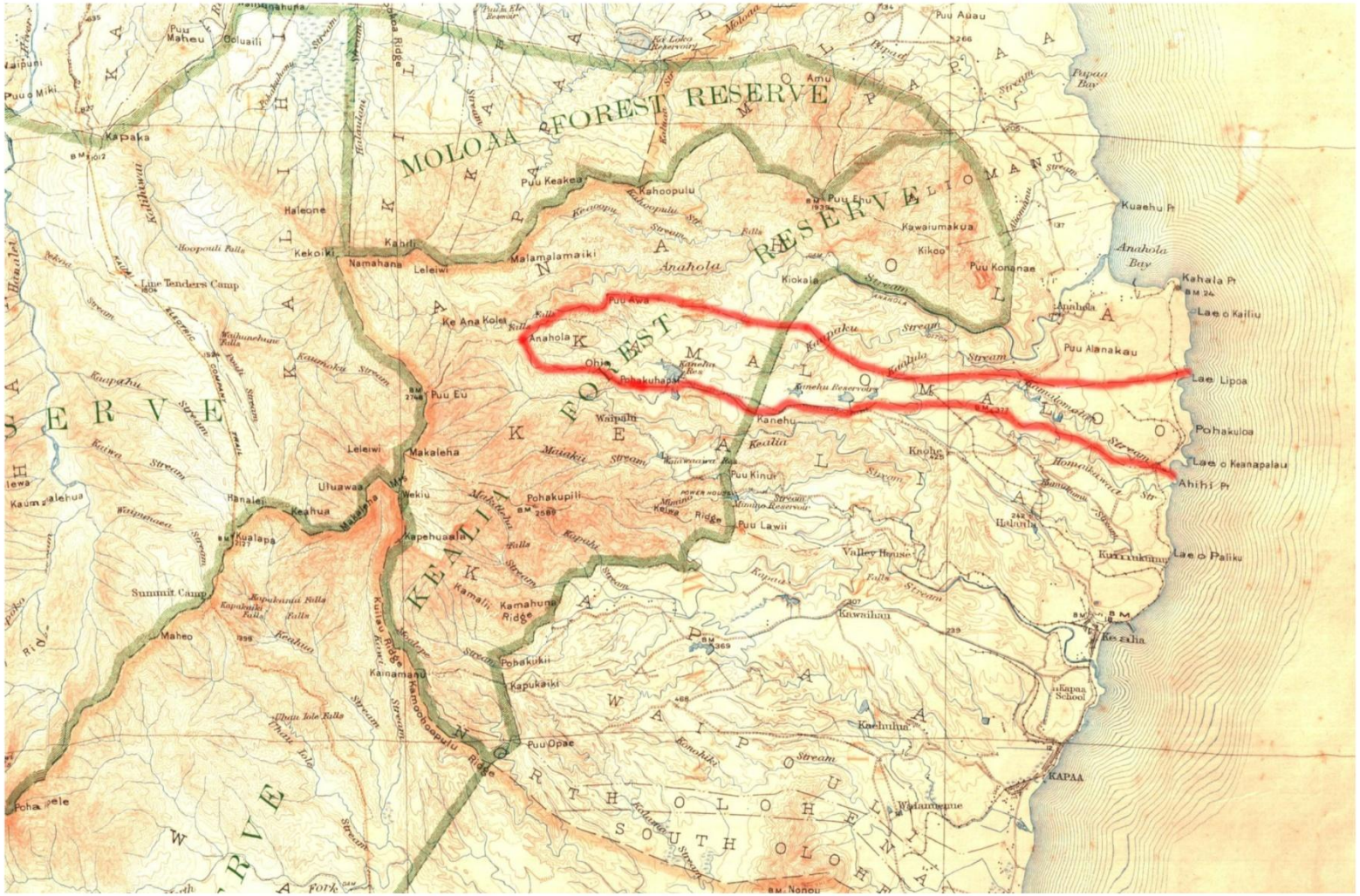


Figure 7. US Department of the Interior Geological Survey Topographic Map. 1912. Kaua`i County, Hawai`i highlighting the ahupua`a of Kamalomalo`o. It's northern seaward boundary is Lae Līpoa, its southern seaward boundary point is where Kamalomalo`o Stream empties into the bay, and the ma uka zenith point is atop of the peak named Anahola.

The Project Area
Kamalomalo`o Ahupua`a

The Anahola Solar Project proposed to be developed upon lands situated in the ahupua`a of Kamalomalo`o.

The traditional ahupua`a of Kamalomalo`o is marked by its northern seaward boundary point at Lae Līpoa. The second boundary point *ma uka* toward the uplands is at Pu`u `Awa (Elevation 1160 ft.). The boundary pinnacles at a mountain peak called Anahola. The ahupua`a turns back toward the ocean and follows a southern boundary which is marked by landmarks of `Ōhi`a, Pōhaku Hāpai, and Kānehū; finally reaching its southernmost boundary point which is where the Kamalomalo`o Stream empties into Kamalomalo`o Bay.

Image KM-2. Laborers harvesting cane by hand in cane field. Makaleha and Pu`u Eu is seen in the far left background. 1900 - 1904. Tambling Collection. Henry Funk Photographer. Kaua`i Museum Archives.

Image NK-7 The mountain peaks of Ka`ināmanu, Wēkiu, Makaleha and Pu`u Eu are observed in the distance from just above of the project area - April 2012. This photo, taken more than a century later (from the image on the previous page) presents the same land base at Kamalomalo`o Ahupua`a with the prospect of developing a solar energy facility for Kaua`i Island.

Boundaries of Kamalomalo`o Ahupua`a

Kamalomalo`o

Kamalomalo`o is a relatively smaller ahupua`a in comparison to its adjacent sister land divisions of Keālia and Anahola It is easy to assume that Kamalomalo`o could simply mean, "*dried loincloth*". The malo or loincloth is a traditional garment worn about the loins of male boys and men. Likened to the vegetation and growth upon the land, the malo is used as a metaphor that is likened to the expanse of vegetation and growth that covers the `āina.

Image NK-2 (L) Lae Līpoa northern seaward boundary of Kamalomalo`o Ahupua`a.

Image NK-3 (R) Kamalomalo`o ahupua`a's southern seaward boundary is mid-bay of the small cove that is informally referred to as Kamalomalo`o Cove or Bay. The beach is commonly known as, "Beach House" and the surf break in the bay is known as, "Crack 14".

The word malō is also a variance of malo`o. The reduplication of the word "*Dry/dried*" could allude to a landscape that is infertile and unproductive. While there are existing water sources that meander through this ahupua`a, they are inconsistent in discharging large, volumes of water that would lend to support widespread cultivation. From 1878 - 2000 the Makee and Līhu`e Sugar Plantations utilized the lands at Kamalomalo`o and Anahola for the cultivation of sugar. They developed the Kānehā and Kānehū reservoirs to divert and store water for its cultivation operations. Since the closure of the Līhu`e Plantation in 2000, the reservoirs have fallen into disrepair and neglect. Now completely drained and dried up, some of the reservoirs are situated on DHHL property in Kamalomalo`o.

Another translation of malo`o, is to trace as of a genealogy, lineage. The malo or loincloth is a traditional garment worn by men. Here it represents the ability to propagate, produce and perpetuate.

Lae Līpoa: *Līpoa Point, Promontory of Līpoa Seaweed*

Kamalomalo`o shares this northern seaward boundary with the ahupua`a of Anahola. The līpoa is a bladelike, branched brown limu or seaweed *(Dictyopteris plagiogramma and D. australis)*. It highly prized on all islands.

Image NK-6 Lae Līpoa - Wa`a

Image NK-1.4 Lae Līpoa Reef Shelf

As indicated by its name, this promontory and the surrounding area off of the Kamalomalo`o and Anahola boundary point is provides an ample supply of the favorite edible limu līpoa. Other limu, including limu kohu can be found here, as well as along the coastline of the project area ahupua`a. Lae Līpoa continues to be a resource for Anahola kūpuna and families who gather limu and fish here daily. The "wa`a" pictured here is a landmark and natural outcropping of rocks in the ocean that resembles a canoe.

Image NK-13 Limu Līpoa (Dictyopteris plagiogramma)

Pu`u `Awa:
"*`Awa Hill" Elevation 1160 ft. This is another place name that can simply be translated as it is presented here...named for the `awa (kava - piper methysticum), a Native Hawaiian plant important in Hawaiian culture for the preparation of a ceremonial drink. Called "Kava" in other parts of Polynesia. `Awa is a kinolau or plant manifestation of the gods Kāne and Kanaloa who according to ancient traditions, travel throughout Hawai`i opening fresh water springs and sources in waterless lands. However, `awa is a cold rain, fog or mist, which is confined to the mountains. It is probable to anticipate that this kind of weather is typical for the upland region of the Kamalomalo`o ahupua`a.*

Anahola
Name of a mountain peak that serves as the upland pinnacle boundary point for Kamalomalo`o ahupua`a. Lit. Hola Cave; which describes an ancient fishing method which utilized the `auhuhu plant *(Tephrosia purpurea syn. T. piscatoria)* to poison or stun fish. (See further discussion in separate section on Anahola)

`Ōhi`a
Another pu`u or mountain landmark that designates the southern boundary of the Kamalomalo`o ahupua`a. `Ōhi`a are primarily two different types of native trees: One is the `Ōhi`a `Ai or mountain apple (Eugenia malaccensis), and the other is of the *(Metrosideros macropus, M. collina subsp. polymorpha);* The plant has many forms, from tall trees to low shrubs. The flowers are red, rarely salmon, pink, yellow, or white. It was highly desired for its spiritual and symbolic qualities, including for the making of carved images (Ki`i), temple structures, weapons and spears.

It is largely misunderstood and believed that the action of picking lehua blossoms will cause it rain....a "bad sign resulting from offending the rain gods". The fact of the matter is that `ōhi`a lehua grow abundantly and best in environments that are usually wet and rainy. The lesson is to refrain from picking the scarlet blossoms on your way into dense forest trails. For it is best to focus on the trail lest you become disoriented by simply not paying attention to your surroundings. A protocol that is followed by disciples of `aiha`a and hula is to pick and gather on your way out.
Both the `ōhi`a lehua and the `ōhi`a `ai are considered to be sacred kinolau - manifestations of godly nature forms. Along with kupukupu fern, the `ōhi`a is the first plant to appear on a newly formed lava field. It is one of the essential plants that are put on to the kuahu or hula altar.

Pōhaku Hāpai:
Located on the southern boundary of the Kamalomalo`o ahupua`a, Pōhaku Hāpai is situated in between `Ōhi`a and the Kānehā Reservoir. *Lit. Stone to cause conception; to conceive.*

Kānehū:
Kāne is the akua nui or major god that is associated with all forms of fresh water including rain, streams, rivers, and lakes and more. The word, hū means to rise, swell, overflow and percolate, etc. Of Kāne's 70 kinolau or nature body manifestations, fresh water and sunlight are of the greatest significance as forms that are necessary for health, growth and life.

Kānehū is a traditional place name of a fresh water source; spring and stream. Located nearby are two reservoirs that were created by the sugar plantation are also named for/after [the place] Kānehū. Note: There is another stream source as well as a reservoir in Kamalomalo`o which is named, Kānehā. The word hā refers to the breath, life, essence and spirit. The god Kāne, is recognized as the provider and progenitor of fresh water.

Field investigations of the Project Area

Image NK-18 View from above of the project area looking seaward toward the eastern horizon

Hawaiian Religious & Cultural Practices
Gathering Rights

Field investigations of the project area resulted in no evidence or findings of traditional sites, significant plants or natural resources that are associated with Hawaiian gathering rights for subsistence, cultural or religious practices. The project area is overgrown with non-native vegetation that is considered to be highly invasive.

Native Hawaiian informants that were interviewed for this study indicated that the project area was unsuitable for subsistence gathering and hunting purposes in its present state. They also testified that the long history of large-scale commercial sugar and pineapple cultivation could easily have obliterated any cultural or religious sites that may have previously existed in the area.

For more than a century, the project area and hundreds of acres throughout the ahupua`a of Kamalomalo`o and Anahola may have been heavily compromised by the plantations' common use of pesticides containing arsenic and mercuric compounds. As cultivation activities ceased with the closure of Līhu`e Plantation in 2002, the land became an illegal dumping ground for abandoned cars, lead/acid vehicle batteries, household appliances and miscellaneous trash; further accumulating the potential for contamination.

It should be noted that action to clear up the project area by removing scattered debris of abandoned vehicles and old household appliances was already taking place at the time of NK's field investigations and studies in April and May 2012.

Image NK-22. Stressed vegetation consisting mostly of invasive, non-native species at the project area.

The project area is heavily covered with haole koa, African tulip, tall grasses and other non-native invasive plant species. Extremely sparse occurrences of native Hawaiian plant species associated with cultural practices are present in the project area. NK's field inspections resulted in the findings of only three native Hawaiian plant species - all of which were observed to be in extremely stressed conditions. The plants recorded include: ha`uowī *(Stachytarpheta jamaicensis (L.) Vahl. Verbenaceae)* and Verbena litoralis), `ilima *(Sida Fallax),* and `uhaloa *(Waltheria indica var. americana).*

Uhaloa is a small, downy, American weed *(Waltheria indica var. americana)*, with ovate leaves and small, clustered yellow flowers. Leaves and inner bark of root are very bitter and are used for tea or chewed to relieve sore throat. It is one of the kinolau plant forms of the pig demigod Kamapua`a. Also known as, ʻalaʻala pū loa, hala ʻuhaloa, hiʻa loa, kanaka loa.

Image NK-19 `Uhaloa at the project area

Image NK-20 Ha`uōwī at the project area

Ha`uōwī is a weedy kind of verbena *(Verbena litoralis)* from tropical America, with square stems 30 cm to 2 m high, toothed oblong leaves, and narrow flower spikes bearing tiny blue flowers. Hawaiians use it for cuts, sprains and bruises, as well as for a tonic taken as a tea to help with ailments such as diabetes and kidney problems. Also known as ōi, ha`uoi, and ōwī.

`Ilima *(Sida Fallax)* is fairly common on the drier sides of the islands and along the seashore. They can be found from sea level to about 6,000 feet. Unlike many of Hawaii's native flora, 'ilima grows well in somewhat disturbed areas. Medicinally, it is used to treat general impediments including, womb disorders, and asthma. Juices from the flowers are squeezed out to make a gentle baby laxative called kamakamaika'i. Mixed with other plants it was used to treat women during their pregnancy.

Image NK-21
`Ilima Papa at the project area

`Ilima is highly esteemed in the Hawaiian culture for its delicate blossoms used to make garlands lei. It was one of the few non-food plants cultivated by ancient Hawaiians and they have several named varieties. The most preferred variety for making garlands is lei `ilima, which has large orange-yellow flowers. In old Hawai'i, as in many other countries, yellow and gold were, and still are, special colors. `Ilima leis were given to departing friends, as this reputedly brought good luck. Each lei requires about 500 flowers and a great deal of patience to make. Also known as, 'ilima, `āpiki, 'ilima lei, `ilima papa, kapuaokanakama`ima`i. 'ilima kū kala, 'ilima makana'ā.

At least 15 species of invasive, non-native plants contribute to the heavy overgrowth of vegetation throughout the project site; all of which are not associated with any traditional or contemporary Hawaiian cultural practices.

A table of the plants are presented on the following page.

Listing of Invasive Non-Native Plants Occurring in the Project Area

Antigonon leptopus	Mexican creeper mountain rose, coral bells, confederate vine, chain-of-love, hearts-on-a-chain
Bryophyllum pinnatum, Cotyledon pinnata	Life plant, 'oliwa kū kahakai
Pennisetum ruppelii	Forest Grass
Lantana Camara	lakana, mikinolia-hihiu, sage
Schinus terebinthifolius	Christmas berry Brazilian pepper, wilelaiki, nani-o-hilo
Spathodea campanulata	African tulip tree Also known as Fire Tree and Fire Bell
Sphagneticola trilobata	Wedelia
Senna alata	Candle Bush
Leucaena leucocephala	Giant Leucaena Koa Haole
Mimosa pudica	Sensitive Plant or Sleeping Grass (kuku)
Leucaena leucocephala	Giant Leucaena Koa Haole
Syzygium cumini	Java or Jambolan Plum
Psidium guajava	Guava
Clidemia hirta	Koster's Curse or Clidemia
Ricinus communis	Castor Bean

At the present, no other indigenous Hawaiian plants or resources were found to exist in the project area. Wild pigs have been observed to wander and forage in the area. While there are other sites and hunting grounds elsewhere that are considered more favorable, local hunters have pursued wild pigs in this area to support their cultural subsistence practices which help to feed their families.

Sun Observations from Project Area

The Anahola Solar Project area is ideally situated in the sun's east - west corridor of the Kamalomalo`o ahupua`a, ma uka of Kūhiō Highway just south of the Anahola ahupua`a, town and community.

Between the period of April 3 to April 20, 2012, a number of cultural field inspections, sun observations and alignment readings were taken from a contiguous area immediately above of the project site that is simply referred to as, "*the corral*". It is a flat and leveled area formally used as a corral for ranching. The location provided an excellent point of reference for observations and excellent 360 degree view planes.

The observation view planes from this location may potentially have served ideally for kahuna kilo lani and kilo hōkū or priestly experts and practitioners of astronomy in ancient times. Hawaiian oral and literary traditions have numerous accounts of kahuna, oracles and seers who proficiently specialized in articulating the movements of the cosmos as a means of predicting the weather, tracking the seasons, etc. for both secular and ordinary daily occasions. In addition to this area immediately above of the project area, there are many wahi pana in both the Kamalomalo`o and Anahola ahupua`a that were specific to this ancient profession.

From the observation area, the head of Anahola's prominent mountain Kalalea is to the north; the coastline, horizon and threshold for the rising of the sun, moon and star constellations lies in the east; Kalanipu`u and the Mount Hā`upu Mountain range is seen in the distance to the south; and Makaleha and Wai`ale`ale mountains are ma uka to the west.

Using the basic compass rose and azimuth plane, NK investigators collected information and data relating to project area and its alignments to the surrounding natural features and landmarks .

Directly above of the project area to the west is the Makaleha mountain range. From the Anahola Solar Project there is a 270 degrees azimuth alignment to a saddle in the Makaleha mountain range. At this time of the year, the sun is setting 270 degrees into the saddle.

To the right of the saddle is Pu`u Eu, the southernmost boundary of the Anahola ahupua`a. On the left side of this saddle is a peak called Makaleha (not to be confused with the generalized reference of the entirety of the mountain range).

From a Hawaiian perspective, 270 degrees west is very important reference as this is the direction where the sun sets, it marks the completion of a day, spiritually marks the passing of a lifetime, and is the place that divides dimensions from light into dark.

Mount Hā`upu is 180 degrees azimuth from the project site. Hā`upu means *to recollect, to recall, and to remember.* The 180 degree bearing falls on the promontory named Kalanipu`u - *"The Royal or Heavenly Hill."* Kalanipu`u is the southernmost promontory of the Hā`upu mountain range and stands as a sentry overlooking the entry into Nāwiliwili Bay. These landmarks are part of the Niumalu ahupua`a in the moku of Puna.

Peaks along the ridgeline of Hā`upu's mountain range play a very important role in ancient Hawaiian traditions associated with navigation. Peak names such as Hōkūlei , Hōkū`ula, Hōkūnui, Makali`i and other highpoints along Hā`upu's ridgeline provide land-based markers that align with the very stars that they are named for during different seasons and significant times of the year.

From the project area, 90 degrees azimuth is a point called Kalaulau which is located on the Anahola coastline. Kalaulau is a promontory protruding into the ocean. At its opposite side north is a point named Lae Līpoa which serves as the northern boundary point of the Kamalomalo`o ahupua`a. Anahola ahupua`a begins at Līpoa and continues to Lae Kuaehu. The place name may very well be directly related to the sun. When spelled and pronounced Kalā`ula`ū, it is defined as, "*The red, sacred inspiration/growth of the sun*".

90 degrees in the Hawaiian culture represents the direction of the rising of the celestial bodies, the sun being the carrier of life, the moon being the magnetic growth to the land, ocean and people, and the stars that rise serving as navigational guides to frequently travelled ancestral destinations.

0 degrees azimuth from the project site is a promontory that marks the northernmost point of the Anahola ahupua`a named Lae Kuaehu. In the Anahola segment of this study, a detailed account from the mo`olelo of `A`ahoaka expands upon the meanings of the place name, Lae Kuaehu as a sacred birthing site of Kalalea. The significance of this place is further experienced during the summer solstice where the light of the rising sun first touches upon the mountain peak Pu`u Ehu. There is a direct alignment that connects the sun with the seaside promontory/point Lae Kuaehu and the mountain peak of Pu`u ehu, further confirming the relationship of both places and their place names.

Pu`u Ehu is part of the greater Kalalea mountain range. The common translation that has been accepted for Kalalea is, "*Prominent, protruding*". Figuratively referencing its status of importance. The phrase Lālani kalalea describes a protruding line of dorsal fins of sharks above the water.

The peak of Kalalea resembles this. In the mo`olelo of Hi`iakaikapoliopele, she describes the mountain peak as, "*`o ka lae o ka nai`a e `ōkū ana i ka moana,*" or as the forehead of a dolphin rising out of the sea.

However, as Kalāle`a, it carries a reference to the sun as, "*the sun of joy and happiness*" or "the clear perfection of the sun".

Immediately north of Lae Kuaehu lies the ahupua`a of Aliomanu.

These compass readings, along with the research and field investigations of significant wahi pana and landmarks throughout both of the greater Kamalomalo`o and Anahola ahupua`a are helpful in culturally interpreting the place as it relates to indigenous Hawaiian practices and beliefs.

Additional findings considered as incredibly significant and valuable has been regretfully been omitted from this CIA due to limited time constraints.

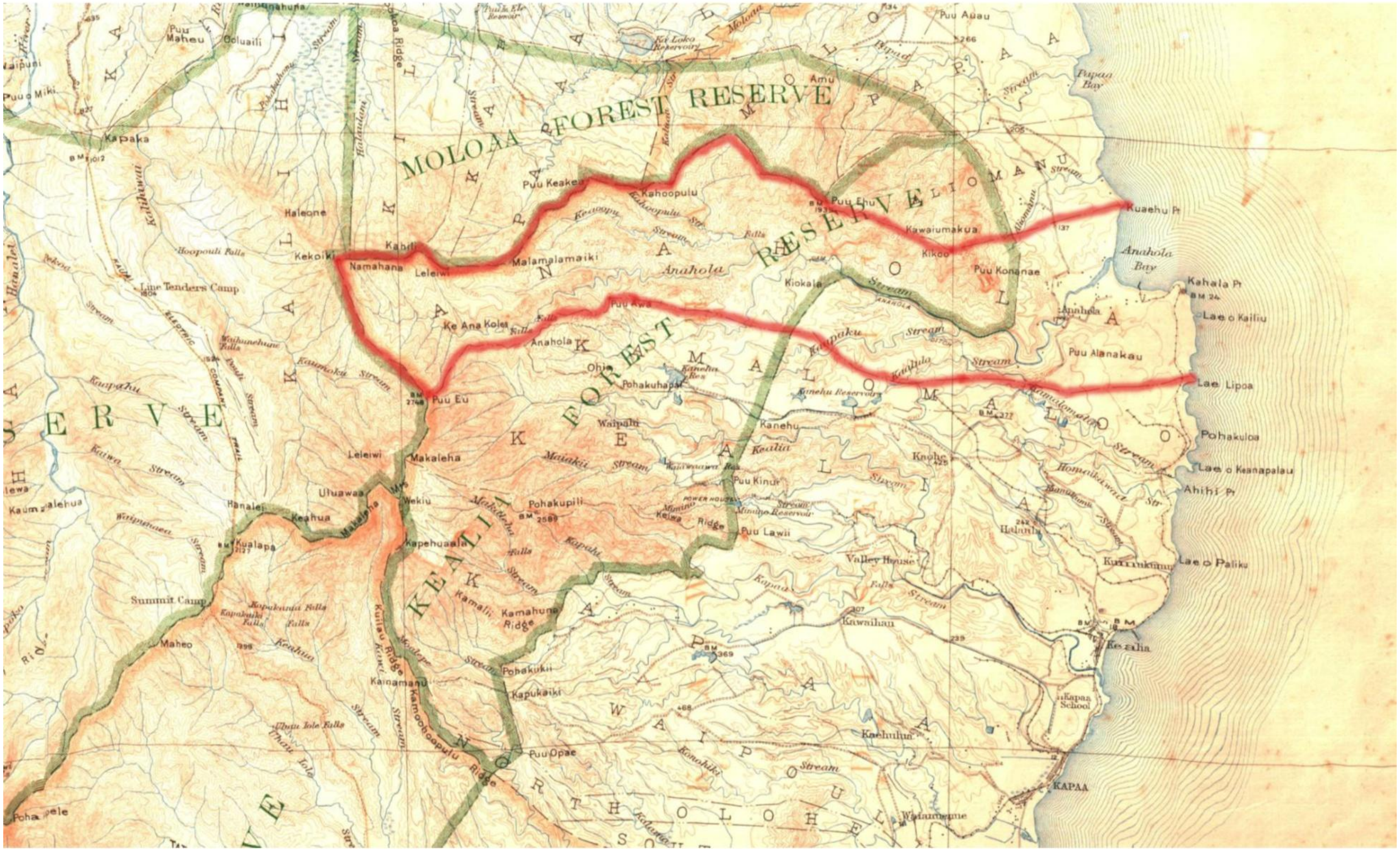


Figure 7. Anahola Ahupua`a highlighted in red. Its seaward boundaries are Lae Kuaehu to the north and Lae Lipoa to the south. Its ma uka boundary points include: Kiko`o, Waiumākua, , Pu`u Ehu, Kaho`opulu, Pu`ukeakea, Mālamalamaiki, Leleiwi, Namahana, Pu`u Eu
US Department of Interior Geological Survey Topographic Map 1912.

Cultural Impact Assessment of Anahola Solar Project
Native Kaua`i LLC Indigenous Hawaiian Cultural Consultants

Anahola Ahupua`a

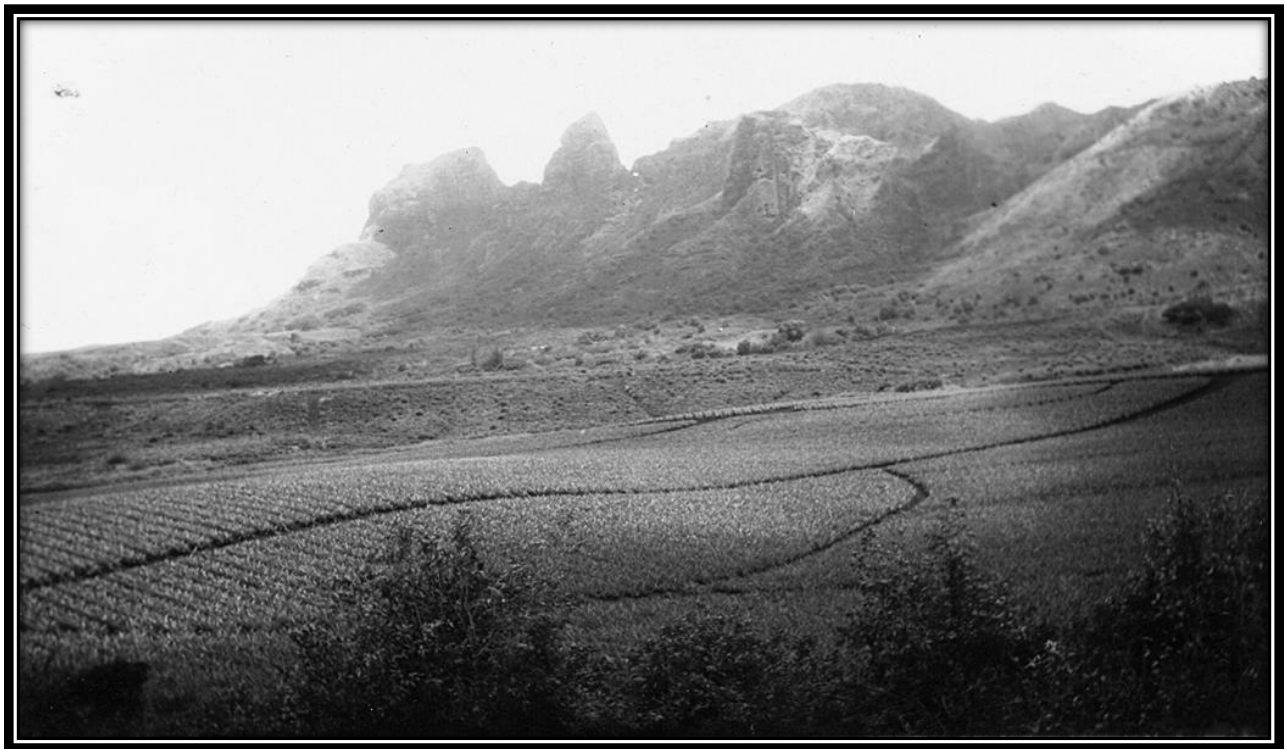


Image KM-7 Kalalea Mountain Range, pineapples fields 1941. Kuchler collection. Showing the "Hole-In-the-Mountain" to the right of Kalalea Peak. Kaua`i Museum Photo Archives.

Holo akula nō lākou nei a `ike akula nō `o Wahine`ōma`o i ke oni mai o kekahi pali, `o ia nō `oe `o ka lae o ka nai`a e `ōkū ana i ka moana, ho`ōho a`ela nō ia, "E kāne ho`i ē? `O wai ho`i kēlā pu`u e kala`ihi maila i ka mālie?

They sailed on until Wahine`ōma`o saw a cliff come into view, like the forehead of a dolphin rising out of the sea, and she exclaimed, "My friend, what is the name of that hill standing so starkly in the calm?

From the Mo`olelo of Hi`iakaikapoliopele as told by Ho`oulumāhiehie
Hawaiian Language Newspaper, Ka Na`i Aupuni of 1905 and 1906

Pane akula `o Hi`iaka, "O Kalalea kēnā āu e `ike akula."
`O ko Hi`iaka manawa nō ia i paeaea a`e ai i kēia kau.

In the epic saga of Hi`iakaikapoliopele, significant wahi pana (storied places) are unveiled in chants throughout the mo`olelo. Highly worthy of the attention and reverence of the goddess Hi`iaka and her companion, Wahine`ōma`o, it is one of two major landmarks that is observed from the ocean on approach toward Kaua`i.

From their canoe outside of the Ka`ie`ie Channel, their first sighting is of Mount Hā`upu - a volcanic relative of Hi`iaka and the fire clan. With humility and aloha, Hi`iaka greets Hā`upu in chant acknowledging its beauty and power. It is essential for her, even in her position as a deity, request permission for entry to the island. In return, Hi`iaka receives a premonition that her sister Pele has broken her promise and that her beloved lehua groves have been burned and destroyed. Shortly after, she also has a vision that the Chief Lohi`au - subject and purpose of her journey to Kaua`i, has taken his own life out of grief and heartbreak for Pele. Hi`iaka is now faced with a greater responsibility and task. She knows that she will need to restore Lohi`au back to life.

As they continue sailing toward the Ko`olau coast of the island, Wahine`ōma`o saw a cliff come into view, appearing like the forehead of a dolphin rising out of the sea. She asks Hi`iaka what the name of the prominent hill is, intrigued by its prominent emergence.

"`O Kalalea kēnā āu e `ike akula."
`O ko Hi`iaka manawa nō ia i paeaea a`e ai kēia kau.

"That my friend, is Kalalea that you see," she replies and lifts her voice to present this chant:

I Kalalea, kuahiwi ki`eki`e i ka lani
`O Keōlewa e lele maila i ka mālie
`O a`u pae pu`u li`ili`i
E huki `ē loa o Wai`ale`ale ke hele ia.

At Kalalea, mountain piercing the heavens
Keōlewa flies by in the calm
My little cluster of hills
Wai`ale`ale shall draw far up as it goes.

Anahola Ahupua`a

Formerly, Anahola was part of the moku or district of Ko`olau. Within the Ko`olau district were the ahupua`a of: Kīlauea, Kāhili, Waiakalua, Waipake, Lepe`uli, Ka`aka`aniu, Moloa`a, Papa`a, Aliomanu and Anahola. Anahola being the largest of the 10 ahupua`a that stretched along the northeast end of Kaua`i.

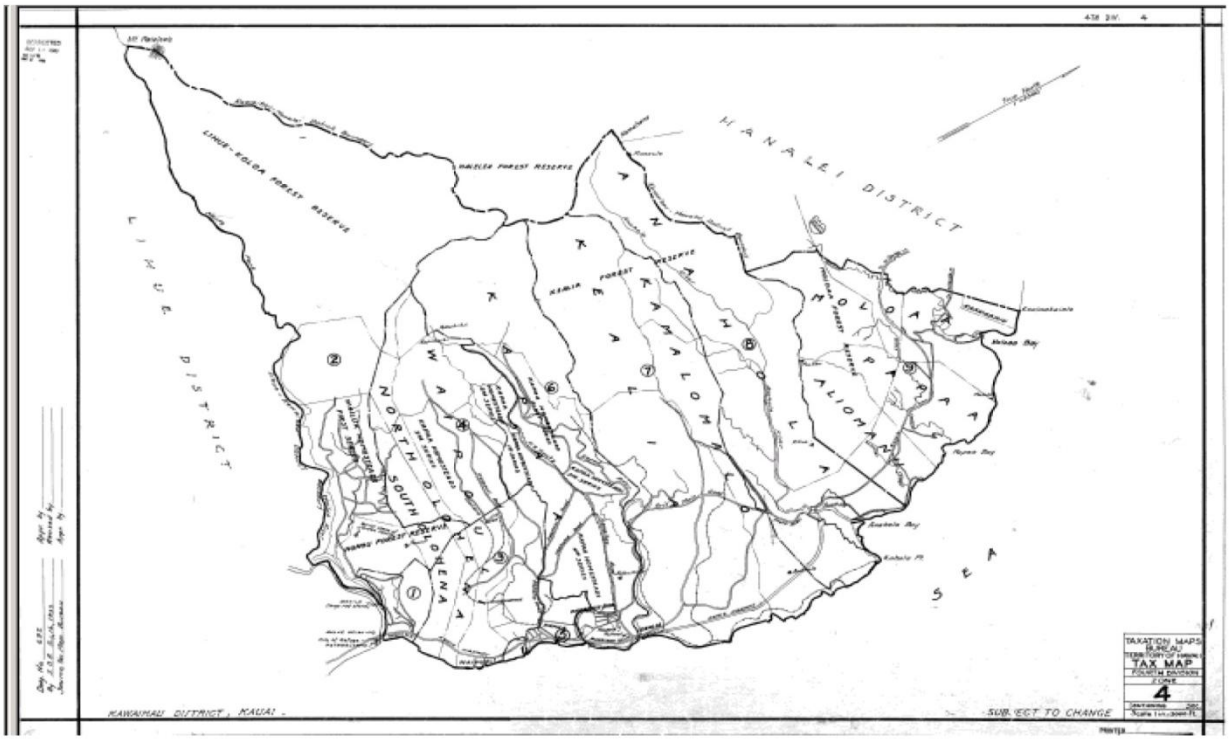


Figure 8. Showing Kawaihau District, East Kaua`i and ahupua`a land divisions including Kamalomalo`o ahupua`a - location of the project area. Taxation Map Bureau Territory of Hawai`i.

Ahupua`a Place Names, Descriptions, etc.

The following descriptions of the project area ahupua`a begin with identification of the *ma kai* or ocean ward boundary points to the north and south. The boundary lines of the ahupua`a are referenced by specific landmarks that lead to the apex of the land division's high point *ma uka* to the west.

The common description that ahupua`a are "pie-shaped" is inaccurate. However, it is a general practice to apply triangulation of the 3 main boundary

points of the ahupua`a when identifying its respective division lines. Additionally, ahupua`a do not terminate at the ocean ward boundary points. The boundary lines are purposely extended into the ocean so that it also includes the resources and minerals of the reef and ocean as well.

The Hawaiian Legislature created the Office of Commissioner of Boundaries in 1862 to determine exact boundaries of previously un-surveyed *ahupua`a*. In 1874, the boundary commission met to identify the Anahola boundaries through native Hawaiian references and landmarks. All persons who had received LCA awards for their lands by names only were mandated to appear before the BC to have their boundaries identified and determined.

Anahola ahupua`boundaries:

Lae Kuaehu (also Kuaehu) is the promontory that divides Anahola from Aliomanu.

Beginning at this northern point of the Anahola ahupua`a, the boundary line runs toward Kalalea mountain from east to west, connecting first to Kīko`o atop of Kalalea mountain. From there, the boundary line connects through the landmarks of Kawaiūmakua, Pu`u Ehu, Kaho`opulu, Pua Keakea, Mālamalamaiki, Lele Iwi and Namahana. From Namahana, the boundary turns south to Pu`u Eu. From there, the southern boundary line turns and continues back east towards the ocean.

Image NK-8. Lae Kuaehu is the northern boundary point for the Anahola ahupua`a. It also serves as the ma kai boundary point for the Aliomanu ahupua`a.

Along the ahupua`a division line shared between Anahola and Kamalomalo`o, there is also a peak called Anahola. This mountain peak serves as the acme of the Kamalomalo`o ahupua`a. Pu`u Anahola connects to Pu`u Awa, and finally ending with Lae Lipoa at the ocean's edge. Lae Lipoa serves as the southernmost boundary in the Anahola Ahupua`a.

He Mo`olelo No `A`ahoaka Ke Koa a me Kona Hānau Kupanaha Ana
He Mo`olelo Kahiko No Kaua`i
A Story of the Warrior, `A`ahoaka and His Extraordinary Birth:
An Ancient Story of Kaua`i

The following is an excerpt from an ancient mo`olelo of Kaua`i that is directly affiliated with the project areas of Anahola and Kamalomalo`o. The main setting of the story is Anahola.

Originally published in the Hawaiian language newspaper, Nupepa Kuokoa in a series of writings from December 30, 1876 to March 3 1877. It is presented below in paragraphs that have been italicized; translated from the Hawaiian text from Nupepa Kuokoa. Please note that we have retained the spelling of all names exactly as it appeared in the newspaper. As such, kahakō or macrons are not used in the presentation of the mo`olelo itself.

Another interesting item of note is the appearance of the place name Anahola as *Anehola.* This variation of spelling has appeared in other writings of mo`olelo and a few examples of chants documented in Hawaiian language newspapers. However, the prevailing use and accounts using the name, Anahola is far more evident in oral and written documentation according to University of Hawai`i at Hilo Hawaiian Language Instructor, Kainani Kahaunaele. All of the kūpuna that were interviewed for this study also concurred that they have only known and used the name, "Anahola" throughout their lifetime.

> *Kalalea was born to Kapa`opa`o the father and Kahala, the mother, Anehola [Anahola] was the birth land. They were ali`i - of the chiefly class from Ko`olau. Their residence was at Kalaewahiwai, located near the upland trailway to a place where the ali`i continue to reside today. While they were living there they were both young.*
>
> *Kahala was pregnant at this time. When it appeared that the time had come for the child to be born, thunder boomed, lightning struck, the earth shook, and the rivers raged with red mud. However, for three nights and three days, there was nothing. No significant signs appeared that this child was soon to arrive.*
>
> *A messenger was sent to seek out the kahuna by the name of Kanoeoalaka`i. Her place of residence was in the uplands of Wainiha. When the messenger arrived, she was seen sitting upon the kuina akaka - a unique kapa from Miloli`i. She had already received a vision of a person traveling and asked, "Why have you traveled here to see me?"*

"I have been sent by the ali`i of Anehola, by Kapa`opa`o, about the childbirth of his wife, Kahala," the messenger replied. "For three nights and three days have already passed, yet the child has not even emerged. Therefore, I have been sent to fetch you."

"I will not go with you today," advised the kahuna. "Instead, when evening arrives tomorrow, I will go and sleep near Kuaehu in Aliomanu."

"Here is what you will say when you return to the ali`i. Fetch pū `awa hiwa with the leaves from Maiakini. This place is located upland of Keālia. Secondly, water must be gathered from atop of Wai`ale`ale; not with a gourd but with the leaf of a mokihana. Bundle it entirely and bring it here to me. Then I can act upon it."

The messenger returned to the ali`i and recited everything that he had heard from the kahuna. The chief listened then turned and asked all of the other ali`i who were sitting there, "Who will be the right one to fetch these things instructed by the kahuna?

Kahala turned in extreme agony and asked her brother Pōhakumalumalu if he could go and fetch the `awa from Maiakini. When asked who would fetch the water, Keanuo`aipō offered to take on the task.

In no time both of the items were gathered and delivered. By the time evening had arrived, the kahuna Kanoeoalaka`i had traveled to lay in the house of Kuaehu. Hoku was the moon phase that evening. And when the morning came, Hoku was also that day. Then the kahuna arrived and stood in front of Kapa`opa`o. Everything had been prepared as instructed. Only the work of the kahuna remained to be done.

All parts of the `awa was prepared, including the roots, stalk, and leaves, until the `awa was soft and mixed with the water. The kahuna then rubbed the ali`i wahine from her head down to her feet. Immediately thereafter, the thunder began clapping, lightening began flashing, and the earth trembled. Then, the cry of a child was heard. Finally, the birthing was complete. The child was a boy, dark skinned on the back from head to toe with dark facial features as well. When ten days had passed the piko was severed and the child was named Kalalea. All of the difficulties were finally over.

In time, Kahala became pregnant once again. Signs of approaching the end of her pregnancy appeared with her cravings for the `ōlalimoeone fish of Hālaulani. When it was almost time for the birthing, just as dawn was about to break, the darkness was honored with the clap of thunder, the flash of lightning and the trembling of the earth. That very evening, the child was born - this time a girl that they named, Nālehuaolulu`upali. The rearing of this child was given to Ho`ohila - a brother of Kahala whose home was in Lumaha`i. These were the only children of these ali`i.

A Connection and Understanding of Place
Traditional Wisdom & Knowledge of Land, Ocean & Atmospheric Forms

The main characters in the story are traditional places in Anahola. They remain significant landmarks to this day. In the process of preparing this study, Native Kaua`i consulted and met with many indigenous Hawaiians of Anahola. While all of them identified and referred to Anahola's landmark mountain range as Kalalea, all were not aware of the individual mountain peaks or their original names and related stories. There was great interest expressed by those interviewed, to learn more of this information.

Kalalea is the offspring born to Kahala - a female, and Kapa`opa`o - a male. Both Kalalea and Kahala are names of traditional wahi pana or storied places in Anahola which will be discussed in further detail separately from this section.

Kahala and Kapa`opa`o - Kalalea's mākua or parents are also names of native fish species that are highly prized as a food source as well as for their symbolism in Hawaiian culture. Both are tropical marine fish in the *carangidae* family which include the jacks, pompanos, jack mackereles and scads. Most species are fast-swimming predatory fishes that hunt in the waters above reefs and in the open sea. Some dig in the sea floor for invertebrates. The largest fish in the family is the greater amberjack or kāhala.

The other characteristic that both the kāhala and kapa`opa`o fish species share is that they are strong, fast and aggressive in nature. They are symbols of protective mana or energy that is an essential value and characteristic of parents with young offspring. These are also `ano or traits that are essential to the child that is destined to grow into a warrior.

As seen on the following page, the pa`opa`o and kāhala have distinctive characteristics of striped markings which elevate their beauty and power as predatory fishes.

Pa`opa`o - Native Golden Trevally
Caranx speciosus

Kāhala - Native amberjack or yellowtail
Seriola dumerilii

The pa`opa`o is also referred to as ulua pa`opa`o as well as the ulua kāni`o (Caranx speciosus); with green and yellow with vertical green bands.

The kāhala is an amberjack or yellowtail (Seriola dumerili). The Kāhala `ōpio is s. *aureovittata*. The name may also be qualified by maoli or moku lei. Āmuka is a variant name or a name for the adult stage of the kāhala fish. Another name that is known by is mokule`ia. Halahala is the young stage of the kāhala fish.

Important as sources of subsistence for Native Hawaiians, the kāhala and pa`opa`o can easily be distinguished by their markings. The kāhala sports a stripe that streaks from its nuku or snout/mouth of the fish through the eye, and all the way to the top of the dorsal. Juvenile pa`opa`o are bright yellow with bold, black bars, adults are brassy with obscure bars and blotches. It is also considered one of the best fishes for eating raw.

Mo`olelo such as those presented here provide insight to the life ways, practices and beliefs of the ancient Hawaiians. We have included this example of a story to share of the kuleana or responsibility that ali`i (or in today's time - government and community leaders) have to the land and the people that they manage and oversee.

Lae Kuaehu held a prominent place in the lives of the ancient people of this district. Located on the coast at the northern boundary line of the Anahola ahupua`a, Kuaehu was identified by native Hawaiian informant, Kauniahi as a place of sacrifice in the olden days, and as a place of worship by Pihuiki. The *kama'āina* also described a resting place called Ahole just *ma uka* of Kuaehu.

Bennett's records of 1931 described several heiau in Anahola. However, he did not identify a heiau within the vicinity of Kuaehu.

There are several definitions to consider when looking at this place name. A *lae* is a promontory or point. It is common throughout the Hawaiian archipelago to see traditional place names attached to them - especially along coastal areas. Lae are seaward boundary points for ahupua`a as well. For the project areas of

Anahola and Kamalomalo`o examples of this is seen in the names of *Lae Kuaehu, Lae o Kahala, Lae Līpoa*, etc.

On a literal level, Kuaehu means, "*silent, still or lonely*". It also describes interactive movements of the environment that is typical to that place. /Windward breezes blowing offshore conjure up waves that carry the *ehukai* or sea spray to create shrouds of ocean mist over the promontory.

However, it is through the experiences of our Hawaiian ancestors, preserved in the form of mo`olelo or traditional stories that we learn there is much more to the place name, Lae Kuaehu.

In the mo`olelo of `A`ahoaka, a messenger is sent by the Anahola chief, Kapa`opa`o to seek out Kanoeoalaka`i who resides in the uplands of Wainiha. The priestess is needed to help his wife, Kahala who is experiencing complications during her pregnancy. In the story, Kanoeoalaka`i is simply referred to as a kahuna - a priestess. However, Kanoeoalaka`i's formal expertise is in the ancient healing practices of obstetrics. She is a *kahuna pale keiki* who is a master of traditional treatments, rituals and healing processes that included pre-natal care, the actual birth and delivery as well as following the birthing of the child. The *kahuna pale keiki* is also an expert in *lā`au lapa`au*, healing treatments using herbs and minerals as well as in lomilomi or massage.

Kanoeoalaka`i does not leave with the messenger, but instead tells him that she will arrive on the following evening, where she will go and sleep near Kuaehu in Aliomanu. The messenger is then advised to return to the ali`i with specific instructions to fetch certain plants and water sources that she will need upon her arrival at Kuaehu. Kanoeoalaka`i prescribed *pū`awa hiwa* from Maiakini above of Keālia, and water from atop of Wai`ale`ale.

Image NK - 1.9 Pu `Awa Hiwa

The *pū`awa hiwa* is cluster of several stalks of *`awa hiwa (Piper methysticum)*. Considered to be the most sacred of all varieties of *`awa*, is the darkest in color (hence, hiwa meaning entirely dark, deep black). It is also reserved for ritualistic use and for offerings made by kāhuna and ali`i. Kanoeoalaka`i also gives instruction that the water not be collected with a gourd, but with the leaf of the mokihana *(Melicope anisata)*. Although the story does not specify why the mokihana leaf is prescribed to gather the water, we know that it is an extremely rare and highly revered plant in Hawaiian culture; especially Kaua`i culture.

Endemic to Kaua`i Island, it is not found anywhere else in the world. Both the berries as well as the leaves have a strong, beautiful fragrance and it is known that both were used to perfume the kapa fiber cloth as well as the bath water of chiefs. The *kahuna* prepares the `awa hiwa roots, stalks and leaves, then administers lomilomi and massages the ali`i wahine hāpai (pregnant chiefess) from her down to her feet. Immediately thereafter, the heavens and earth stirred and rumbled and lightning flashed overhead. The cry of a child was heard, signaling that Kahala's enduring labor was finally complete.

Image NK-1.10 Mokihana (Melicope anisata)

The place that Kanoeoalaka`i treated Kahala was in a *hale* or structure at Kuaehu. This provides us with the hint that there was once a significant heiau at Kuaehu. It is important to look at the area not as we see it today, but as it could have appeared hundreds and hundreds of years ago. Without the present day road, vacation rentals and erosion, Kuaehu would have been much larger than it is today. Storms and the rampant destruction of sacred structures following the breaking of the kapu system and conversion to Christianity are logical possibilities to there being no archaeological evidence of a heiau today.

At the time of Kauniahi and Pihuiki's testimony before the Land and Boundary Commissions in 1862, they use the reference, "in the olden days". It also appears that knowledge and notion of heiau had already been reduced to forbidding "places of sacrifice".

The details given in this portion of the mo`olelo is a crucial link to understanding the significance of Lae Kuaehu - not only as a wahi pana, but as a wahi kapu or sacred place. This was realized only after rounds of research and lengthy discussions regarding traditional cultural practices and protocols associated with ali`i. Repeated field observations to consider alignment of celestial bodies such as the rising sun and moon were prompted by nuances within the mo`olelo that were initiated by the expertise and skill of the kahuna.

At first look of the word, ehu (as well as `ehu), it is easily assumed that there is a reference to the sea spray or ocean mist because of the promontory's Oceanside location. It is the most obvious and sensible meaning behind the place name. According to the Hawaiian dictionary by Pukui and Elbert, "many older people say ehu for `ehu 1-4, which is probably the older form; note lack of glottal stops in such forms as ehuehu, `ehuehu, kaiehu, kēhu, juehu, luehu, puehu."

The mountain peak, Pu`u Ehu along the Anahola ahupua`a boundary prompted additional study to determine all possible meanings and applications of the word, ehu. In doing so we found that Kuaehu and Pu`u Ehu, are directly related and in alignment with each other. During the summer solstice, the sun is directly in alignment with the point, Lae Kuaehu and the summit, Pu`u Ehu.

The expertise of the kahuna pale keiki is shown through her selection of place and its relation to the sun. This is vital to the survival of the chiefess Kahala who is exhausted and weak from enduring the painful burdens (kua) of labor. Kanoeoalaka`i's lā`au lapa`au prescription combining the ingredients of the pū `awahiwa, the pure, sacred water from the summit of Wai`ale`ale and the leaves of the mokihana involve the use of kinolau or nature body forms of the god Kāne.

In his role as the primordial akua, Kāne's principal purpose is to inspire and grant life. The entire process is a ceremony as well. Through her chanted prayers, the kahuna channels the mana of the sun along with the energetic forces from the atmosphere to her patient while simultaneously administering the ancient healing method known as, ehu. Using water mixed with fragrant herbs, the kahuna sprinkles and gently massages her patient from "head to feet" to revive her from fainting or lapsing to death.

> *"All parts of the `awa was prepared, including the roots, stalk and leaves, until the `awa was soft and mixed with the water. The kahuna then rubbed the ali`i wahine from her head down to her feet. Immediately thereafter, the thunder began clapping, lightning began flashing and the earth trembled. The cry of a child was heard...finally, the birthing was complete. The child was a boy, dark skinned on the back from head to toe with dark facial features as well."*

This entire process was pivotal in ushering in the new life cycle of Kahala's first-born ali`i child. Kahala and Kapa`opa`o named their newborn keiki, Kalalea. The naming of Lae Kuaehu is a result and reflection of all of the definitions that have been provided in the preceding narrative. It references the movements and physical interaction of sea spray that is blown upon the promontory and the land. However, it is the mo`olelo that provides us with a deeper understanding of this particular place, and the intricate details of the experiences that occurred there that prompted the naming of Lae Kuaehu. From this mo`olelo, the ancient practice, beliefs and ceremonies associated with chiefs, child birthing, healing and sun worship are revealed to bring the meaning of an ancient place name back to life.

Other Anahola Place Names

Recordings preserved in the Bishop Museum archives feature oral interviews with native Hawaiian kūpuna of Anahola in the 1950s and 1960s were invaluable for this project. The following is based on an interview conducted by Hawaiian scholar, Mary Kawena Pukui and Kūpuna Daisy Waihoikahea Valpoon Lovell.

Hālaulani
Lit. Myriad Breaths of the Heavens

Just outside of Lae Kuahu is a channel where the kūpuna cite the location of Hālaulani - the home of the shark god and his retinue of resident manō. Kūpuna Daisy Waihoikahea Valpoon Lovell spoke about Hālaulani as the home of `aumākua sharks just outside of Lae Kuaehu. She described the relationship and feeding customs that her grandmother and her `ohana were still practicing when she was a young girl. Makahia and Malaepapa are the names of the reef flats in this area where the shark was fed. This shark provided them protection and was both an ancestor and guardian to them. Neither of the two big tidal waves in her lifetime damaged Lovell's seaside home.

The name Hālaulani, also references a heavenly or chiefly structure; such as a home of a chief. The ali`i is not only the native chief who rules over the land.

The manō too, is recognized as a chiefly denizen of the ocean realms - fierce, dominant and ready to protect and regulate over his domain.

Other elders of Anahola, as well as kūpuna in our own family preserved knowledge of these practices through the telling of stories and experiences that were occasionally shared. Admittedly, they did not explain all of the intricate details of how and why they interacted with the manō (sharks) in the way that they did. There was no need to know more beyond their response that, *"We feed them because they are `ohana to us."*

This was especially important for those who sustained their families through the practices of lawai`a or fishing and gathering from the sea.

The Lovell `ohana of Anahola continue to be expert lawai`a today - not only in the gathering, but also in the preparation of fish and produce harvested from the sea. Born and raised in the Oceanside village of Anahola, the offspring of the late master lawai`a, Hosea Kaina Lovell have expanded their lifetime experiences of lawai`a and ocean wisdom. Althea Kalei Arrinaga is an educator at Kapa`a Elementary School. Recognized in 2011 as the District Teacher of the Year, Kalei has implemented innovative curriculum opportunities for her students such as the `Aliomanu Limu Restoration Project.

Her sister, Nālani Kāneakua is a trained chef and the former owner of the highly acclaimed restaurant, Cafe `Āina in Hanamā`ulu. In 1999 she was the only woman on the crew of the Polynesian Voyaging canoe, Hōkūle`a, and served as its cook and quartermaster on its voyage from Rapa Nui to Tahiti. Today, she is part of the staff at Waipā Foundation in Halele`a where she directs `āina-based culinary education programs that involves the gathering and preparation of produce and products from the ocean and the land.

Along with their sibling and cousins, they were raised in an extended family of expert lawai`a whose patriarch and grandfather was Andrew Lovell - noted konohiki of Anahola. As children, to fish and gather from the ocean for subsistence by their late father, Josea Kaina Lovell, Jr. who worked as a farm manager and commercial fisherman, Nālani is adamant that her lifestyle is inseparable from the land and ocean today. Whether for gathering for personal use and home consumption, or even to relaxation and rejuvenation after a day at work, the ocean is an integral part of a family legacy that spans more than 16 generations.

One of our informants, Kūpuna Val Ako who we interviewed for this study spoke very highly of a master lawai`a by the name of Andrew Lovell who was the konohiki of Anahola at the time. Uncle Val, now in his 80s was a young man when he first met Andrew Lovell. He referred to Lovell with great respect, addressing him as uncle or kūpuna.

The elder Lovell was the expert of his day that oversaw and regulated the fishing resources in Anahola. Andrew Lovell is also the father of the late beloved kūpuna, Aunty Loke Pereirra - who too, was highly respected for her knowledge and skills as an expert of the ocean resources. Not only was she well known for gathering limu, fishing and for making the most delicious poke enenue *(Chub fish, also known as rudder or pilot fish Kyphosus bigibbus, K. vaigiensis)*. Aunty Loke was also a leading advocate and activist for protecting native Hawaiian access and gathering rights for sustainability practices. Her husband, Uncle Charlie Perreira is an expert throw net fisherman as well, and a recognized master of Hawaiian throw net making. He can regularly be seen in Anahola and throughout the community sewing his fishing nets. He is always willing and wanting to share and teach of his Hawaiian practice and craft to all that are interested, especially those of the younger generation who he feels will carry on the traditions of Hawai`i.

Anahola Mountain Peaks & Landmarks

One of the most important topics of research for this study was the identification of Anahola's mountain peaks and landmarks. As we spoke with native Hawaiian residents of Anahola, all of them interchangeably identified the mountain in its entirety as, the "Anahola mountains" or as the "Kalalea mountain range". When asked about the names of the individual peaks, a few recognized its most prominent peak as Kalalea. Spelling and pronunciation of other names given included Konānae and Kōnanai, as well as, Hōkū`ālele and Hōkūalele. Aolani, the name of Anahola's famous "Hole in the Mountain" was known to a few.

Over the years, residents have lost touch with the place names and their meanings for this mountain range. The habit of identifying traditional landmarks - whether they are mountains, beaches, etc. by generalization is common. A greater misfortune is the more popular trend and use of nicknames created by recent generations of transient and kama`āina residents. Disappointedly, this has resulted in the greater loss of knowledge and awareness of traditional Hawaiian places and wahi pana.

The June 2010 DHHL Regional Plan sums up a description of the Anahola mountains in 2 short sentences. The only place names that are referenced are the Kealia mountain range, Hōkū`alele peak and Kalelea/Kalele`a, with and without the `okina or glottal stop; singular and plural.

Another random search for Hawaiian names of Anahola mountains produced the following description penned by a travel writer.

> "Looking inland towards the Kalalea Mountain Range our attention was directed to a specific mountain peak, once known as Mano Mountain but which has, in recent years, taken on the popular name of King Kong's Profile due to the fact that it resembles a gorilla head. The Kalalea Mountain Range certainly does inspire one's imagination. "Bam Bam" [tour guide] pointed out that in this very range you can see not only a gorilla's head, but also a bust of George Washington, a tortoise, a hippopotamus and a pregnant lady. He was absolutely right!"
>
> *-- John Fischer, Travel Writer for About.Com Hawai`i Travel - part of the New York Times Company.*

A recent article covering the Kaua`i Habitat for Humanity's Build-A-Thon in the Garden Island Newspaper was an amazing display of the community coming together to support 3 Anahola families. The article was a positive and uplifting news piece for Anahola. However, despite the status, respect, aloha and dignity that Kalalea mountain is given in the oral and literary works of Hawaiian deities, scholars and master practitioners, it has become commonplace to use inappropriate monikers, such as "*King Kong Mountain*" instead. There is an urgent need to educate and inform, first and foremost the native Hawaiian Anahola community of Kalalea's importance and the traditions associated with this storied mountain.

Everyone that we interviewed for this CIA had firsthand knowledge that the name of the mountain is Kalalea. However, no one person was able to articulate any of the other names of the individual mountain peaks and valleys that make up the greater mountain range that stands as Anahola's most prominent landmark. Knowledge of wahi pana and their place names for both subject ahupua`a of this CIA are on the verge of being forgotten and lost altogether. There is a sense of urgency to bring this to the forefront of our collective attention and create learning opportunities for the Anahola native Hawaiian community.

"Realtor volunteers work on the floor of a house in Anahola during the Kauai Habitat for Humanity Build-a-thon, Sunday.

Leonard and Cecelia Mahoe of ‘Ele‘ele were among those helping in the shadow of the “King Kong Mountain.”

Dennis Fujimoto, The Garden Island Newspaper - August 6, 2012

Mary Abigail Kawena‘ulaokalaniahi‘iakaikapoliopelekawahine‘aihonuainālеilehuaapele Wiggin Pukui (1895–1986), (or better simply known as Mary Kawena Pukui) was a Hawaiian scholar, dancer, composer, and educator. Born in Ka`u on Hawai`i island, she was raised in the tradition of hānai by her maternal grandparents who were kahuna, healers and chanters. Fluent in the Hawaiian language, she was later educated at the Hawaiian Mission Academy, and later at Punahou School on O`ahu. From 1938 to 1961, Tūtū Pukui worked as a ethnological assistant at the Bishop Museum where she translated hundreds of documents including stories, chants and early writings of ali`i and Hawaiian historians alike.

Of her notable works during her term at the Bishop Museum, are the oral histories that she led in the 1950s and 1960s. Traveling throughout six of the Hawaiian islands, she interviewed residents on various subjects of Hawaiian culture, stories, places and experiences of the interviewees' lives. Most of the oral histories were recorded in the Hawaiian language.

Kūpuna Recollections - Anahola 1950s

Recordings of oral interviews preserved in the BMA (August 13, 1959) include kupuna, David Kahanu who discusses prominent land features of Anahola. He speaks about the puʾu named Kalalea and Kōnanae, citing that the former - Kalalea, is male and Kōnanai, the latter is female. They are husband and wife companions - allegorical figures in nature that are celebrated characters of indigenous stories and traditions of this region. They are viewed and personified as beloved kūpua or supernatural forms in the landscape that guard, watch over and protect the families who have dwelled in this quaint Hawaiian community for generations.

Other kūpuna participating in the same interview conducted by Mary Kawena Pukui include Mrs. Evelyn Ewaliko and Mrs. Daisy Lovell. In the recorded interviews, they offer up additional place names such as: Pālaha, Heke, Pūaua, Pu`ukōaniani, Makahia, Malaepapa, Alaweo, Kaluaokehulu, Paeaea, Kahe, Kukae`iole, Pali`au, Pukaaolani, Āmū, Pālaha, Pāpa‘a, Heke, and Pūaua amongst others.

Kalalea is seen as the upright peak representing the male prowess and energy of the god, Kū. Kōnanae renders the maternal power of femininity representing the prostrate balance of the goddess, Hina. Together, they serve as icons for procreative vigor, inspiring the potential for perpetuation of family lineages and the population in the community.

Over the recent generations, the traditional place names of the Anahola mountain range, their meanings and stories have become more and more unfamiliar to residents in the community. With the exception of Kalalea, the cherished names and its related mo`olelo have succumbed to hollow monikers such as *"Kong Mountain", "Buffalo Peak", "Tortoise Hill"* and others.

Anahola Kaua`i's Mystic Hawaiian Village (Marti-Kini 2009:40 - 45) provides a listing of place names, suggestions and possible definitions for the various mountain peaks of Anahola's mountain range. The publication only applies the name Kalalea to the entire mountain range. It's most prominent peak which is known to long-time native Hawaiian residents of Anahola as Kalalea, is instead identified as, Kiko`o.

A number of map sources referenced for clarification of place names and peaks produced conflicting information and statistical data as well. Further research, including examination of oral histories and other sources for accurate identification is of great importance and priority.

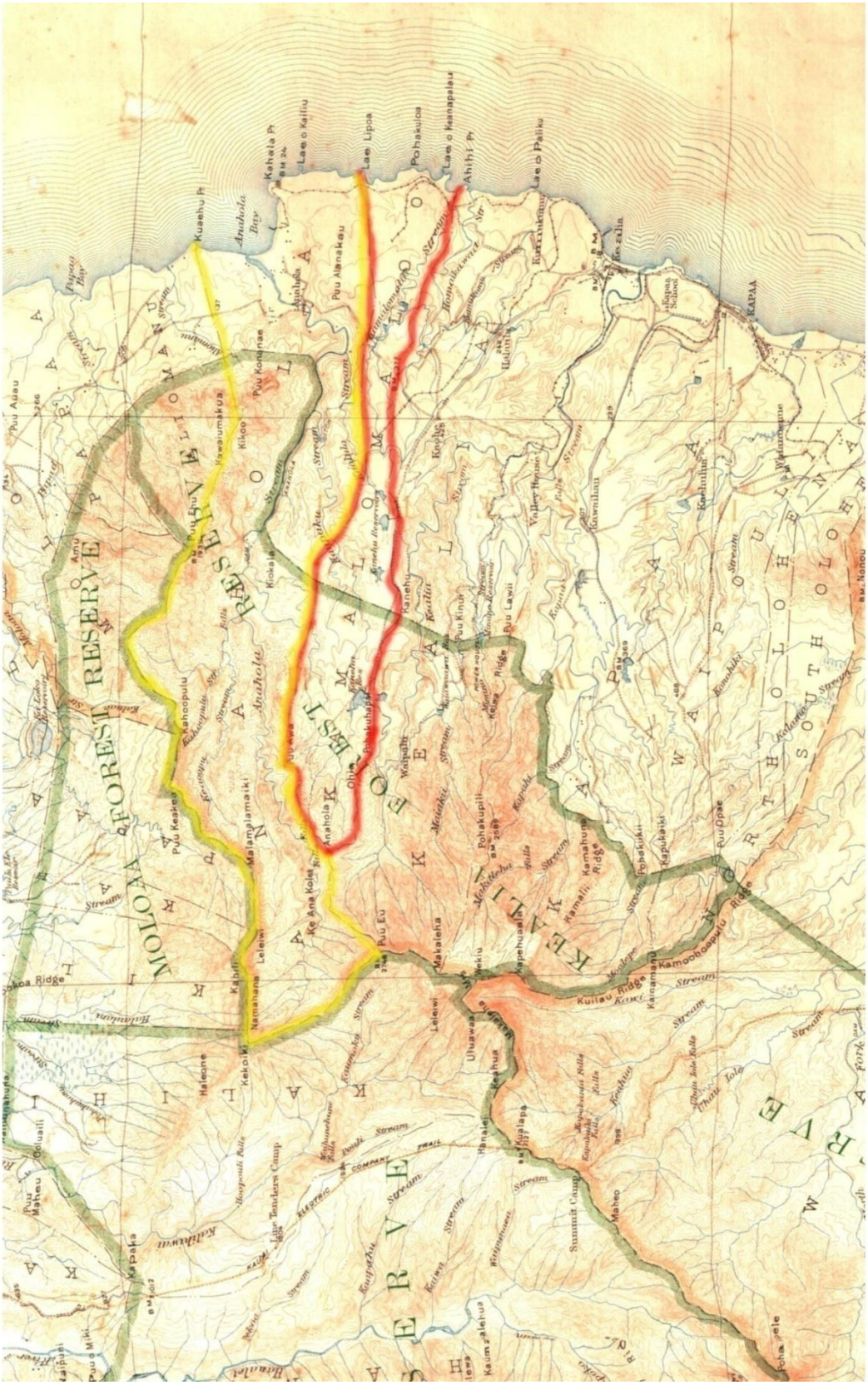


Figure 6. Kamalomalo`o (red) and Anahola Ahupua`a (yellow). US Department of Interior Geological Survey Topographic Map 1912.

Fresh Water Sources of Kamalomalo`o and Anahola

- Kaho'opulu stream (Anahola)

  Lit. To become wet, soaked, drenched by water.

- Kea`o`opu stream (Anahola)

  `O`opu is the general name for fishes included in the families Eleotridae, Gobiidae, and Blennidae. Some are in salt water near the shore, others in fresh water, and some said to be in either fresh or salt water. Varieties include blue-spotted goby (Quisquilius eugenius) and indigo hover goby (Ptereleotris heteropterus). ʻOʻopu ʻai lehua, poetic description of ʻoʻopu found in upland streams where lehua flowers drop into the water; lit., lehua-eating ʻoʻopu.

  O'opu nakea are the largest of the stream gobies, reaching 14 inches (35cm) in length and weighing up to 1/2 a pound. It is endemic to Hawai'i, omnivorous in its eating habits and found in middle to lower reaches. The color pattern is distinctive. The dorsal fins are yellowish with black bars and the base of the tail is dark in color. This species occurs on all the larger Hawaiian islands. Probably because of its large size and abundance, o'opua nakea was a popular food fish among the Hawaiians.

  There is an `ōlelo no`eau: "Kau ke alapiʻi a ka ʻoʻopu, the ʻoʻopu", which translates to say, "Fish form a stairway" `O`opu are said to jump over rocks from pool to pool and are able to climb up steep faces of waterfalls to upstream pools.

- Anahola stream (Anahola)

  Main fresh water source in Anahola. Lit. "Hola Cave"

- Ke Ana Kolea falls (Anahola).

  "The cave of the Kōlea bird"

  The Kōlea is the Pacific golden plover (Pluvialis dominica), a migratory bird which comes to Hawaiʻi about the end of August and leaves early in May for Siberia and Alaska. ***Fig.****, to repeat, boast; a scornful reference to foreigners (Kel. 70) who come to Hawaii and become prosperous, and then leave with their wealth, just as the plover arrives thin in the fall each year, fattens up, and leaves; a less common figurative reference is to one who claims friendship or kinship that does not exist; in some localities the kōlea is an ʻaumakua.*

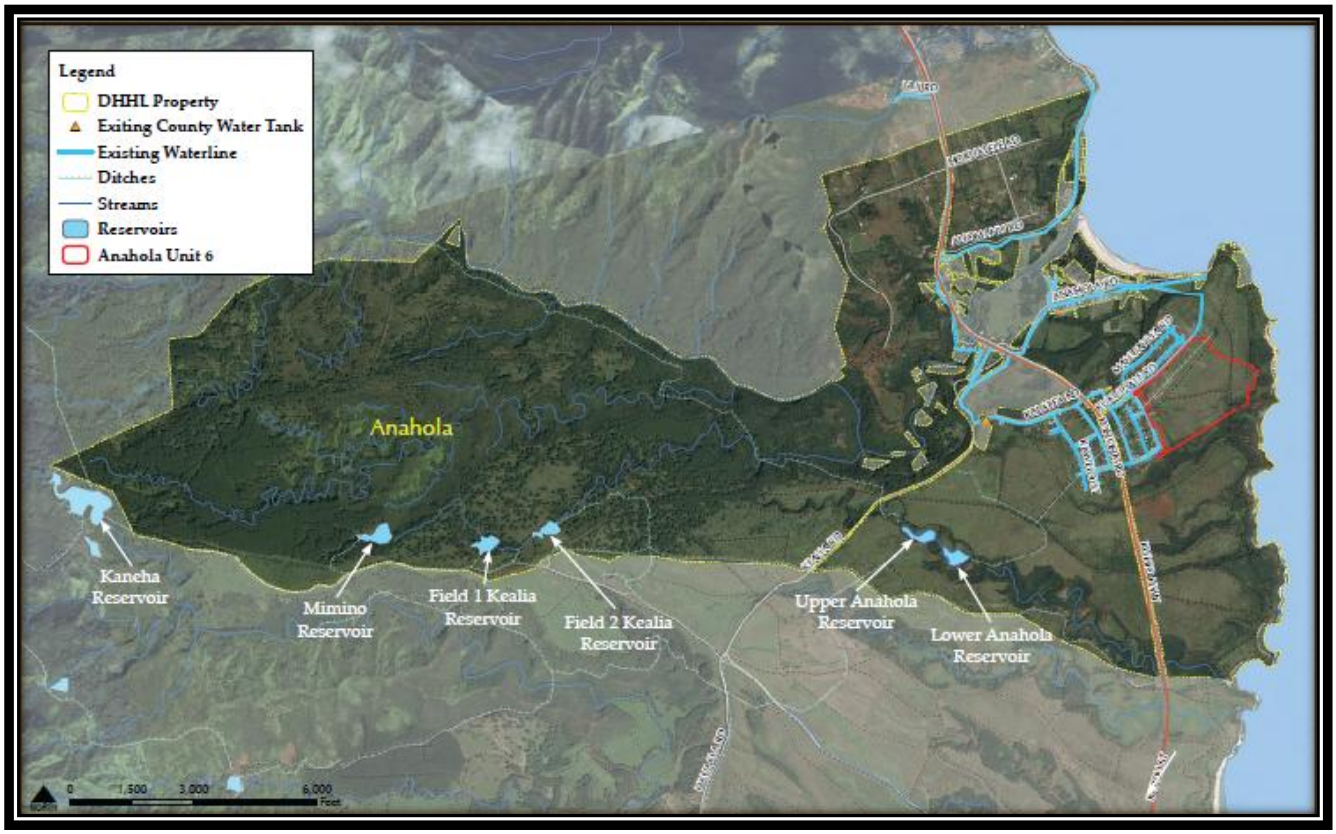


Figure 10. Reservoirs created during Kaua`i's plantation era offer great potential for future agricultural opportunities in the Anahola Region. 5 reservoirs on DHHL Kamalomalo`o land include: Mimino, Field 1 Keālia, Field 2 Keālia, Upper Anahola and Lower Anahola. Source: June 2010 Anahola Regional Plan.

- Kaupaku stream (Kamalomalo'o/Anahola)

  This stream source begins in the ahupua`a of Kamalomalo`o and continues through to Anahola. Kaupaku is a variation of the word kaupoku which translates as ridge pole, highest point, roof , ceiling; figuratively referring to the greatest. It is located above of Ka`alūlā stream. The mountain valleys of Pu`u Eu and Makaleha are conduits for the receiving of rainwater which is then fed to the main streams of Kaupaku, Ka`alūlā and Kamalomalo`o. Eventually, Kaupaku feeds into Anahola stream in the neighboring ahupua`a.

- Ka'alūlā stream (Kamalomalo'o/Anahola)

  This stream source begins in Kamalomalo`o. Alike the Kaupaku stream it eventually meets and flows into the Anahola Stream. Lit. "Moving Calmly"

- Kamalomalo'o stream (Kamalomalo'o)

  Literally, Kamalomalo`o could simply mean, "dried loincloth". The malo or loincloth is a metaphor for the expanse of land in this relatively smaller than usual size ahupua`a. All accounts of the word "malo" needs to be taken into consideration. The word malō is a variance of malo`o. The reduplication "Dry/dried" upon itself would allude to dry, waterless lands. However, this is not the case here with 3 stream sources. Another translation of malo`o, is to trace as of genealogy.

- Kānehā and Kānehū Reservoirs (Kamalomalo'o)

  Kāne is the akua nui or major god that is associated with fresh water, streams, rivers, and lakes. The word hā refers to the breath, life, essence and spirit. The word, hū means to rise, swell, overflow and percolate. Of Kāne's 70 kinolau or nature body manifestations, fresh water and sunlight are of the greatest significance as forms that are necessary for health, growth and life.

  A post-contact plantation era ditch system (also named Kānehā) runs from the Kānehā Reservoir all the way until it joins the Kamalomalo`o Stream. Additionally, there are the Upper and Lower Anahola Ditches as well. 6 reservoirs created by the plantation in the project area ahupua`a include: Mimino, Field 1 Keālia, Field 2 Keālia, Upper Anahola and Lower Anahola.

  Kānehū is a traditional place name for which another set of reservoirs are named after.

Land Commission Award Claims
Anahola and Kamalomalo`o Ahupua`a

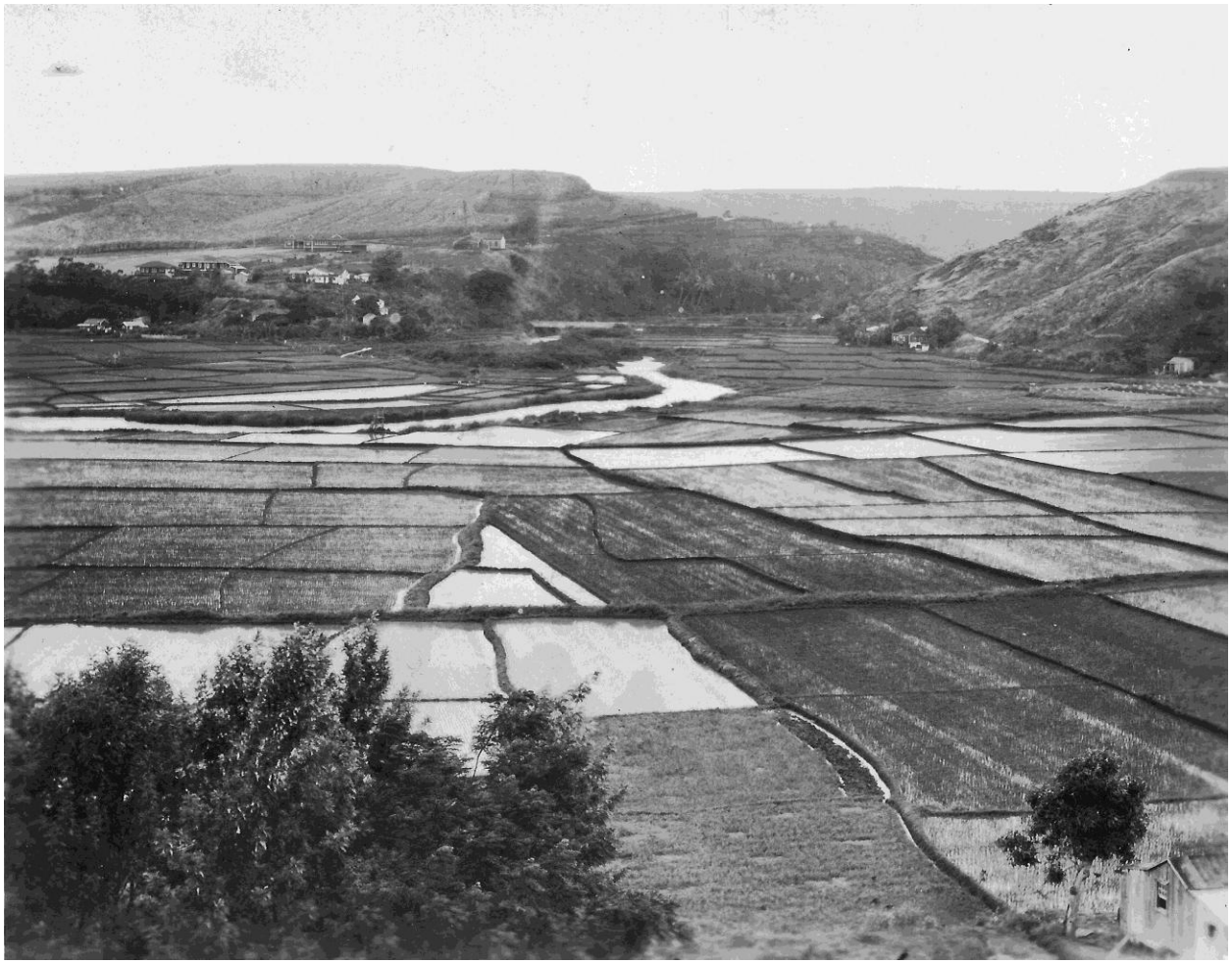


Image KM-6. Rice cultivation and former lo`i kalo (looking ma uka) is shown in abundance in Anahola. Back of photo reads "1890 - 98". Photograph thought to be by Theo Severin. Kaua`i Museum Photo Archives.

With the Anahola Stream as its main source, generations of native Hawaiians thrived in the ahupua`a of Anahola inhabiting mostly the valley and nearby coastal areas. In pre-contact times, prior to transformation of ancient Hawaiian religious and political systems, Anahola's population was comprised of ali`i, kahuna and maka`āinana that were experts in the professions of planting and farming, fishing, healing and kapa making.

Land Commission Award Claims
Ahupua`a of Anahola and Kamalomalo`o

Land Commission Awards and Mahele Awards are Sources of Title adjudicated by the Land Commissioners to claimants.

Mahele Awards are Sources of Title specifically issued to those chiefs who received their lands from the king but failed to present their claims before the Land Commission and thus received titles to their lands from the Minister of the Interior.

Kamehameha Deeds are Sources of Title to Crown Lands that Kamehameha III, IV and V conveyed.

Minister of Interior Deeds were Sources of Titles that conveyed lands from the government to private individuals by the Minister of the Interior during the Kingdom of the Monarchy.

Patents - both Royal and Land were issued on the awards as evidence that the Government's right to commutation therein was satisfied. An award together with a patent perfected the awardee's title to the property.

Grants by Royal Patent and Land Patent were Sources of Title deriving from the sales of government lands.

The term "Royal" indicates that the document was issued during the Hawaiian Monarchy (up to 1893). The Land Patent or Land Patent Grant thus means the document was issued subsequent to the monarchy.

A total of 42 claims for kuleana lands were brought before the Land Commission by native Hawaiians residing in the ahupua`a of Anahola and Kamalomalo`o in January 1848. Majority of the claims made were based on lands in Anahola. Of the 42 listed, 5 claims were not awarded LCAs. It is also known that many native Hawaiians did not appear to petition for their kuleana before the Land Commission.

Of the LC's listed in the following pages, the collective claims accounted for more than 113 lo`i in Anahola in 1848.

28 mala were dedicated to the cultivation of wauke (paper mulberry), plus an additional 10 larger kula or fields and a pali wauke - a steep slope or hill that was also planted in wauke.

A claimant by the name of Naiwi with kuleana at the ili of Mamania, Kaluanui (LCA No. 04780 / RP 3917) noted that in addition to his house lot, his kuleana consisted of: 5 lo`i; 3 mala of wauke; 6 mala of noni; 3 orange trees; 2 Pō`ulu of breadfruit trees.

Pō`ulu are young breadfruit trees from which the bark of tender breadfruit shoots are used to make a less fine, lower grade of kapa.

The January 11, 1848 LCA Claim No. 04627 / RP 6651filed by Paia in the ili of Kapoko at Anahola states that his kuleana land consisted of 3 lo`i and his house lot. In addition, Paia also claimed a *pali wauke*. Pali or cliffs, precipices, steep hills and slopes were found very suitable and favorable for the cultivation of olonā and wauke.

> In a NK's interview taken with Anahola homestead resident, Chono Fernandez, he pointed out how there are so many vacant agrcultural land parcels that should be awarded to lessees. He stressed a sense of urgency for DHHL to take a closer look at the need for lessees to have access to `āina so that they can grow food. As we stood in his yard adjacent to the Anahola Village Soccer Park, he gestured toward the hills that lay beyond the edges of the park and shared that even the slopes and hillsides could be used for that same purpose. A life-long resident born and raised on that same property in Anahola, Chono knows the landscape well, stating how the area (now overgrown with invasive grass and vegetation) has fresh water spring sources.
>
> Chono's idea resonates with common sense and reasoning that "residential lessees should be given access to parcels of agricultural land - even if it is a small piece, enough to grow food to sustain one's family."

A total of 45 mala and kula lands were dedicated to the cultivation of noni, with one claimant growing ipu, and another with an entire kula planted with ulu or breadfruit trees.

Today, the revitalized use of noni as a lā`au lapa`au is primarily used as a natural healing remedy for various ailments. When carefully reviewing the claims, it became evident to us that the large amount of noni was not specifically being grown for medicinal needs of the community. Instead, it served as a supplemental source for natural plant dyes for the making and decorating of

kapa (fiber cloth). The cambium layer from the root of the noni tree is used to make a beautiful yellow dye. When mixed with coral, the dye result is a vibrant red.

NK's field investigators observed great quantities of noni patches and groves growing in the wild throughout the ahupua`a of Anahola. This included upland, valley, and seaward bound areas; no doubt, remnants from previously tended crops that were being cultivated in Anahola 165 years ago.

LCA Claims
Kamalomalo`o and Hōmaikawa`a

The following LCA claims were listed under Kamalomalo`o and Hōmaikawa`a. Between January 22 and February 1, 1848 four claimants appeared before land commissioners to identify lands that they had occupied in Hōmaikawa`a and Kamalomalo`o. The appointment of a new konohiki assigned to replace Holoaumoku as konohiki was the cause of the January 31, 1948 hearing.
In claim no. 8042, Alapa`i is quoted as follows below. Other notes follow as well:

> "I hereby state my claim to you, O Land Commissioners; it is my own claim, 80 fathoms long by 40 fathoms wide. I am with aloha," (no signature is given, Oliva is the witness)

Alapai came forward & made oath that he with his mother (Holoaumoku) & 3 servants of theirs, Pihia, Kaiaoni, Wahaeku & `Ainoa having forsaken their lands in the Ahupuaa of Hōmaikawa`a & gone to Anahola to reside, have no further claims in Hoomaikawaa.

> "Alapai, sworn, before us (two) and before the people whom he governs, in behalf of five claimants. They have rejected their claims permanently without thought of returning again to this land of Homaikawaa."

On February 14, 1848 the lands at Hōmaikawa`a, along with the lands of Kamalomalo`o and elsewhere were awarded to (08559B) King William Charles Lunalilo.

Land Commission Award Claims
Ahupua`a of Kamalomalo`o & Hōmaikawa`a
District of Puna

(Listed in alphabetical order of Claimant's name)

Lands at Hōmaikawa`a and Kamalomalo`o				
Claim Number	**Claimant**	**`Ili/Ahupua`a**	**Kuleana**	**Designation**
08043	`Ainoa	Hōmaikawa`a Kamalomalo`o		Not awarded. Jan. 31, 1848
08042	Alapa`i	Hōmaikawa`a Kamalomalo`o		Jan. 31, 1848
08208	Holoaumoku (Holaaumoku) (Holoumoku) Alapa`i, her son	Hōmaikawaa, Kamalomalo		Not awarded Jan. 22, 1848
08559B*K	Lunalilo, William C. Kanaina, Charles for King Lunalilo	Pilaa, Kahili, Kumukumu, Waipouli, Kapaa, Kamalamalo, Kalihiwai, Hanapepe, Waipouli	Ali`i	Awarded Feb. 14, 1848
11014	Wahaeku	Hōmaikawa`a Kamalomalo`o		Feb. 1, 1848

Land Commission Award Claims
Ahupua`a of Anahola - District of Ko`olau
(Listed in alphabetical order of Claimant's name)

Claim Number	Claimant	`Ili/Ahupua`a	Kuleana	Designation
04547	Anahola	Anahola Puamano, Papaikiahoaka	3 lo'i, 2 mala of wauke, 1 mala of noni and the house site	Award 4547; R.P. 7083; Anahola,Koolau Jan. 11, 1848
04538	Ehuelua	Anahola	2 lo'i, 2 mala of noni, a kula planted in wauke and the house lot	Not awarded Jan. 12, 1848
04593	Haili	Anahola Haili	5 lo'i and a kula adjoining the lo'is, and the house lot	Award 4593; R.P. 6544;Haili Anahola, Ko`olau Jan. 12, 1848
04594	Hiapo	Anahola	2 lo'i, 1 cultivated kula and the house lot and the trees planted on it, an orange, some breadfruits and a kou	Not awarded Jan. 11, 1848
05391	Hilo	Anahola Kaakaulua, Papakolea	Taro land; Name of the taro land is Papakolea, and there is also a house	Award 5391; R.P. 8086; Kaakaulua Anahola, Koolau Jan. 19, 1848
04591	Hulu	Anahola Kuakemana, Paanoho	9 lo'i and 2 mala of noni, an orange tree, a mala of wauke. Kali`ipalala is the name, and Koelonai 2 is the house lot	Award 4591; Poanoho Anahola, Ko`olau Jan. 13, 1848
04581	Huluhulu	Anahola Kanapaa, Kapuonunui, Papaukai	1 lo'i, 3 mala of noni and the house site	Award 4581; R.P. 6631; Kanapa`a, Anahola Koolau Jan. 11, 1848

Land Commission Award Claims
Ahupua`a of Anahola - District of Ko`olau

Claim Number	Claimant	`Ili/Ahupua`a	Kuleana	Designation
04879	Inoa`ole (No name given)	Anahola Kape, Kukuluauki	4 taro lo'i and 1 house lot. Taro lo'i and kula received from Makuakāne	Not awarded; Numerical index lists this as Inoa`ole Jan. 13, 1848
05143	Kaahiki Hilo, his son	Anahola	13 lo'i, 2 kula for wauke, 2 kula for noni, 7 orange trees, 2 kuakua, two hala trees, one place in a gobey fish stream. It was held from Kahanapapa until Panipani (probably Konohiki names)	Not awarded Jan. 13, 1848
05048	Kaehu	Anahola	3 lo'i, 1 mala of wauke and the house lot	Not awarded Jan. 13, 1848
04909	Kaeleu	Anahola Kamalupe, Kaloula/Kalouulu, Olelokana	9 lo'i, a cultivated kula adjoining those lo'is, also another cultivated kula in another place, 2 kula for wauke and 3 kula for noni, two house claims, Malupa and Kumakole, 1 orange tree	Award 4909; R.P. 7487; Kalouulu Anahola, Ko`olau Mar. 13, 1850
05105	Kahaiola	Anahola Pikau, Kalama	2 lo'i and a cultivated kula, and a house lot	Award 5105; Pikau Anahola,Ko`olau 1847
05205	Kaholomoana	Anahola Hahalua	Lo'i and its kula, 1 mala of noni, 2 mala of wauke and one house lot	Award 5205; Hahalua Anahola, Koolau Jan. 12, 1848

Land Commission Award Claims
Ahupua`a of Anahola - District of Ko`olau

Claim Number	Claimant	`Ili/Ahupua`a	Kuleana	Designation
05170	Kalawaia	Anahola Ananakini, Hakaea	9 lo'i, 3 mala of noni, 1 mala of wauke and the house site	Award 5170; Ananakiki Anahola, Ko`olau Jan. 11, 1848
04971	Kalehua	Anahola Kanamoa, Kapuakea	4 lo'i, a kula, a house lot, a plantation of wauke and a mala of noni	Award 4971; Kahaina`a Anahola, Ko`olau Jan. 12, 1848
04981	Kalimaeleele, wahine	Anahola	3 lo'i and the noni standing there and the house site	Award 4981; Anahola, Ko`olau Jan. 12, 1848
05142	Kaliuwa`a	Anahola Hooolakauka, Kamoku	2 lo'i, 1 mala of wauke, 1 mala of bitter gourd, 1 mala of noni, 1 mala of tobacco, and the house lot	Award 5142; Anahola, Ko`olau Jan. 11, 1848
05084	Kaniku	Anahola Palikoa, Puapala	5 lo'i, 5 mala of noni, 3 orange trees, 1 place for catching gobey fish. There are some pōulu, also breadfruit trees	Award 5084; R.P. 6760; Puapala Anahola, Ko`olau Jan. 12, 1848
04913	Kanuha	Anahola Olokuiha, Kamokuapi	2 lo'i and a kula and the house lot	Award 4913; R.P. 6325; Kamokuapi Anahola, Ko`olau Jan. 13, 1848
05099	Kauhaialae	Anahola Puuomano, Olelokana	1 lo'i, 2 mala of noni and the house site	Award 5099; R.P. 5541; Olelokana Anahola, Ko`olau Jan. 11, 1848

Land Commission Award Claims
Ahupua`a of Anahola - District of Ko`olau

Claim Number	Claimant	`Ili/Ahupua`a	Kuleana	Designation
05141	Kaukai	Anahola Kuloa, Koapupu	14 lo'i, 2 mala of noni, 1 mala of wauke and the house site	Award 5141; R.P. 7872; Kuloi`i Anahola, Ko`olau Jan. 11, 1848
05078	Kawaaiai	Anahola Kahalepua, Pohakumano	2 lo'i and kula which adjoins them. 2 mala are in another place, and in another place is a mala of noni and wauke, and also a house lot	Award 5078; Anahola, Ko`olau Jan. 11, 1848
03030	Kawaimakanui	Anahola Palawai, Pauko	House lot and also taro land	Award 3030; R.P. 7275; Palawai Anahola, Ko`olau Jan. 12, 1848
05104	Kawaohia (Kawaaohia)	Anahola Olokauha, Kaheewale	3 lo'i, 2 kula of wauke and noni, and the 2 house lots	Award 5104; R.P. 7314; Kaheewale Anahola, Ko`olau Jan. 11, 1848
04987	Keanuhawai`i	Anahola Pauku, Kaupapa, Papaikiapoaka	4 lo'i, 2 mala of noni, and the house lot and a kou tree	Award 4987; R.P. 6291; Anahola, Ko`olau Jan.. 12, 1848
04590	Kekuaiki Ho`opana, his wife	Anahola Hahalina / Kahalina	5 lo'i and a kula planted in tobacco, 4 mala of noni and the house lot	Award 4590; R.P. 7347; Kahalina Anahola, Ko`olau Jan. 12, 1848
05190	Kekuaiki	Anahola	5 lo'i and the kula planted in wauke and the house site	Not awarded Jan. 11 1848
05083	Kiei	Anahola Kanakawale, Hikii	4 mala of noni, 2 mala of wauke, 3 lo'i and the house site	Award 5083; R.P. 7122; Anahola, Ko`olau Jan. 11, 1848

Land Commission Award Claims
Ahupua`a of Anahola - District of Ko`olau

Claim Number	Claimant	`Ili/Ahupua`a	Kuleana	Designation
04984	Kole (Kale)	Anahola Papooulu, Kealuaahokia/Kalalea	2 lo'i, a kula planted in gourd and the house site	Award 4984; R.P. 7597; Kaluaohiki Anahola, Ko`olau Jan. 12, 1848
04935	Koleaka (Kolehaka) Keolawa, brother in law	Anahola Kalahiki, Hikii	2 lo'i, and a cultivated kula and one house lot	Award 4935; Hiki`i Anahola, Ko`olau Jan. 12, 1848
05023	Kolia, D	Anahola Pukoenieni, Kanakahikio, Kuka, Kuaimanui, Kahonaula, Palikoa, Kauakahi	Small area of land named Kiki`i which was given to me by Kaikioewa. Lo'i named Kuemonū, 2 house lots, 2 mala of noni	Award 5023; R.P. 7740; Kauakahi Anahola, Ko`olau Jan. 13, 1848
05089	Kuhaimoana Nahulekoa, wahine	Anahola	2 lo'i, 6 mala of noni, 1 mala of wauke, and the planted trees: 2 kou, 1 orange and 1 breadfruit	Not awarded Jan. 12, 1848
05102	Kuihu	Anahola Puuoniunu, Papahikiloaka	1 lo'i, 1 mala of noni, 2 mala of wauke, and the mala of bitter gourd, and the house lot	Award 5102; R.P. 5927; Anahola, Ko`olau Jan., 11, 1848
04916	Kumukou	Anahola Lanakini, Piwaha	1 lo'i, 1 gulch planted with noni, and 2 mala of wauke and the house lot	Award 4916; R.P. 7318; Lanakini Anahola, Ko`olau Jan. 12, 1848

Land Commission Award Claims
Ahupua`a of Anahola - District of Ko`olau

Claim Number	Claimant	`Ili/Ahupua`a	Kuleana	Designation
04984	Kole (Kale)	Anahola Papooulu, Kealuaahokia/Kalalea	2 lo'i, a kula planted in gourd and the house site	Award 4984; R.P. 7597; Kaluaohiki Anahola, Ko`olau Jan. 12, 1848
05199	Kuoha (Kueha)	Anahola Puamano, Kalua`o`opu	7 lo'i and a kula for planting tobacco adjoining the lo'is, a mala of noni in another place, and the house lot	Award 5199; R.P. 7120; Kalua`o`opu Anahola, Ko`olau Jan. 12, 1848
04980	Kuohu	Anahola Pu`uoio, Olelokana	1 lo'i, 1 mala of noni, 1 mala of wauke and also the house site	Award 4980; R.P. 6018; Olelokana Anahola, Ko`olau Jan. 12, 1848
05112	Kupukupu Mumuku	Anahola	5 lo'i, a place for planting wauke and also a mala of noni, and the house site	Not awarded Jan. 13 1848
04694	Lono	Anahola Puoio, Kumunana	2 lo'i, 2 mala of noni, 1 mala of wauke, 1 male of bitter gourd and the house lot	Award 4694 to Lono 2; R.P. 6449, Anahola, Ko`olau Jan. 11, 1848
04694B	Lonoiki	Anahola Ananakini, Kalua`o`opu; Puoio, Kapuoni	1 loi in `ili Ananakini 1 lo`i in `ili Kalua`o`opu	Award 4694B; Lonoiki Anahola, Ko`olau (No Date)
04693	Luahele	Anahola Palawai, Koananai	2 lo'i, 4 mala of wauke	Award 4693; R.P. 7598; Palawai Anahola, Ko`olau Jan. 12, 1848

Land Commission Award Claims
Ahupua`a of Anahola - District of Ko`olau

Claim Number	Claimant	`Ili/Ahupua`a	Kuleana	Designation
04699	Lupaieie	Anahola	2 lo'i and a kula which adjoins them, also a mala of wauke in another place, also a mala of noni, another mala of noni at Kamalomalo`o, and my house lot in Anahola	Award 4699; R.P. 7275; Anahola, Ko`olau Jan. 13, 1848 4608 not awarded
04722	Mahilauawa	Anahola Palawai	1 lo'i, and some trees, a kou and a noni	Award 4722; R.P. 7511; Palawai Anahola Ko`olau Jan. 13, 1848
04711	Mailou	Anahola Hakaea, Makaikai	6 lo'i, 3 mala of noni, 1 mala of wauke, 2 orange trees, 2 mala of kikope* and the house site	Award 4711; Land Patent 8090 Jan. 11, 1848
04712	Makaino Kikoo	Anahola Hioka / Kioka	7 lo'i, 3 mala of noni, 1 mala of wauke and the house site.	Award 4712; Hioka Jan. 11, 1848
04721	Makakane	Anahola	1 lo'i, and a cultivated kula and the house lot	Not awarded Jan. 13, 1848
04719	Makaole (Makaola)	Anahola Hoopala	12 lo'i and a cultivated kula adjoining the lo'is, and the house lot	Award 4719; R.P. 3887; Ho`opala Jan. 12, 1848

Land Commission Award Claims

Ahupua`a of Anahola - District of Ko`olau

Claim Number	Claimant	`Ili/Ahupua`a	Kuleana	Designation
04731	Makuakāne	Anahola Kanapa`a, Pouka, Pauka, Palawai	I, the Konohiki on the land of Anahola on the island of Kauai, am under Ka`aha. All the benefits of the Pō'alima confirmed by law as belonging to the Konohiki are what I claim	Award 4731; R.P. 6342; Kanapa`a Anahola, Koolau Jan. 11, 1848
04730	Manamana	Anahola Kalaewahiwai, Kamuliwai, Kekau	6 lo'i, 5 mala of wauke, 3 mala of noni, 1 kula weuweu /grass kula/, 4 orange trees, 2 kou trees and two house lots	Award 4730; R.P. 7118; Anahola, Ko`olau Jan. 12 1848
04718	Maumau	Anahola	1 lo'i and a kula for cultivation and a house lot	Award 4718; R.P. 6685; Anahola, Koolau Jan. 12, 1848
04724	Mona (Mana)	Anahola Kamoku, Kamuliwai, Kekau	4 lo'i, 4 kula of noni, one kula of wauke, 2 house lots	Award 4724; R.P. 7119; Kamoku Anahola, Ko`olau Jan. 12, 1848
04760-1	Naelele	Anahola Palawai, Pukalio	1 lo'i and a kula and 2 mala of noni	Award 4760; R.P. 5666 Anahola, Ko`olau Jan. 13, 1848
04780	Naiwi (Naiui)	Anahola Mamania, Kaluanui	5 lo'i, 3 mala of wauke, 6 mala of noni, 3 orange trees, 2 pō'ulu breadfruit trees, and 1 house lot	Award 4780; R.P. 3917; Kaluanui Jan. 12, 1848

Land Commission Award Claims
Ahupua`a of Anahola - District of Ko`olau

Claim Number	Claimant	`Ili/Ahupua`a	Kuleana	Designation
04782	Nakea	Anahola Pauko	2 lo'i and a kula and 3 mala of noni	Award 4782; Pouko Anahola, Ko`olau Jan. 12, 1848
04690	Nalawaia Nalawaianui	Anahola Kealohi	Lo'i, named Ke`alohi, 2 mala of noni, 2 mala of wauke and 2 house lots	Award 4690; R.P. 7596; Kealohi Anahola, Ko`olau Jan. 12, 1848
04777	Nanukuwaiki (Nukuwaiki) Kukaena, his wife	Anahola Kauapa, Kumuahane, Kapunakuoio	4 lo'i, 5 mala of noni, 2 mala of wauke, 1 mala of bitter gourd, and the house lot	Award 4777; R.P. 3957; Kauapa Anahola, Ko`olau Jan. 11, 1848
04765	Naololi Kekuaiki, his brother	Anahola Pukoanini, Kaupake	5 lo'i, 2 mala of noni, 1 mala of wauke and 2 house lots	Award 4765; R.P. 7319; Kaupaka Anahola, Ko`olau Jan. 11, 1848

Land Commission Award Claims
Ahupua`a of Anahola - District of Ko`olau

Claim Number	Claimant	`Ili/Ahupua`a	Kuleana	Designation
04530	Ohao (Oohao)	Anahola Puoio, Kapahupoko, Kawaikapu	1 lo'i 3 mala of noni and 1 mala of wauke, and the house lot	Award 4530; R.P. 6695; Kahapupoko Anahola, Koolau Jan. 12, 1848
04526	Opae	Anahola Keawaawaehu (Keakaawaehu)	20 lo'i, 2 orange trees and a single mala of wauke	Award 4526; Anahola, Ko`olau Jan. 13, 1848
04624	Pa`a Kawaimakanui, his son	Anahola Kukuluaukai, Paea	1 lo'i and a kula planted with noni and wauke, and the house lot	Award 4624; R.P. 8112; Kukuluaukai Anahola Ko`olau Jan. 12, 1843
04627	Paia	Anahola Kapukalio, Kapoko	3 lo'i and the pali wauke, named Pīwaho, and the house lot	Award 4627; R.P. 6651; Kapoko Anahola, Ko`olau Jan. 13, 1848
03411B	Paupau	Anahola Kalaiula, Hope	1 Loi, kula & house lot, kula in "Kalaiula, 2 Lois in "Hope	Award 3411B; R.P. 7317; Hope Anahola, Ko`olau No Date
04621	Pehuiki	Anahola Hoolakaupu, Kapuapala, Kahononahala	three lo'i and the house lot, and three kula planted in wauke	Award 4621; Land Patent 6687; Hoolakaupu Anahola, Ko`olau Jan. 12, 1848
04643	Piawe (Piawa)	Anahola Pukoenieni, Anahola	three lo'i, four mala of wauke, three mala of noni and two house lots	Award 4643; Anahola, Ko`olau Jan. 11, 1848
04649	Pohaku	Anahola	one lo'i and a cultivated kula and the house lot	Not awarded Jan. 12, 1848

Land Commission Award Claims
Ahupua`a of Anahola - District of Ko`olau

Claim Number	Claimant	`Ili/Ahupua`a	Kuleana	Designation
04611	Pokake	Anahola Kapapa, Manaiki	6 lo'i, 1 mala of noni, 1 mala of wauke and the house site	Award 4611; R.P. 6019; Manaiki Anahola, Kaua`i Jan. 11, 1848
04632	Poopoo Lono, his brother	Anahola	3 lo'i, 2 mala of noni, 2 mala of wauke and the house lot	Not awarded Jan. 11, 1848
04651	Poopoo (Paopao)	Anahola	1 lo'i and a cultivated kula and the house lot	Award 4651; Anahola, Ko`olau Jan. 12, 1848
04640	Puaa (Puaahunehune)	Anahola Keakimoma, Keokala/Kiokele, Kamano	2 lo'i, 1 kula for planting noni, 1 kula planted in breadfruit, and the house lot	Award 4640; Kiokele Anahola, Ko`olau Jan. 12, 1848
04652	Puaeae	Anahola	1 lo'i, 1 mala of wauke and the house lot	Not awarded Jan. 12, 1848
04655	Puaokehau wahine Naiwi, her husband	Anahola Kakaea	4 lo'i, a kula planted in wauke, 2 mala of noni and the house lot	Award 4655; Anahola, Ko`olau Jan. 12, 1848
04657	Puaunahi	Anahola Hikii, Paeia	3 lo'i, a kula for planting noni, a kula for planting wauke and the house site	Award 4657; R.P. 7236; Hikii Anahola, Ko`olau Jan. 11, 1848
04656	Puoa	Anahola Kanaua, Kapoko	2 lo'i, 1 large kula and 1 house lot	Award 4656; R.P. 6762; Kanaua Anahola, Ko`olau Jan. 12, 1848
04535	Upai	Anahola	2 lo'i, 1 mala of noni, 1 mala of wauke and the house site	Not awarded Jan. 11, 1848

Land Commission Award Claims
Ahupua`a of Anahola - District of Ko`olau

Claim Number	Claimant	`Ili/Ahupua`a	Kuleana	Designation
04559	Wahie	Anahola Kaihulu, Palikoa	1 lo'i and a cultivated kula	Award 4559; R.P. 7121; Kaihulu Anahola, Ko`olau Jan. 12, 1848
04556	Wailau Nawelau/Welau Kanuha	Anahola	1 lo'i and the kula for planting wauke	Not awarded No Date
04554	Walanaeku (Walanaiku)	Anahola Koolaukai, Koolaukani Kolauhani	7 lo'i, 1 mala of wauke, 2 mala of noni and the house site	Award 4554; Ko`olaukai Anahola, Ko`olau Jan. 11, 1848

The Hawaiian Legacy of Mo`o

Image NK-14 Lae O Kahala is the promontory of rocks jutting out into the ocean. Immediately in front of is Anahola Bay and the prominent mountain of Kalalea.

From a Hawaiian perspective, hō`ailona are signs, portents and manifestations in nature that symbolize purpose and connection to place, relationships and responsibilities. Hō`ailona associated with chiefly births are thunder, lightning, earthquakes and heavy rains. Extreme weather conditions that bring rain are symbols of health and prosperity. Large volumes of rain fill the streams and rivers. It also saturates the ground and fill aquifers that will provide long term supplies of fresh water. The rains also nourish crops and the earth as well.

In post-contact times, these types of hō`ailona and severe weather conditions are seen as inconvenient and burdensome by the general populace, including

many native Hawaiians today. With influential seeds planted by the introduction of western and puritan ideals since the arrival of Captain Cook (1778) and Calvinist missionaries (1820), a great divide between the Native Hawaiian and his environment and culture has continued to grow. The following is taken from an article titled, "*Earth's Weather Changed by Degeneration and Catastrophe*" published by Eden Communications with content adapted from the book, "Weather and the Bible".

> *"A serious flaw in secular environmentalism is that it sees nature as inherently good and normal. The biblical view is that creation and the weather were originally "very good" When God created the world and until the first man sinned. Due to man's sinfulness, the world did not stay "very good." Not long after creation, all of nature was affected by man's fall to sin and God's curse. The pain and sorrow of this present world, along with severe weather, demonstrate an imperfect world. Furthermore, the worldwide flood of Noah's time would clearly have caused radical changes in our environment. Before the flood, the weather was evidently very mild and different from today; it did not even rain (Genesis 2:5-6, 7:11-12). Thankfully, a new world is coming, when God will burn up this universe and create a new heavens and new Earth (II Peter 3:10-13, Isaiah 65:17, Revelation 21). Paradise will be restored. Once again, deadly storms will not be a part of our world."*

This is just one of myriad examples that show how the worldview of indigenous Hawaiians and western perceptions of nature are opposite poles apart. In a short period of only 2 centuries - 234 years since the arrival of Captain Cook and 192 years since the first ali`i converted to Christianity, a very high percentage of the Native Hawaiian population have become disconnected with the rich history, wisdom and traditions of their fore bearers. This has contributed to the loss of traditional cultural knowledge and the values of not only stewardship, but kinship with the land and environments of Hawai`i Nei.

Ka Mo`olelo O Keaomele
The Story of Keaomelemele

This once-famous story of Keaomelemele was told by Moses Manu in 1884. His version was printed in the newspaper *Ka Nupepa Kuʻokoʻa*, and ran 31 consecutive weeks. The mo`olelo of Keaomelemele tells of the origins of the *moʻo* as a class of spiritual beings in the islands. It also provides insight to the earliest sources of Hawaiian cultural practices and beliefs. Presented here, through this particular story are the traditions of hānai and mo`o.

In this story, there are five children who are born to the gods. The eldest is Kahānaiakeakua *(The one nurtured by the gods)*, who is raised by Keānuenue *(the rainbow goddess)* at Waolani. And then Paliuli *(The dark verdant cliffs)*, who is raised by

Waka in the forests of `Ola`a on Hawai'i Island. Although Keaomelemele *(The golden cloud)* is the third child born, she is the heroine of the story. She is raised by Mo`oinanea, the highly revered mo`o or lizard goddess in a house made of clouds in the heavens. The other two siblings are Kaumaili`ulā *(Twilight resting in the sky)* who too is hānai by Mo`oinanea; and the youngest, Kaulanaikapōki`i *(Beautiful daughter of the sunset)* who is raised by the god Kū and goddess Hi`ilei in the mythical island of Kū`aihelani.

All five of them are taken from their birth parents and placed with their `aumākua or spirit/god parents who hānai and raise them as their own. They are reared to understand all that there is to know about the land and sacred resources that bring life and health to the people and all living forms.

mo'o

1. n. Lizard, reptile of any kind, dragon, serpent; water spirit.

2. n. Succession, series, especially a genealogical line, lineage.

3. n.Story, tradition, legend (less common than mo'olelo).

4. n. Narrow strip of land, smaller than an 'ili. Also mo'o 'āina.

5. n. Small fragment, as of tapa, not attached to a large piece.

6. n. Narrow path, track; raised surface extending lengthwise between irrigation streamlets.

7. n. Ridge, as of a mountain.

8. n. Young, as of pigs, dogs; grandchild. Ku'u mo'o lei, my beloved grandchild.

9. vs. Brindled, as a dog, favored for sacrifice to the mo'o spirits.

Each of them are groomed to become kāhuna or priestly experts in the cultural and spiritual practices of Hawai`i. In time, they are given respective roles and responsibilities and they are imparted special mana and divine ranks as well. Kaulanaikapōki`i was given the domain of speech and healing and also becomes a master of the hula arts. She is given the ability to call upon the magic trees known as Makalei and Maku`ukao who bring and prepare fish and food to feed the masses of people. Kahānaiakeakua learns the responsibilities of the priesthood and becomes a

master of navigation and the fishing arts. He is the first to show the Hawaiian people this knowledge, along with the arts of omen reading and astronomy, architecture and oratory. Keaomelemele possesses the sacred nature of a deity and the power of extrasensory perception. Along with Kaumaili`ulā, she is given power over all the lands and the people. Paliulli remains with her guardian Waka.

Upon completion of their training and rites of passage, they are given the kuleana or responsibility as akua and `aumākua (Hawaiian deities). They are now obligated to oversee, guide and inspire nourishment for the land, ocean, creatures and people.

Mo`oinanea:
The Nurturing of Mo`o

The goddess, Mo`oinanea appears in many mo`olelo, chants and oral traditions. Mo'oinanea is said to have first arrived on O'ahu from Ku`aihelani and Kealohilani, the lands in the clouds. She settles at Kūkaniloko, a celebrated place well known as one of two of Hawai`i's most sacred birthplaces of ancient chiefs. (The other being Wailuanuiaho`ano here on Kaua`i) With her, she brings the mo`o and the expertise and traditions of the mo`o. A procession of *mo'o* starts out in Waialua, and they march into Waolani. By the time the first ones reach Nu'uanu valley, the end of the procession is still at Waialua.

Kua mo`o, the spine or backbone of supernatural lizards (mo`o) are seen in the natural landscape and succession of peaks and ridges of mountain ranges.

Within the story, other of origins of traditions are mentioned:

Keānuenue is the sister who's going to raise Kahānaiakeakua. But she has borne no children. So when this baby is brought to her and needs to be breast-fed, she has no milk to offer. So she goes to the brothers, Kāne and Kanaloa, and says, *"I need milk for the baby."* And they tell her, take these herbs, and some of them you rub on the breast, some of them you eat, and put this together, and you tweak the nipple of the breast and it will start to produce *waiu*, mother's milk. This is one of the *lā'au lapa'au* (Hawaiian medicine) traditions.

Ho'okau i ka waiū, is a ceremony that is performed to make the breasts fill with milk. Ho'olele i ka waiū is a ceremony that is performed to make the breast cease flowing.

The following is a prayer chant that was offered in the ceremony called, *"Ho`olele I Ka Waiū"*. Directed to the gods Lono, Kāne and Nuakea who is said to be a part of the goddess Haumea who oversees all female functions and responsibilities. Also known as Keakea or Keakealani, Nuakea became the patron of nursing mothers and is prayed to when an increase or decrease in the flow of milk is desired. The prayer chant was offered when a nursing mother is ready to wean the child. It was also offered when a male child was about 4 to 6 years old, as he prepared to transition from the women's house to the hale mua or the men's house. This was for the ritual of separation. At that time it was asked that the child be given prosperity and to guard against the malice of sorcery

.
E Lono, e Kāne, e Nuakea, ka wahine iaia ka poli waiu o ke keiki
Eia ka ukuhi nei o (name)
E lawe aku `oe i ka waiu o ka makuahine.
Ia `oe e ka lā, ke mahina, ka hōkū;
E lawe `oe a kukulu o Kahiki!
Ha`alele aku i ka omino, ka `uwe wale o (name)
A e hānai `oe i ka `ia kapu a Kāne,
`Oia ka hili, ka noho mālie,
Ke ola ia `oe e Kāne!
Amama. Ua noa.

Translation:
O Lono, O Kāne, O Nuakea the woman with breast of mik for the child
We are about to wean (name).
Staunch the flow of milk in his mother.
Yours are the sun, the moon, the stars;
Carry away to the pillars of Kahiki
And there leave the emaciation, peevishness and wailing of the child.
Feed him with the sacred fish of Kāne.
That is the repose and quiet,
This is your blessing, O Kāne!
Amama. The pray is ended and is set free.

In Moses Manu's articles that appear in the Hawaiian language newspaper, *Ka Nupepa Ku`oko`a* in 1884, the Hawaiian historian/writer of Keaomelemele goes into an explanation that this is how different traditions, art forms and practices began and was handed down from that time.

In his writings, he says:

> "*Compare this, to the foreign nations, who of course take milk from other animals, rather than produce their own. So they take the milk of the cow, or the milk of the goat, to feed the children, whereas the Hawaiians were very innovative."*

The kinolau or one of the plant body forms of the god, Lono is the `uala - the sweet potato. Nutritious young `uala or sweet potato leaves were fed to invalids and pregnant women to invigorate them. A broken sweet potato vine could be worn as a lei to induce the flow of milk in a nursing mother. This practice of herbal healing known as, lā`au lapa`au hints to Lono's role in the aforementioned chant as a means to aid and stimulate a source of breast milk through his plant forms.

There are many other native Hawaiian plants that are kinolau forms associated with pregnancy and child bearing traditions. Strips of wauke (paper mulberry) - a Kāne kinolau were also worn around the neck to induce the flow of breast milk. The hau tree sap, along with the base of its blossoms without its petals were mo`o kinolau that were important treatments for the pregnant woman preparing to go into labor. The slimy sap of the hau is said to reduce complications during delivery and child birth.

There are many stories and places that are directly connected to mo`o presence. Mo`o are both male and female...some are generous and compassionate and caring; some are malevolent. In most cases, mo`o are revered as guardians and protectors of land and water sources that provide subsistence for the people. Different mo'o took up residence in different places, mostly watery spaces and land areas that are host to major and minor water sources.

What are the *mo‘o*, exactly?

> *“There are mo‘o that are simply lizards -- the mo‘o of the house, that’s a little wall lizard. And the term is used for lizards, but it doesn’t tell you that these were necessarily lizard formed. It’s hard to say that mo‘o are crocodilians or some kind of serpentine creatures. They are entities that are associated with the wet places; they have to reside in the wet. Whether they take the form of a lizard -- because there are mo‘o that are simply lizards, like the mo‘o of the house: that's a little wall lizard. And the term in general is used for lizards. But this doesn't tell you that these mo‘o were necessarily lizard formed. There just isn’t a reliable sense of what they look like. We have two accounts, two stories of people who saw mo‘o, and dealt with them, and it looked like people to them. Both of the accounts use the same description, in which the whole structure of the face is fluid and keeps moving, so that there’s no way to grasp features. But not that they were shaped or formed like a lizard. "* *-- Puakea Nogelmeir, Editor of Keaomelemele*

The story of Keaomelemele implies that all of the *mo'o* were in effect the descendants of Mo`oinanea. She is reputed to be the grand dame of her descendents, her offspring and all aspects of mo`o-responsibilities that are associated with her. The story identifies some of these *mo'o* individually and where they lived.

Is Anahola's Kalalea Mountain a Mo`o?

Image NK-14 Kalalea Mountain from Lae O Kahala

In the mo`olelo of Keaomelemele, there are 12 noted mo`o who inhabit Kaua`i as large hills and mountains. The mo`o ali`i or royal chief of all of Kaua`i's mo`o was named Keolewa (also appears as Keaolewa). This mo`o resides at the summit of mount Ha`upu where it lives amongst the clouds. It is said that from Hāupu, Keolewa had a full view of all of Kaua`i. The famous freshwater spring and pool named Kemamo belonged to her as well.

The following is an excerpt from the mo`olelo of Keaomelemele:

> Eia nā mo`o ma Kaua`i, O Keaolewa ka mo`o ali`i o Kaua`i, aia kona wahi noho ma luna pono o ka pu`u o Ha`upu i ke ao, ma laila `oia i noho ai e nānā i nā wahi a pau; a no kēia mo`o ho`i ka wai kaulana o Kemamo.
>
> O Pu`umo`o ma uka o Lihu`e, o Kawelowai ma uka o Wailua, o Kalalea ma Anahola, o Kikiula ma Hanalei, nona ka muliwai o Wai`oli, o Kilioe a me Ke`e ma Ha`ena. No laila, e ho`omana`o ka mea e heluhelu ana i ka mo`olelo o Hi`iakaikapoliopele, o keia ka mo`o nana i lawe o Lohiau e huna i luna o ka pu`u o Makana, no laila, ma ka ho`omaopopo ana i keia mo`olelo, ua mua loa aku ka noho ana mai o keia po`e mo`o a me Kamo`oinanea ma keia pae aina, a he hope mai na mo`olelo e ae a pau i ho`olilo ia e na kanaka i mau

> mo`olelo kaao. O Kili`oe me Ke`e a me Miloli`i na mo`o no lakou na pali o Kalalau a hiki i Polihale, o Kawaili`ula ka mea nona o Mana a me Kekaha, a o Makaweli ka mo`o ma Waimea nona ka Waiulailiahi ma laila.
>
> O Papai ka mo`o ma Hanapepe, he mo`o noho kula pili keia, a ua olelo ia ma keia mo`olelo, o keia mo`o ka mea nana i huna kekahi wai ma ke kula ma kahi i kappa ia ma ka inoa o keia mo`o a hiki i keia wa, oia ho`i o Pu`uopapai; a mai Wahiawa a hiki i Koloa, o Po`ipu ko laila mo`o, puni o Kaua`i aia no kona kowai nui ke waiho la ma laila a hiki i keia la, aia wale no lakou a pau ma lalo aku o ka mo`o ia ia o Ha`upu ka pu`u Ki`eki`e; o Lehuakona ko Ni`ihau mo`o nona ka wai a ka pao`o ma Lehua. O ko Maui mo`o ali`i, oia ho`i o Kihawahine, o keia ka mo`o i like pu aku me Kamo`oinanea ka mana, a o keia ka mo`o i oi aku ka nui o nakahu nana oia i malama a me ka nui o ka po`e nana i ho`omana aki ia ia i akua; ua ho`omana na ali`i a me na maka`ainana ia ia a puni o Maui a me Moloka`i a me Lana`i i ka wa kahiko, a no keia mo`o ka lua ma ka loko o Mokuhinia ma Lahaina. E nana i ka mo`olelo o Kihapi`ilani, a malalo aku o keia mo`o o Kalamainu`u a me Klioeikapua, he mau mo`o ino laua. Ua olelo ia ma keia mo`olelo, ua ka`apuni o Kihawahine ia Maui a puni, a pela no ma Hawai`i, O`ahu a me Kaua`i; a ma ia hele ana ona, ua nui wale ka po`e nana i ho`omana aku ia ia mai Hawai`i a Ni`ihau, a oia ka mo`o ho`okahi nana i poai puni keia mau pae moku, a penei ka mo`olelo e pili ana in a kanaka no keia mo`o no Kihawahine.
>
> Keoilii aku nei o Keaomelemele me kona mau hiohiona nani, a o ka nohea ho`i nana e ho`oni na pu`uwai o na tausani hoa kaunu o keia nanea, a kono ae i ka mana`o e hele kino e ike in a wahi a na mo`o a ua kupueu la i luakaha ai.

The mountain of Kalalea in Anahola is one of the named mo`o in the story that falls under the leadership of Keolewa. Kalalea oversees all of the fresh water sources of Anahola and the moku or district of Ko`olau. Other water sources located throughout the neighboring ahupua`a of Kamalomalo`o and Keālia are also part of Kalalea's domain. While there are other mo`o guardians who take up residence in fresh water pools, fish ponds and smaller streams, they too are part of the hierarchy that is accountable to the authority of Kalalea as well.

Here is the translation:

> These were the lizards of Kauai, Keoloewa, a royal lizard whose home was on the summit of Haupu, among the clouds, where it remained and could see in every direction. To this lizard belonged the famous pool of Kemamo.
>
> Pu`umo`o lived above Lihu`e, Kawelowai, above Wailua; Kalalea at Anahola; Kikiula at Hanalei, and to it belonged the Waioli river; Kili`oe and Ke`e lived at Ha`ena. Let the reader recall the story of Hi`iakaikapoliopele. Kili`oe was the lizard that took the body of

> Lohiau and hid it on Makana. In considering this tale, these lizards lived on these islands with Mo`oinanea long before the other characters of the legends told by the people. Kili`oe, Ke`e and Miloli`i were the lizards of the cliffs of Kalalau and on to Polihale. Kawaili`ula was the lizard that owned Mana and Kekaha, and Makaweli was the lizard of Waimea and it was the owner of the reddish water that flowed there.
>
> Papai was the lizard at Hanapepe, a lizard that lived on the plain where the pili grass grew. It was said in this legend that this was the lizard that hid a spring on the plain that bears its name to this day, that is, Pu`uopapai. From Wahiawa to Koloa the lizard was Po`ipu. Its large pool still lies there to this day. These take in all of Kaua`i. All of them served under the lizard of the tall hill, Ha`upu. Lehuakona was the lizard at Ni`ihau and it owned the "pool of the pao`o fish" on Lehua. Maui's royal lizard was Kihawahine and it had mana like Mo`oinanea. This was the lizard that had the greatest number of caretakers and many worshippers to deify it. Chiefs and commoners worshipped it all over Maui, Moloka`i and Lana`i in ancient times and to it belonged the pit in the pond of Mokuhinia in Lahaina. Look at the story of Kihaapi`ilani. Under this lizard were Kalamainu`u and Kilioeikapua, both were bad lizards. It was said in this legend that Kihawahine made a circuit of Maui and also of Hawai`i, O`ahu and Kaua`i. In this journey there were many worshippers from Hawai`i to Ni`ihau. It was the only lizard that went around the islands of the group and this is the tale concerning the people of this lizard, Kihawahine.

The mo`o that are mentioned in Keaomelemele are forested regions that contribute greatly to maintaining Kaua`i's major watersheds on Kaua`i.

The word and idea of mo`o has to do with continuity and succession. One of the primary reasons behind the ancient Hawaiian tradition of hānai for the hiapo or first-born was to ensure the transference of ancestral knowledge and wisdom from the elder kūpuna to the mo`opuna or grandchild.

The word, puna meaning "*freshwater spring*" appears in both Hawaiian words for grandparent or elder (kūpuna) and grandchild (mo`opuna). Kū means to stop or halt. Mo`o means to continue, succession or series. Especially so in a genealogical line; lineage. The fundamental source of a puna (freshwater spring) is to give, nourish and produce life.

Hence, the kūpuna is one who has had his/her children; and in turn, their offspring have reproduced offspring of their own. The kūpuna is one whose reproductive spring (puna) has stopped flowing (kū).

The mo`opuna or grandchild is the succeeding spring, who too will grow and mature to produce offspring of their own. This repetition of life cycle from one generation to the next is essential to the continuation of family genealogies and connection to birth lands of Hawai`i.

Variations of Mo`o:

The following is a list of "Mo`o" words that illustrate the purpose of preservation, perpetuation and continuity of traditions.

Mo`o	Lizard, reptile of any kind, dragon, serpent; water spirit. Succession, series, especially genealogical line, lineage.
Mo`o `Ōlelo	Story, tale, myth, history, tradition, literature, legend, journal, chronicle, record.
Mo`okū`auhau	Genealogy
Mo`omeheu	Culture; cultural
Mo`o Ali`i	Succession of Chiefs
Mo`opuna	Grandchild; great-niece or -nephew; relatives two generations later, whether blood or adopted; descendant; posterity.
Mo`o Lono	Priests of the lineage of Lono, devoted to the worship of Lono.
Mo`omo`o	Ridges (plural of mo‘o). Rare. Also, young as of animals
Kuamo`o	Backbone, spine; road, trail, path

Image NK-16 Kuamo`oloaakāne - The long successive spine to the god Kāne. Mount Wai`ale`ale as seen from Wailuanuiaho`ano, Kaua`i

Aia i ke kuahiwi
I ke kualono
I ke `awawa
I ke kahawai
Aia i laila ka wai a Kāne!

NK-17 Sculpture depicting the foot of a mo`o upon the landscape, creating ridges and valleys of a mountain

There in the uplands
Along the ridges
And in the valleys
In the rivers and streams
There is the water of Kāne!

Lines from the ancient chant, "He Mele No Kāne" which articulates the cycle and flow of fresh water resources in the Hawaiian universe. Above left, an artist rendering of a mo`o's foot resembling the ridges, gulches, and valleys of the uplands. Mo`o are symbols of protection, regeneration and succession of lineages for humans as well as that in the environment. They are also spiritual icons associated with forested regions and fresh water resources.

Early Lesson in Acquiring Land Wisdom

Transference of knowledge and skills in Hawaiian customs, beliefs and skills begin at a very young age. In the traditional Hawaiian family system, this on-going process is passed on from kūpuna (grandparents) to mo`opuna (grandchild/children). In the extended family as well as within the community, this exchange and transmission was shared from loea and kumu (masters and teachers) to haumāna who are disciples, students and apprentices.

Kūpuna, loea, `ōlohe, kāhuna and kumu are traditional titles and stations that were, and are still held by accomplished elders, masters and teachers. They are the repositories of extensive knowledge, experience and skills, having endured many years of formal training in various practices and specialized areas of discipline. A customary belief shared by most masters and teachers is that the primary source for all Hawaiian knowledge are inspired and held by our ancient kūpuna. Maintaining a relationship with ancestors through the practices of mo`okū`auhau, pule and ceremony are essential to receiving continued guidance and inspiration by ancestral sources. Equally important is the commitment to responsibly care for, and perpetuate Hawaiian ancestral knowledge by sharing and teaching others.

E lawe i ke a`o a mālama a e `oi mau ka na`auao.
He who takes his teachings and applies them increases his knowledge.
`Ōlelo No`eau #328

NK Principal Kēhaulani Kekua shares of her upbringing under the care of her maternal grandparents in Anahola, Kaua`i in the 1960s.

> *I was very fortunate to have been hānai to my paternal grandparents - Helen Kaipuwai Kekua and Miki Waiau at birth. My grandmother was a kumu hula and my grandfather was a musician descended from a family of chant and music composers. My grandmother taught me at a very young age that every significant waterfall, fresh water pool, stream and river had a resident mo`o that guarded and protected it. During instances of heavy rainfall, the mountain regions - especially water places were avoided. If the surface of a freshwater pond or area of the river was covered with hu`a wai or frothy foam and yellowing leaves of the hau, it was an indication that the mo`o of that place was present and in residence. Kumu in my adult years confirmed these same beliefs.*
>
> *Traditional teachings of my kūpuna conveyed that the water source was to be left undisturbed out of respect for the mo`o and his/her home. It is no different from having consideration for any other person's home or place. Whether it was venturing into the*

forest, mountain or stream-side areas to gather `opae (shrimp), pick palapalai ferns for the making of lei and adornments, or even to hook `o`opu after a big rain or flood, there was a required set of protocols that we always participated in. It was important to observe and heed to weather conditions, cloud formations and rain patterns before determining whether or not it was appropriate to go. This has stayed with me my entire life and I insist that my haumāna (students) adapt these practices as part of their lifestyle. After all, it is a good thing to be respectful and to behave considerately no matter where it is that you go.

Basic Protocols for Visiting Sacred Sites

1. Pule/Oli Komo to ask permission to enter the place;

2. Refrain from loud chatter, yelling or talking. The quieter, the better;

3. In advance, prepare an appropriate ho`okupu or gift-offering as an expression of humility and respect;

4. Take only what is needed; gather responsibly and respectfully;

5. Pule/Oli Mahalo to express gratitude and appreciation;

6. Leave in a quiet, respectful manner.

Origins of Change & Cultural Impacts

Captain Cook's "discovery" of the Hawaiian Islands in 1778 marked the beginning of catastrophic changes to the physical, spiritual and cultural landscape of Hawai`i. Native Hawaiians first came in to contact with foreign diseases brought by Cook's crew, and then by other ships of explorers and tradesmen that followed in his wake. Introduced species of animals brought by the expeditions of Cook and Vancouver in the 1700s included sheep, cattle and goats that quickly began to have negative effects on native species of plants, birds, and habitats. Converse to accounts that describe these were "gifts" to the ali`i, they were purposely imported by captains for future food sources for their expedition crews. Along with new efforts to cultivate potatoes, the animals were specifically introduced to replace the fish and poi options that were foreigners were adverse to.

When King Kamehameha the Great unified all of the Hawaiian Islands into one kingdom under his rule in 1810, he kept the traditional land and kapu systems in place. However, 32 years had already passed since Captain Cook introduced Hawai`i to the Western World. From this, a market economy rapidly emerged attracting explorers, merchants, fur and sandalwood traders as well as whalers to Hawai`i. With this influx of newcomers to Hawai`i, the fabric of Hawai`i's ancient society quickly began to unravel. Different perspectives, beliefs and values began to mount in conflict with laws that had governed native Hawaiians for centuries. A gigantic shift prompted by a new emerging capital economy and the pressures of purchase power of goods and supplies removed the maka`āinana from the balance of a communal, sustainable lifestyle and into laborious conditions.

Although the sandalwood trade had found its way into the Hawaiian Islands around 1790, it wasn't until 1814 that the industry escalated. With Kamehameha I still in control of the sandalwood, he placed a kapu on young trees to allow for regeneration of forest supplies. He was adamant that no transaction was ever done on credit.

Year of Critical Change

1819 was a year of critical change. Upon Kamehameha the Great's passing, his eldest son, Alexander Liholiho ascended to the throne as ali`i nui at the age of 22. However, he was no match for the political power and experience of Kamehameha I's favorite wife, Ka`ahumanu who insisted that she rule alongside him as Kuhina Nui or Queen Regent. Liholiho became the figurehead of the

Hawaiian Kingdom, but it was Ka`ahumanu who took hold of the administrative power.

The vice to usurp power and capitalize from the resources of the land and people, was fueled by greedy foreigners and the ruling chiefs alike. With the social order falling into disarray, Kamehameha II succumbed to the pressures of Ka`ahumanu and Keōpuolani to declare an end to the kapu system. Contrary to claims that the Hawaiians had grown increasingly dissatisfied with the ancient system, this was purely a political move that went beyond spiritual consciousness and integrity.

Foreigners introduced Hawaiians to the concept of "easy credit" by using the persuasion of liquor, military uniforms, silks, guns, leather and silver mirrors that were purchased against future sandalwood income. The Hawaiian economy became overextended and Kamehameha II and the chiefs fell deeply into debt.

Image BM-8 Sandalwood Trade Hawai`i. Bishop Museum Archives

The sandalwood trade exacted a heavy price in human life and health and in ecological damage. In 1823 the Reverend William Ellis described the transport of sandalwood from the adjacent mountains to the beach at Kawaihae by "between two and three thousand men, carrying each from one to six pieces of sandalwood, according to their size and weight. It was generally tied on their backs by bands made of ti leaves."

As the sandalwood forests began to disappear, the north-central Pacific whaling industry arrived to make its base in Hawai`i. The first whaling ship visited the Hawaiian Islands in 1820, marking the beginning of a 50-year presence in

Hawai`i's economy. Within a span of 30 years, the whaling industry expanded with more than 500 whaling ships visiting Hawai`i annually. By 1870, the petroleum industry had overcome the need for whale oil and the number of ships visiting Hawai`i began to spiral down.

Funded by the American Board of Commissioners for Foreign Missions, the first missionaries arrived in the Hawaiian Islands on March 30, 1820 upon the *Thaddeus*. Much had already taken place while they were en route to Hawai`i; including the death of Kamehameha I, and the abolishment of the ancient kapu system by his son and successor - Kamehameha II, Liholiho. Theoretically, there was no alternate belief system in place. However, not all Native Hawaiians entirely relinquished their beliefs or cultural practices.
Winning over the support of the ali`i, the missionaries set out to convert native Hawaiians to Christianity. With the advent of a written form of the Hawaiian language, the missionaries set out to fill the religious void throughout Hawai`i. Over the next two decades as attendance to their churches escalated, they became involved with developments in education and instructed the ali`i in the economy of western politics.

By 1826, American Traders were complaining about outstanding debts owed to them by the king and chiefs and a general tax was imposed upon the people. Ultimately, greed exhausted the forest mountains of sandalwood and the maka`āināna were driven into poverty. The grueling labor of pillaging the mountains of sandalwood led to the degradation and compromise of traditional values and beliefs of the Hawaiian people.

Rising Tides of Political Change

The Hawaiian Kingdom continued to be governed as a sovereign nation until 1838 without legal enactments. It was based upon a system of common law, which consisted partly of the ancient kapu system and the practices of celebrated chiefs that had been passed down by tradition. Advised by foreigners and recognizing Western forms as a useful model, Kamehameha III established the Hawaiian Bill of Rights, also known as the 1839 Constitution of Hawai`i. This was the first crucial departure from the ancient ways - an attempt by Kamehameha III and his chiefs to guarantee that the Hawaiian people wouldn't lose their tenured land.

Kuleana Act-August 6, 1850

One of the notable provisions of the Great Mahele was the Kuleana Act (1850).

Under this provision, maka`āināná - common people were allowed to petition for title to kuleana lands that they cultivated and lived on. With no concept of land ownership, Native Hawaiians did not understand the process, nor the need to make a claim for land that they already had been given tenure to live and work on.

The only means of learning about the new Kuleana Act solely depended on word-of-mouth communication, or through printed announcements that required the ability to read and write. There was a fee for a required pre-claim land survey as well. Native Hawaiian claimants petitioning for their kuleana lands were also required to appear with two witnesses to back their claims. In many cases, commoners confused or uninformed of the requirements of this new law, were displaced from their lands.

In the following years, judicial and executive branches of government would be formed along with a system of land ownership under the Great Mahele of 1848.

Despite its own political and structural growth, Hawai`i remained in a vulnerable position internationally. The Islands' economy, meanwhile, totally moved toward capitalism under the influence of foreign trade.

E kipi ana lākou nei. ʻAʻole naʻe o lākou ponoʻī akā lākou mau keiki me nā moʻopuna. O ke aliʻi e ola ana ia wā e ku ʻōlohelohe ana ia, a o ke aupuni e kūkulu ʻia aku ana, oia ke aupuni paʻa o Hawaiʻi nei.

These people [the missionaries] are going to rebel; not they themselves, but their children and grandchildren. The ruler at that time will be stripped of power, and the government established then will be the permanent government of Hawai'i.

Prophesied by David Malo

A New Industry in Sugar Arrives in Hawai`i

In 1835, three New Englanders - William Ladd, Peter a. Brinsmade and William Northey Hooper, signed a lease with Kamehameha III for 980 acres of land to start the first large-scale commercial sugar plantation in Kōloa on Kaua`i. This endeavor would open the floodgates to another chapter of change and impacts upon Hawai`i and its people.

Contrary to what is viewed as Hawai`i's most historical, influential and successful industry of all time the development of the sugar in Hawai`i was largely responsible for the demise of Hawai`i's sovereign independence and the overthrow of Hawai`i's Kingdom. With this came foreign power and control of Hawai`i's land, water, and natural resources.

Having access and control of lands in 1887, the struggle for control of Hawaii was at its height as David Kalākaua was elected to the Hawaiian throne. King Kalākaua signed a reciprocity treaty with the United States making it possible for sugar to be sold to the U.S. market tax-free, but the foreign American businessmen were still distrustful of him. They criticized his ties to men they believed to be corrupt, for his revival of Hawaiian sciences and traditions, and encouragement of hula and oral traditions. Kalākaua's creation and funding of a board of genealogy, and the revival of the Hale Naua that promoted the esoteric, spritual and symbolic significance and connection to Hawaiian genealogy, history and law was met disapprovingly as well. They were also greatly opposed to Kalākaua's building of the royal `Iolani Palace. However, it was the King's advocacy for native Hawaiian rights that posed the

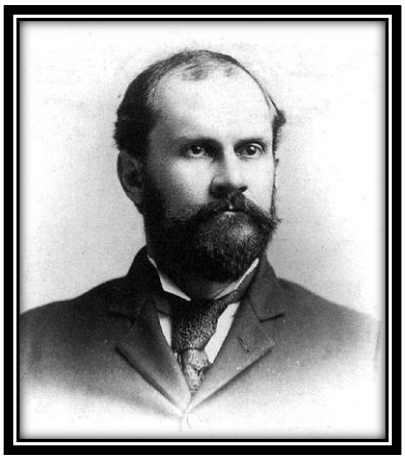


Image HA-1 Lorrin Thurston, leader and key conspirator to the overthrow of the Hawaiian Kingdom

Image HA-2 Asa & Lucy Thurston, Pioneer Missionaries to Hawai`i and grandparents to Lorrin Thurston (left)

greatest threat for foreign and American businessmen. Many of his ministerial appointments went to native Hawaiians which reflected the king's consistent loyalty to his core constituency.

The opposition was led by Lorrin Thurston, a grandson of missionaries who played a prominent role in the overthrow of the Hawaiian monarchy. He formed the

semi-secret Hawaiian League made up of a group of planters and businessmen who were anxious to control the kingdom of Hawai`i - both economically and politically. Accompanied by members of the Hawaiian League, Thurston coerced a new cabinet on King Kalākaua and used the threat of violence to press the King into accepting a new constitution that he had written, eliminating the King of his executive powers.

The 1887 Constitution of the Kingdom of Hawai'i became known as the Bayonet Constitution for the use of intimidation by the armed militia which forced King Kalākaua to sign it or be deposed. The document created a constitutional monarchy like that of the United Kingdom, stripping the King of most of his personal authority, empowering the legislature and cabinet of the government. By 1890, the industry was tightly controlled by former missionary families and foreigners who owned 75% of all privately held lands in Hawai`i. Known as, "The Big Five" these included Alexander & Baldwin, C. Brewer & Co., Castle & Cooke, Theo H. Davies & Co., and American Factors which later became known as Amfac. Additionally, they eventually gained a monopoly over other economic aspects in Hawai`i manipulating banking, shipping, importing and exporting of goods, and warehouse commerce activities. Having corporate control over commodity distribution burdened Hawaiians and Hawai`i's wage-earning labor forces with high prices and a diminished quality of life. In order to survive Kānaka `Ōiwi had to become "contract laborers and serve people like slaves" (Kamakau 1992:403). They were anxious to obtain cheap labor to transform thousands of acres of land into sugarcane fields to secure their profits. This resulted in a Hawaiian population left in impoverished living conditions and eventually, loss of their native lands.

Rise of Sugar, Overthrow of Hawaiian Monarchy

Within decades, title to thousands of acres had fallen into the control of non-Hawaiians. Even Crown Lands that had been owned by the King and his successors, were used to pay for delinquent debts that had been exchanged for foreign goods and supplies.

With close ties as missionaries to the Hawaiian monarchy along with capital investments, cheap labor and land, and increased global trade enabled them to prosper. In 1893, it was the businessmen of missionary families who were directly linked to the overthrow of the Kingdom of Hawai`i. Queen Lili`uokalani was forced into imprisonment and the monarchy illegally overthrown. The new, self-proclaimed provisional government confiscated the remaining Crown Lands.

In 1898 they were instrumental in lobbying for the annexation of Hawai`i by the United States to become the Territory of Hawai`i.
In a short span of only 83 years from Kamehameha I's unification of the Hawaiian Islands in 1810 to the illegal overthrow of the Hawaiian monarchy in 1893, Hawai`i would go through a series of catastrophic changes. The commerce developments of sandalwood, whaling and subsequent industries that followed yielded a heavy price on human life and health, as well.

PUBLIC LANDS NOTICE.

On Monday, November 21st, at 12 o'clock noon will be sold at public auction at front entrance of Judiciary building, Honolulu:

44½ acres of land at Kamalomaloo, Kauai, Broken Gulch Land, about 3½ miles mauka of Government road.

Upset price, $500.

Terms, Cash, U. S. Gold.

For full particulars, plan, etc., apply at Public Lands Office, Honolulu.

J. F. BROWN,
Agent of Public Lands.

Oct. 18 1898. 2013

Public Lands Notice announcing auction sale of 44.5 acres of land at Kamalomalo`o, Kaua`i. Printed in Hawaiian Gazette Newspaper - November 4, 1898, just 5 months following the annexation of Hawai`i as a Territory of the United States. At the time of the Māhele, records of February 14, 1848 show that the lands of Kamalomalo`o were claimed by Kana`ina for (King) William Charles Lunalilo. They would later be referred to as, "Government Lands" which were sold off at the discretion of the self-proclaimed Provisional Government of Hawai`i.

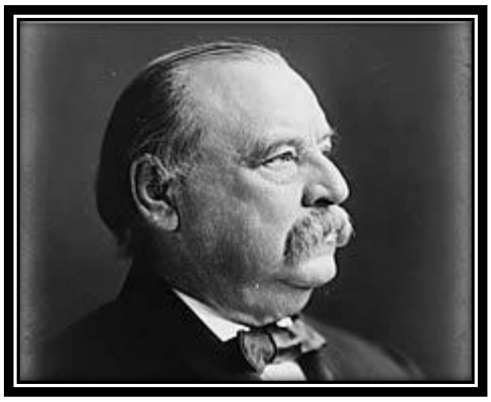
The Significance of Hawaiian History

In the pages to follow, a detailed timeline of political events resulting in the overthrow of the monarchy and the purported annexation to the United States have been included as vital links to understanding the impacts of land issues and lost of cultural identity in Hawai`i.

Queen Lili`uokalani was Hawai`i's last reigning monarch.

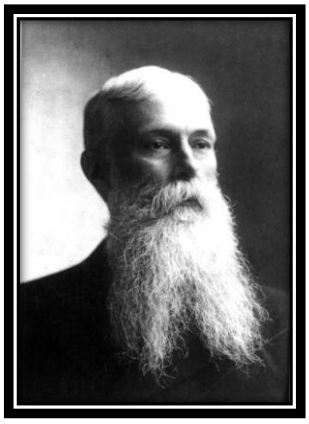
When King Kalakaua died in 1891, his sister Lili'uokalani succeeded him, and members of the native population persuaded the new queen to draft a new constitution in an attempt to restore native rights and powers.
The move was countered by the Committee on Annexation, a small group of white businessmen and politicians who felt that annexation by the United States, the major importer of Hawaiian agricultural products, would be beneficial for the economy of

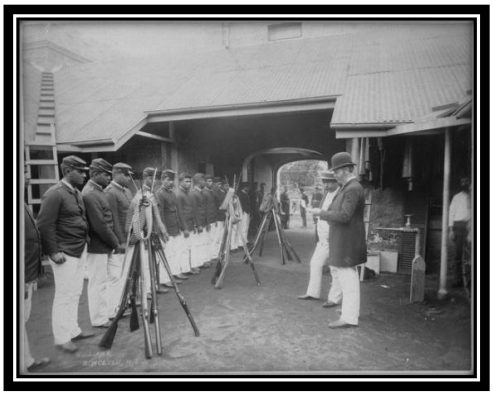
Image HA-3 Queen Lili`uokalani ascended to the throne upon the passing of her brother, King David Kalākaua in 1891. Her reign ended with the illegal overthrow of the Kingdom of Hawai`i by the self-imposed Provisional Government, made up of American businessmen in 1893.



(Above L) President Grover Cleveland appointed James Blount as a special investigator to closely look into the events in the Hawaiian Islands. The investigation found that Minister Stevens had acted improperly and Cleveland ordered the American Flag be lowered from all Hawaiian Government Buildings. He also ordered that Queen Lii`uokalani be restored to power. Figure ___ (Above R) Navy Marines assemble near Honolulu Harbor to support **coup d'état** on January 17, 1893. Image HA-4 and HA-5 Courtesy of Hawai`i

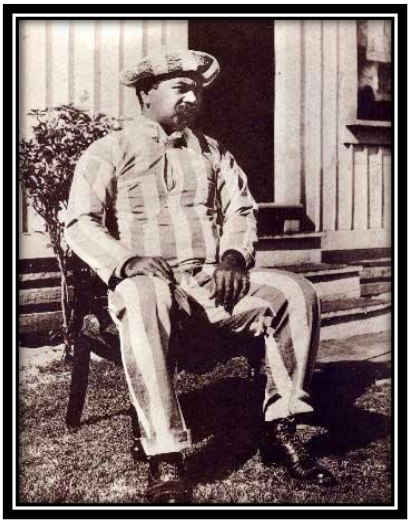
Without permission from the U.S. State Department, Minister Stevens then recognized the new government and proclaimed Hawaii a U.S. protectorate. The Committee immediately proclaimed itself to be the Provisional Government. President Benjamin Harrison signed a treaty of annexation with the new government, but before the Senate could ratify it, Grover Cleveland replaced Harrison as president and subsequently withdrew the treaty. Despite orders issued from President Grover Cleveland, Sanford Dole, the president of the Provisional Government of Hawaii, refused to turn over power as directed. Dole successfully argued that the United States had no right to interfere in the internal affairs of Hawaii. The Provisional Government then proclaimed Hawaii a republic in 1894, and soon the Republic of Hawaii was officially recognized by the United States.





(Above L) Sanford Ballard Dole - son of missionary parents and a lawyer. Although never elected, he became the first President of the Republic of Hawai`i after the overthrow of the legitimate government of the Hawaiian Kingdom. (Above R) The Queen's guards are discharged on January 18, 1893 by Provisional Government Col. John Soper. Images HA-6 and HA-7. Hawai`i State Archives.

On January 5, 1895, the protests took the form of an armed attempt to derail the annexation but the armed revolt was no match for the forces of the Republic troops and police. Amongst the Hawaiian Kingdom loyalists was Prince Jonah Kūhiō Kalaniana`ole who was twenty four years old at the time.



(Above) Prince Jonah Kūhiō Kalaniana`ole is pictured above in prison garb, sentenced to one year in prison for treason and his part in the unsuccessful rebellion of the overthrow of the Queen. Image HA-8 Hawai`i State Archives

Kūhiō, other leaders of the revolt and those involved in the rebellion were captured and imprisoned - along with Queen Lili`uokalani who was additionally charged for failing to put down the revolt. Kūhiō was sentenced to a year in prison while others were charged with treason and sentenced with execution. Death sentences were commuted to imprisonment. Kūhiō served his full term. He was visited daily by his fiancée, Elizabeth Kahanu Ka`auwai. They were later married in October 8, 1896.

Image HA-9. This is the only known photo to exist of the Queen's arrest, where she is seen being escorted to her trial in the former Throne Room of the `Iolani Palace. Hawai`i State Archives

Lili'uokalani was arrested on January 16, 1895, several days after the failed 1895 Counter-Revolution in Hawaii led by Robert William Wilcox, when firearms were found at the base of Diamond Head Crater. She denied any knowledge at her trial, defended by former attorney general Paul Neumann. She was sentenced to five years of hard labor in prison by a military tribunal and fined $5,000, but the sentence was commuted to imprisonment in an upstairs bedroom of 'Iolani Palace. During her imprisonment, she abdicated her throne in return for the release (and commutation of the death sentences) of her jailed supporters, including Minister Joseph Nawahī, Prince Kawananakoa, Robert Wilcox, and Prince Jonah Kūhiō.

Restoration of the Monarchy or Annexation of Hawai`i to the U.S.?
From 1893 to 1896, the Republic of Hawaii actively sought annexation to the United States. However, despite intensive debate on the matter in the legislature, annexation was strongly opposed by the U.S. Presidency of Grover Cleveland 1893 - 1897), the people of Hawai'i, and much of congress.

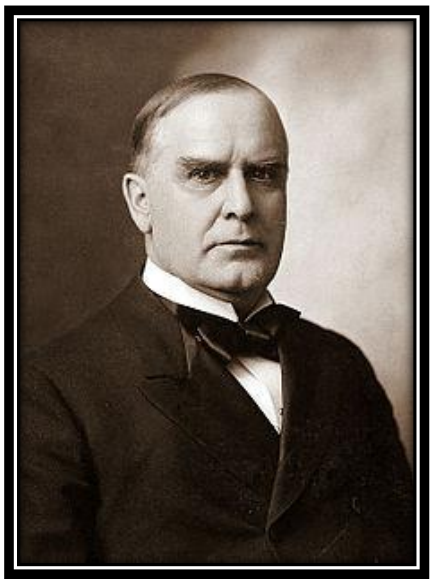


Image HA-10 President William McKinley Hawai`i State Archives

In March 4,1897, William McKinley was inaugurated as President of the United States. Unlike his predecessor, Grover Cleveland, McKinley was in favor of annexation of Hawai`i.

On June 16, 1897, McKinley and three representatives of the government of the Republic of Hawaii –Lorrin Thurston, Francis Hatch, and William Kinney– signed a treaty of annexation. President McKinley then submitted the treaty to the U.S. Senate for ratification.

- Henry Ernest Cooper, American citizen who arrived in 1890, named chairman at mass meeting January 14, 1893
- Crister Bolte, German national, Hawaiian subject, member
- Andrew Brown, Scottish national, member
- William Richards Castle, born in Honolulu 1849, attorney general for Kalākaua 1876, Hawaiian legislator 1878-88, member
- John Emmeluth, American citizen, member
- Theodore F. Lansing, American citizen, member
- John A. McCandless, American, naturalized Hawaiian subject, member
- Frederick W. McChesney, American citizen, member
- William Owen Smith, born on Kaua'i 1838 of American missionaries, member
- Lorrin A. Thurston, born in Hawaii of American grandparents, member
- Edward Suhr, German citizen, member
- Henry Waterhouse, Hawaiian subject of Tasmanian birth, came to Hawai'i 1851, member
- William C. Wilder, American, Hawaiian subject, brother of Samuel Gardner Wilder, member

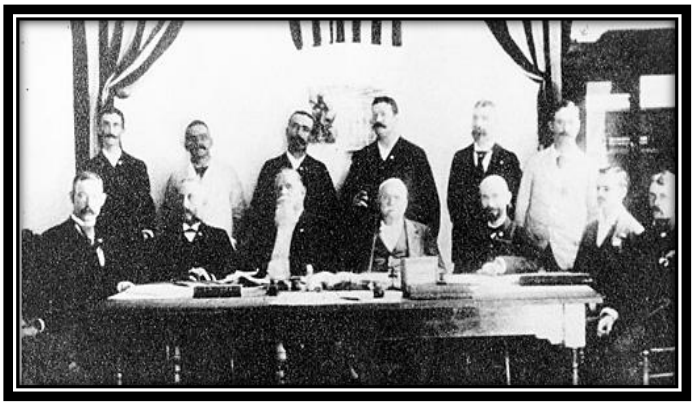


Image HA-11 13-Member "Committee of Safety", conspirators of the overthrow of the Hawaiian Monarchy. Hawai`i State Archives

HO`O KŪ`Ē: TO STAND IN OPPOSITION, TO RESIST
Anti-Annexation Petitions of 1897

As recorded by Professor Noenoe K. Silva, the anti-annexation petitions of 1897 were mentioned in the Native Hawaiian Study Commission's Minority report in 1983. A concerted effort was made to retrieve them as legal evidence for Ka Ho'okolokolonui Kanaka Maoli, The Peoples' International Tribunal convened by Dr. Kekuni Blaisdell in 1993. However, upon contacting the U.S. National Archives, it was advised that a search could not begin without a record group (catalog) number. Nevertheless, even without the petitions in hand, they became part of the Tribunal records in the testimony of several Kanaka Maoli speakers.

In 1996, a page of the petition, along with its record group number, was reproduced in a U.S. National Archives exhibit booklet titled, "Ties That Bind: Communities in American History", by Lisa B. Auel. Noenoe Silva was then able to locate the petitions in the archives in Washington, D.C. A year later a complete copy of all 556 pages finally arrived in Hawai'i Nei.

On January 17, 1998 the petitions were presented to the public in Hawai`i during observances of Sovereignty Sunday at the `Iolani Palace in Honolulu. An entire century had passed since the Hui Aloha `Āina delivered and presented the Anti-Annexation petitions to the United States Congress in Washington, DC. The 556-page document containing more than 21,000 signatures had literally sat, long forgotten in old boxes in the National Archives. Representing well over half of the adult population of Hawai`i at the time, signatures were acquired through grassroots efforts of Hawaiian nationals who traveled by foot, horseback and boat to amass the petitions. The signatures represented the majority of Hawai`i's national population who stood in strong opposition of annexation to the United States. It is a reaffirmation of the actions taken by the ancestors of living Hawaiians today, and their dedication to restore the pono or good and righteous to the wrongs that were committed to Hawai`i as an independent nation and its people.

This alone proves that the overthrow of Lili'uokalani and imposition of the Republic of Hawaii was contrary to the will of native Hawaiians and non-native Hawaiian nationals. It is also a key component to the ongoing Hawaiian sovereignty movement occurring in Hawai`i today.

The following pages contain a detailed account by Professor Noenoe K. Silva of the events that took place upon McKinley's actions to enter into a Treaty of

Annexation with representatives of the government of the Republic of Hawai`i. It shows of the solidarity of the Hawaiian people and others who were loyal to their beloved Queen, Lili`uokalani and the Hawaiian Nation. Most of all, it exhibits the deep love of nation and love for the people, culture and land of Hawai`i Nei.

Also included are selected pages of the petition drive for Kaua`i Island for the moku of Ko`olau and Kawaihau - the two districts that the project area ahupua`a of Anahola and Kamalomalo`o are a part of. Many names that appear on the petitions are names of families that continue to reside in the Anahola community today, showing an excellent example of the endeared term of, *`āina hānau" or birth lands*. Some of the names that have long been familiar and connected to Anahola include: Kelekoma, Lovell, Huddy, Ka`auwai, Kauo, Kahanu, Kaui, Pa, Kapu, Alapa`i and Kekua and many others. Native Kaua`i has also had the privilege of interviewing descendants of some of these kūpuna for this study as well. In another section, some of the same names appear in Land Commission Award claims and testimonies; again showing a history and connection of kānaka `ōiwi or native Hawaiians to these very lands of Anahola and Kamalomalo`o. Kānaka `Ōiwi is another term used to describe the indigenous Hawaiian who is intrinsically linked to places where generations of his/her `ohana and ancestors were born and raised; and even buried.

This petition is a significant source that bears witness to another side to Hawai`i's history. Contrary to the western perspective that Native Hawaiians embraced and welcomed annexation of their country, it is evident that the masses stood in solidarity against annexation.

EXHIBIT A

The 1897 Petitions Protesting Annexation

Noenoe K. Silva

When William McKinley won the presidential election in November of 1896, the question of Hawaii's annexation to the U.S. was again opened. The previous president, Grover Cleveland, was a friend of Queen Liliuokalani. He had remained opposed to annexation until the end of his term, but McKinley was open to persuasion by U. S. expansionists and by annexationists from Hawaii. He agreed to meet with a committee of annexationists from Hawaii, Lorrin Thurston, Francis Hatch and William Kinney. After negotiations, in June of 1897, McKinley signed a treaty of annexation with these representatives of the Republic of Hawaii. The President then submitted the treaty to the U. S. Senate for approval.

The Hui Aloha Aina for Women, the Hui Aloha Aina for Men, and the Hui Kalaiaina formed a coalition to oppose the treaty. Together, these three organizations represented a majority of the Kanaka Maoli (Native Hawaiians). Hui Kalaiaina had originally been formed after the Bayonet Constitution of 1887 as a vehicle for Kanaka Maoli political power. The two Hui Aloha Aina organizations were founded just after the overthrow of the Native government in 1893, expressly to support the Queen and to oppose U.S. annexation.

The Kanaka Maoli believed that the American government was committed to their stated principles of justice and of government of the people, by the people, and for the people. They believed that once the U.S. President and members of Congress saw that the great majority of Hawaiian citizens opposed the annexation, the principles of fairness would prevail, that is, their Native government would be restored. The three huis therefore began to organize mass petition drives. The heading on Hui Aloha Aina's petition read: PALAPALA HOOPII KUE HOOHUI AINA, *Petition Protesting Annexation.*

On September 6, 1897, the Hui Aloha Aina held a halawai makaainana - *a mass meeting* - , at Palace Square, which thousands of poe aloha aina - *patriots* - attended. President James Kaulia gave a rousing speech, saying "We, the nation (lahui) will never consent to the annexation of our lands, until the very last patriot lives." He said agreeing to annexation was like agreeing to be buried alive. He predicted that annexation would open the door for many foreigners to come here, and to take jobs and resources away from the Native people. He asked, "Then where will we live?" The crowd answered, "In the mountains," which figuratively means, "we shall be homeless." He asserted that a mass refusal by the people could prevent the annexation: "If the nation remains steadfast in its protest of annexation, the Senate can continue to strive until the rock walls of Iolani Palace crumble, and never will Hawaii be annexed to America!"

The 1897 Petitions Protesting Annexation
Exhibit: Page 2 continued - Noenoe K. Silva

The annexationist newspapers had published threats that the leaders of the mass meeting would be arrested for treason, but Mr. Kaulia assured the people that their assembly was legal. He said that it was because the brains of the government could not push over the brains of the Kanaka Maoli that the government had to resort to weapons of war. (At this time, Hawaii was ruled by a haole - *European- American* - oligarchy called the Republic of Hawaii that had deprived the Native people of political participation.) He said, "Let us take up the honorable field of struggle, brain against brain." He told the people, "Do not be afraid, be steadfast in aloha for your land and be united in thought. Protest forever the annexation of Hawaii until the very last aloha aina [lives]!" The crowd cheered.

Following Kaulia, David Kalauokalani, President of the Hui Kalaiaina, explained the details of the annexation treaty to the crowd. He told them that the Republic of Hawaii had agreed to give full government authority over to the United States, reserving nothing. It would also give all the government's money, the government and crown lands, government buildings, harbors, bays, military forts, military armaments and warships, and all resources claimed by the government of the Hawaiian Islands. Furthermore, he explained, the laws of the United States would not extend to the Hawaiian Islands, but the Congress of the U.S. would decide how Hawaii was to be governed. It was uncertain whether the Kanaka Maoli would have the right to vote. He said those who favored annexation would want to deny Kanaka Maoli voting rights because, from the very beginning, they have known that the Kanaka Maoli would overwhelmingly vote against annexation and anyone who supported it. This is the reason they were always afraid to put a vote to the people.

A resolution protesting the annexation was read to the crowd, who approved it. It was announced that U.S. Senator Morgan, an advocate of annexation, would be arriving soon, and that there would be another mass meeting held while he was here.

The petition drive started at about this time. Very soon afterwards, Mrs. Abigail Kuaihelani Campbell, President of the Women's branch of the Hui Aloha Aina, and Mrs. Emma Aima Nawahi boarded the inter-island ship the *Kinau* for Hilo on a signature gathering mission.
On September 14, Senator Morgan and four congressmen from the U.S. indeed arrived. On the same day, Mr. Enoch Johnson and Mr. Simon Peter Kanoa boarded the *Claudine* for Maui, and Mrs. Kaikioewa Ulukou departed for Kauai - all bound to gather signatures on those islands. The Hui Aloha Aina paid all of their expenses.At the same time, there was a branch of the Hui Aloha Aina active at Kalaupapa (on the island of Molokai) where people with leprosy were imprisoned1. The President of the Kalaupapa branch was Mr. Robert M. Kaaoao, who not only gathered signatures on the protest petitions, but had also organized a full day's activities to

The 1897 Petitions Protesting Annexation
Exhibit: Page 3 continued - Noenoe K. Silva

commemorate the Queen's birthday on September 2. The activities included a prayer service; boating, swimming, running, horse, and donkey races; as well as pole climbing and apple eating contests.

When Mrs. Campbell and Mrs. Nawahi arrived in Hilo harbor, they were greeted with honors. A delegation of the Hilo chapter of the Hui, consisting of Mr. Henry West, Mrs. Hattie Nailima, Mrs. Kekona Pilipo, and Mrs. J.A. Akamu met them at the harbor. The Hilo delegation showered them with leis, and proclaimed that a Hawaiian double-hulled canoe would carry them into the harbor. They had decorated five seats on the beautiful vessel with leis of maile, lehua, and other flowers, and had a Hawaiian flag waving at the back. The people of Laupahoehoe had sent welcome gifts of opihi, limu, and fish. Mrs. Campbell and Mrs. Nawahi attended meetings of the Hui Aloha Aina all over the Hilo and Puna area, and returned with thousands of signatures.

Meanwhile Mrs. Laura Mahelona was working hard in Kona and Kau; she was the committee member delegated to gather signatures there of both men and women. She traveled from North Kona south to Kau, leaving blank petitions with instructions everywhere she went. She told the chapter presidents to get the petitions signed and return them in a few days when her ship would stop again at the same harbors. When she returned, signed petitions were ready at every harbor. When she landed at each port, she was welcomed by the women of the Hui Aloha Aina branches, carrying leis over their arms, and when she returned to the boat, her clothes couldn't be seen because she was completely covered by leis. Mrs. Mahelona gathered 4,216 signatures. Mrs. Kaikioewa Ulukou gathered 2,375 on the island of Kauai. Mr. Simon P. Kanoa gathered 1,944 in the district of Hana, Maui.

When all the work was done, there were over 21,000 signatures- men's and women's in about equal numbers. When one considers that the population of Native Hawaiians at the time was less than 40,000, this is an impressive number.

The Hui Kalaiaina also had a substantial membership- -they conducted their own petition drive at the same time, collecting about 17,000 signatures.

The Hui Aloha Aina held another mass meeting on October 8, 1897, and at that time decided to send delegates to Washington D.C. to present the petitions to President McKinley and to the Congress.

The executive committees of the three hui met and decided to send four delegates: James Kaulia of Hui Aloha Aina, David Kalauokalani of Hui Kalaiaina, with John Richardson, and with

1897 Petitions Protesting Annexation
Exhibit: Page 4 continued - Noenoe K. Silva

William Auld as secretary. All four were Kanaka Maoli. This was an important sign to the nation. Some people had written in the papers that previous delegates to Washington had failed The because they were not Kanaka Maoli, or because they were too wealthy to truly have the nation's well-being in mind at all times. It is important to note that although a women's representative did not travel to Washington, Mrs. Campbell, President of the women's branch of Hui Aloha Aina, was part of the decision-making committee, and was viewed as a leader of the nation along with the men.

The four Elele Lahui - *National Delegates* - left Hawaii on November 20, 1897. In San Francisco on November 28, they commemorated La Kuokoa - *Hawaiian Independence Day*.
They arrived in Washington on December 6, the day that the Senate opened. They first met briefly with Queen Liliuokalani, who was staying in Washington. Then they met Senator Richard Pettigrew who took them in to the Senate's opening ceremonies. After the ceremonies, they returned to Ebbitt House where the Queen was staying, and where they would also stay. Someone told them at that time that their trip to Washington was useless, since it was known that there 58 votes on the side of annexation, with only 2 more votes needed for the treaty to pass. They said they didn't answer but remained as quiet as doves. They spoke amongst themselves later, however, to plan what to do.

The next day, December 7, they met again with the Queen to consider how to present the petitions. They chose the Queen as chair of their Washington committee. Together, they decided to present the petitions of Hui Aloha Aina only, because the substance of the two sets of petitions was different. Hui Aloha Aina's was called "petition protesting annexation," but the Hui Kalaiaina's petitions called for the monarchy to be restored. They agreed that they did not want to appear divided, as if they had different goals.

The day after that, the delegates met with Senator Hoar, who was against annexation. They braved snow, cold and slippery streets to get to the Senator's residence. They said the "elemakule" (*old man*) greeted them with a handshake. He asked them what the people of Hawaii thought about annexation. John Richardson, the spokesman, explained everything. While he was explaining, they could see tears welling up in the old man's eyes. Richardson told him that they brought petitions signed by the whole nation protesting the annexation. Senator Hoar told them to submit the petitions to him, and he would bring them before the Senate, and then to the Foreign Relations Committee. David Kalauokalani of Hui Kalaiaina also submitted his endorsement of those petitions (so that the U.S. would know both huis had the same goal). On December 9, Senator Hoar read the text of the petitions to the Senate and had them formally accepted. The delegates were present, seated in the area where people are allowed to observe the Senate proceedings.

1897 Petitions Protesting Annexation
Exhibit: Page 5 continued - Noenoe K. Silva

On December 10, the delegates met with Secretary of State John Sherman, and Kalauokalani submitted a memorial protesting annexation (Ka Memoriala a ka Lahui) to him.
In the following days, the delegates met with many different Senators and Congressmen. Senators Pettigrew and White encouraged them in the hope that the annexation treaty would be defeated. They said that they were asked a lot of questions about Japan or England trying to annex Hawaii. They answered that either of them could have taken Hawaii if they had wanted to any time in the past five years. Why would they wait for America to try before they did so? They also reminded the U.S. Congressmen that Hawaii had remained independent for fifty years, partly because of the 1843 resolution signed by Great Britain and France guaranteeing Hawaii's independence.

By the time they left Washington on February 27, there were only 46 votes in the Senate on the pro-annexation side, down from 58 when they had arrived. Forty-six votes was far too few for the treaty to pass -- sixty votes were necessary.

Senator Pettigrew and Senator Turpie insisted that the Kanaka Maoli of Hawaii be given a chance to vote on annexation. But Senator Morgan and the other pro-annexation Senators knew that if a vote were taken, it would be overwhelmingly in favor of Hawaii's independence. In a report, these Senators wrote, "If a requirement should be made by the United States of a plebiscite [vote] to determine the question of annexation, it would work a revolution in Hawaii which would abolish its constitution." They knew, in other words, that if the people were allowed to vote, not only would they reject annexation, they would also reject the haole Republic that had been forced upon them against their will.

Three of the delegates, James Kaulia, David Kalauokalani, and William Auld returned to Honolulu victorious, sure that the treaty would fail, as indeed it did. They had carried the hard work and hopes of the whole nation to Washington in the form of the protest petitions. They had succeeded in persuading many senators to vote against the treaty. They left behind John Richardson to continue the work, along with Queen Liliuokalani, her secretary Joseph Heleluhe, and her devoted friend, J.O. Carter.

One annexation crisis was over, but another was soon to follow. This same year, the peoples of Cuba and the Philippines were fighting wars of independence against Spain. The United States also declared war on Spain after the U.S. warship, the Maine was blown up in a harbor in Cuba. The reason that the Maine was even in Cuba is questionable, since the U.S. had not been involved until it involved itself by sending the ship there. Be that as it may, the United States was at war. Suddenly, the empire-builders of the United States were saying that they needed to send military troops on ships to the Philippines to fight Spain. For this, they said they needed Hawaii. In the midst of the fever of war, a Joint Resolution of Congress called the Newlands

1897 Petitions Protesting Annexation
Exhibit: Page 6 continued - Noenoe K. Silva

Resolution passed by a simple majority of each house, making Hawaii a territory of the United States. That was in July of 1898; the flag of the United States was hoisted over Hawaii on August 12th.

The Kanaka Maoli continued to protest. The Hui Kalaiaina concentrated on persevering to undo the annexation, and restore the Native government. Hui Aloha Aina began to work towards securing full civil and political rights for Hawaiian citizens in the U.S. territorial system. In 1900, the two huis banded together as one political organization called the Home Rule Party. David Kalauokalani was elected President, and James Kaulia as Vice-President. This was the party that elected Robert Kalanihiapo Wilcox as (non-voting) Delegate to the U.S. Congress.

James Keauiluna Kaulia continued his work for his nation until the day of his death at age 41, in 1902. On that Sunday, he spent the morning at the jail house trying to help prisoners assert their rights. After church and lunch, he lay down for a nap from which he never woke up. He died of heart failure.

David Kalauokalani lived until 1915, also serving his people all of his life. He served as a senator in the territorial legislature, and as a member of the Board of Health. His son, also named David, became the first clerk of the City and County of Honolulu.

Mrs. Kuaihelani Campbell served as President of Hui Aloha Aina for its entire existence. She later became well-known as a benefactor for the ill and poor among her people, and for her many charitable deeds. She married Samuel Parker in 1902. Her daughter Abigail married Prince David Kawananakoa at about the same time, and Mrs. Campbell-Parker thereby became an ancestor to the royal family remaining in Hawaii today. She passed away in 1908.

Mrs. Emma Aima Nawahi kept the newspaper *Ke Aloha Aina* running for many years as its owner and business manager. She sold it in 1910. She also remained active in charities until her death in 1935.

The petitions protesting annexation, consisting of five hundred fifty-six pages, are now held in the National Archives in Washington D.C.

The Kanaka Maoli continue to protest today. We have never relinquished our national sovereignty. Kanaka Maoli are working on state, national, and international levels to have our existence as a nation recognized. Kanaka Maoli also continue to resist and protest every encroachment upon our inherent rights to this land, our ocean and fresh waters, and all the other natural resources of Hawaii. We are insisting as well on our rights to keep our language and cultural traditions, and the land itself, alive.

1897 Petitions Protesting Annexation
Exhibit: Page 6 continued - Noenoe K. Silva

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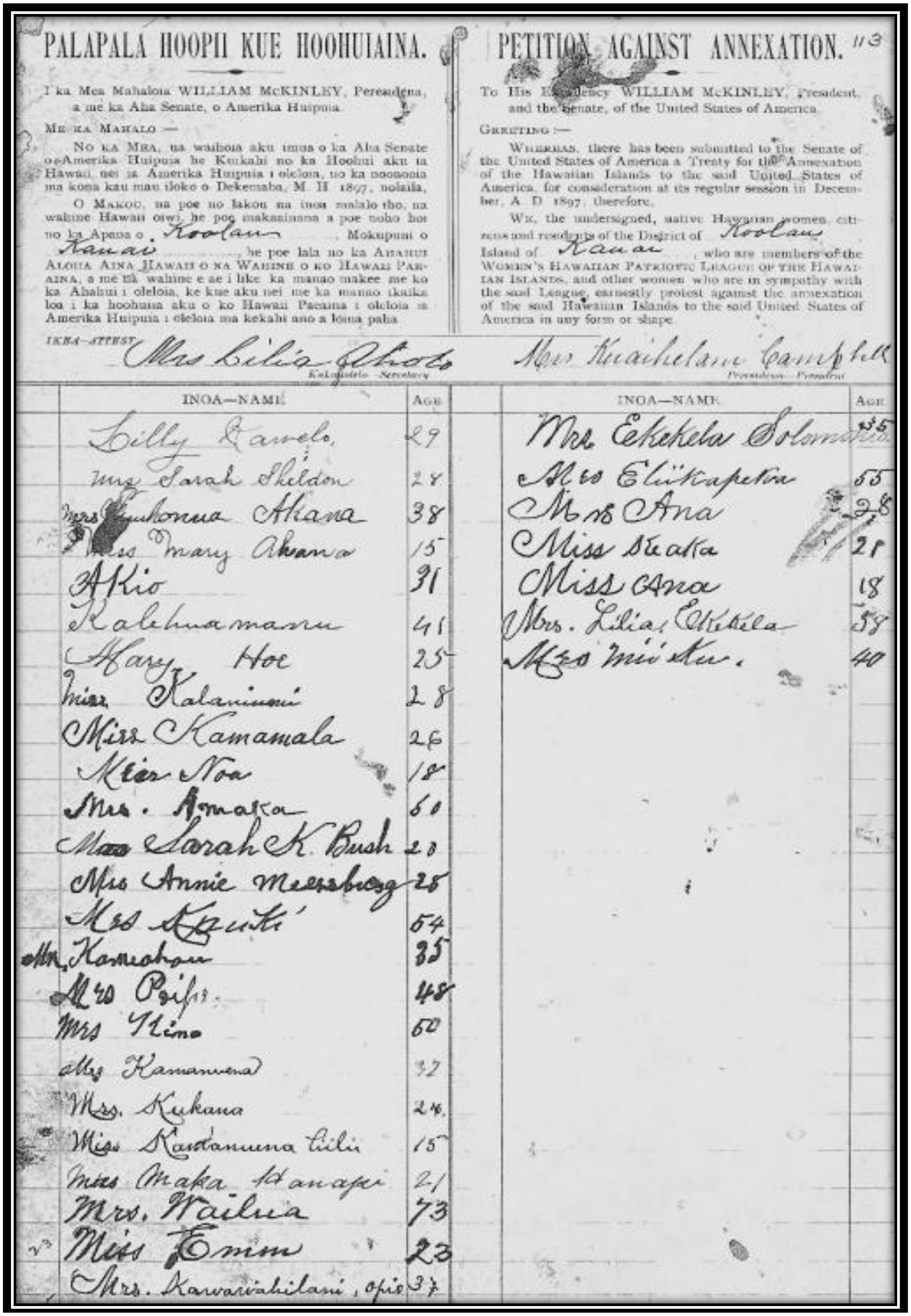
- Ke Aloha Aina (newspaper) various issues 1897-1898.
- Russ, William Adam. The Hawaiian republic (1894-98) and its struggle to win annexation. Selinsgrove: Susquehanna University Press, 1992 [1961].
- Senate Committee on Foreign Relations. 55th Congress. [Sen. 55A-J11.2]. National Archives and Records Administration.
- Senate Report 681 (55th Congress 2nd Session).

Footnotes

1 The government called their confinement "quarantine," but the people confined called themselves "prisoners." It was nearly impossible to escape the quarantine area bounded by rough seas and sheer cliffs. Prisoners were sent there for life; most would never see any family member again. Furthermore, the prisoners were not given adequate food or medicine, which added to their sense of being punished.

2 This handshake seemed to be an important detail in the reports of their meeting with Senator Hoar. It may be because the delegates were subjected to race prejudice in Washington some white men may have refused to shake their hands. They do not complain of this directly, however.



PALAPALA HOOPII KUE HOOHUIAINA.

I ka Mea Mahaloia WILLIAM McKINLEY, Peresidena, a me ka Aha Senate, o Amerika Huipuia.

ME KA MAHALO :—

NO KA MEA, ua waiho ia aku imua o ka Aha Senate o Amerika Huipuia he Kuikahi no ka Hoohui aku ia Hawaii nei ia Amerika Huipuia i oleloia, no ka noonoo ia ma kona kau mau iloko o Dekemaba, M. H. 1897, nolaila,

O MAKOU, na poe no lakou na inoa malalo iho, na wahine Hawaii oiwi, he poe makaainana a poe noho hoi no ka Apana o Koolau, Mokupuni o Kauai, he poe lala no ka AHAHUI ALOHA AINA HAWAII O NA WAHINE O KO HAWAII PAEAINA, a me na wahine e ae i like ka manao makee me ko ka Ahahui i oleloia, ke kue aku nei me ka manao ikaika loa i ka hoohuia aku o ko Hawaii Paeaina i oleloia ia Amerika Huipuia i oleloia ma kekahi ano a loina paha.

IKEA—ATTEST: Mrs Lilia Aholo
Kakauolelo—Secretary

PETITION AGAINST ANNEXATION. 113

To His Excellency WILLIAM McKINLEY, President, and the Senate, of the United States of America.

GREETING :—

WHEREAS, there has been submitted to the Senate of the United States of America a Treaty for the Annexation of the Hawaiian Islands to the said United States of America, for consideration at its regular session in December, A. D. 1897; therefore,

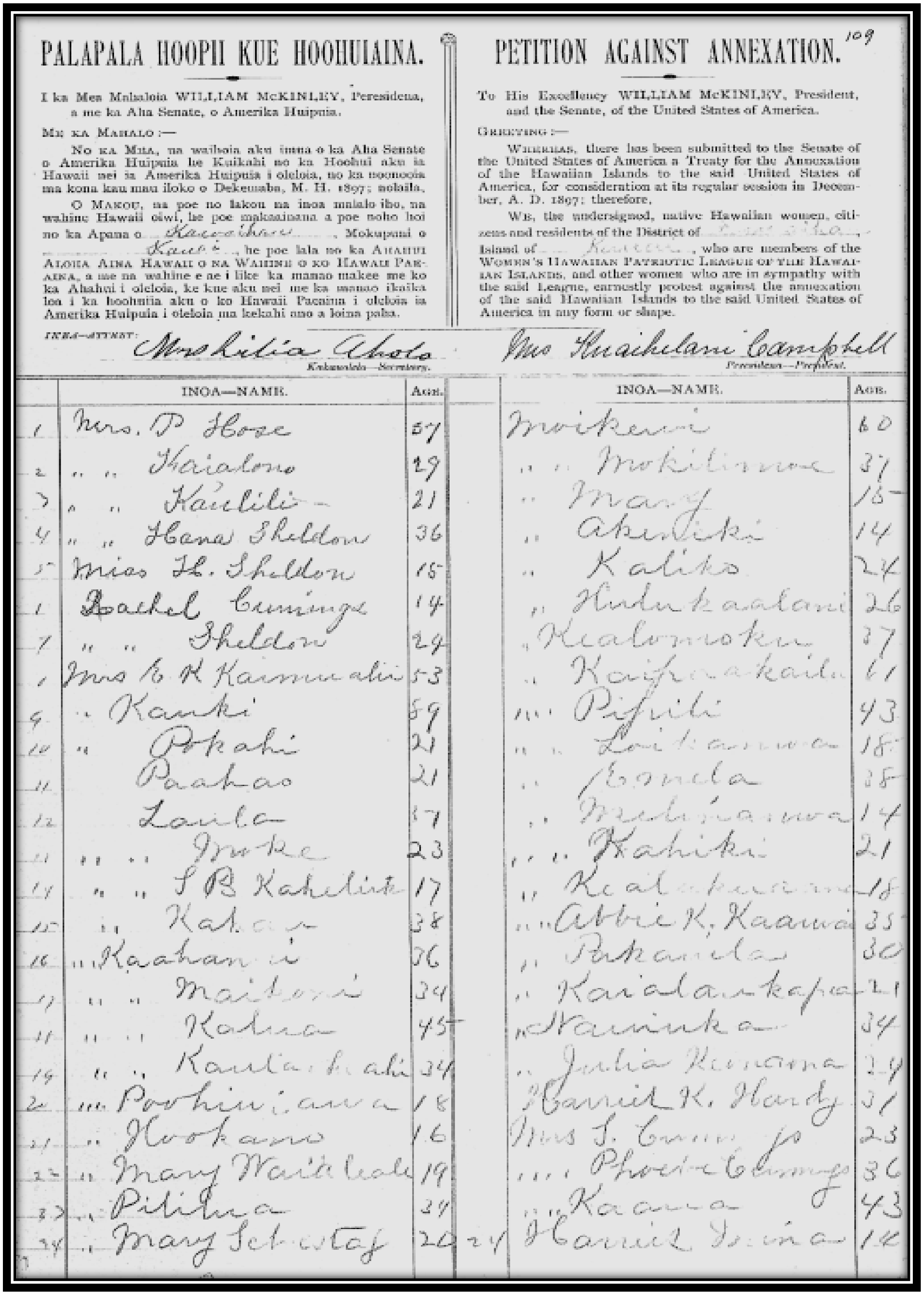
WE, the undersigned, native Hawaiian women, citizens and residents of the District of Koolau, Island of Kauai, who are members of the WOMEN'S HAWAIIAN PATRIOTIC LEAGUE OF THE HAWAIIAN ISLANDS, and other women who are in sympathy with the said League, earnestly protest against the annexation of the said Hawaiian Islands to the said United States of America in any form or shape.

Mrs Kuaihelani Campbell
Peresidena—President

INOA—NAME	AGE
Lilly Kawelo	29
Mrs Sarah Sheldon	28
Mrs [illegible]konua Akana	38
Miss Mary Akana	15
Akio	31
Kalehuamanu	41
Mary Hoe	25
Miss Kalaniumi	28
Miss Kamamala	26
Miss Noa	18
Mrs. Amaka	60
Miss Sarah K. Bush	20
Mrs Annie Meershing	28
Mrs Kauki	54
Mr. Kamealoha	35
Mrs Paipu	48
Mrs Heino	60
Mrs Kamanuena	32
Mrs. Kukana	24
Miss Kaulanuena Lilii	15
Miss Maka Kanapu	21
Mrs. Wailua	73
Miss Emm	23
Mrs. Kawaiahilani, opio	37

INOA—NAME	AGE
Mrs Ekekela Solomon	35
Mrs Elikapeka	55
Mrs Ana	28
Miss Keaka	21
Miss Ana	18
Mrs. Lilia Ekekela	58
Mrs Miiku	40

Figure 1 1897 Anti-Annexation Women's Petition - Ko`olau, Kaua`i



109

PALAPALA HOOPII KUE HOOHUIAINA.

I ka Mea Mahaloia WILLIAM McKINLEY, Peresidena, a me ka Aha Senate, o Amerika Huipuia.

ME KA MAHALO :—

NO KA MEA, ua waiho ia aku imua o ka Aha Senate o Amerika Huipuia he Kuikahi no ka Hoohui aku ia Hawaii nei ia Amerika Huipuia i oleloia, no ka noonooia ma kona kau mau iloko o Dekemaba, M. H. 1897; nolaila,

O MAKOU, na poe no lakou na inoa malalo iho, na wahine Hawaii oiwi, he poe makaainana a poe noho hoi no ka Apana o *Kawaihau*, Mokupuni o *Kauai*, he poe lala no ka AHAHUI ALOHA AINA HAWAII O NA WAHINE O KO HAWAII PAE-AINA, a me na wahine e ae i like ka manao makee me ko ka Ahahui i oleloia, ke kue aku nei me ka manao ikaika loa i ka hoohuiia aku o ko Hawaii Paeaina i oleloia ia Amerika Huipuia i oleloia ma kekahi ano a loina paha.

PETITION AGAINST ANNEXATION.

To His Excellency WILLIAM McKINLEY, President, and the Senate, of the United States of America.

GREETING :—

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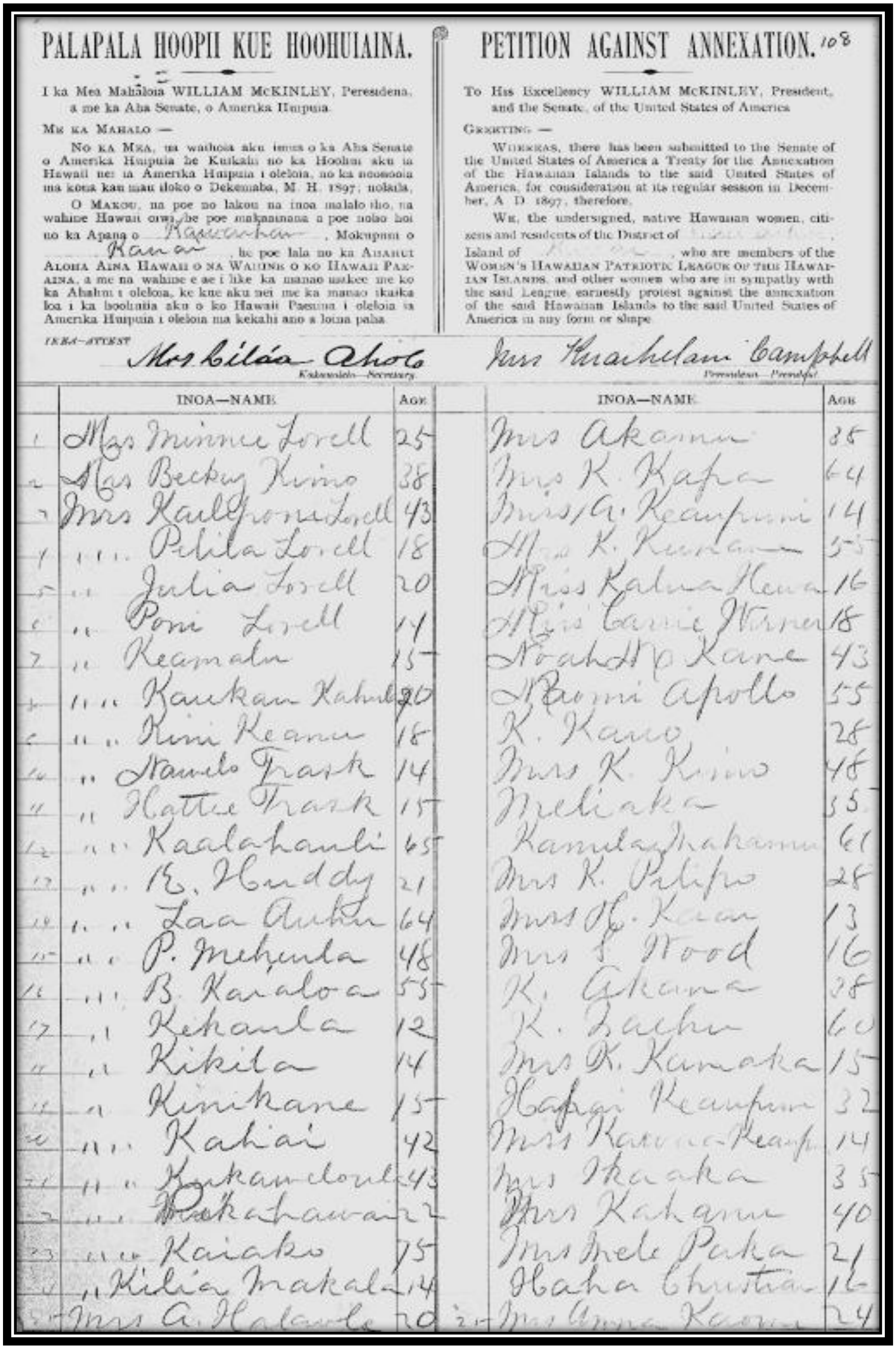
WE, the undersigned, native Hawaiian women, citizens and residents of the District of *Kawaihau*, Island of *Kauai*, who are members of the WOMEN'S HAWAIIAN PATRIOTIC LEAGUE OF THE HAWAIIAN ISLANDS, and other women who are in sympathy with the said League, earnestly protest against the annexation of the said Hawaiian Islands to the said United States of America in any form or shape.

IKEA—ATTEST: *Mrs Lilia Aholo*
Kakauolelo—Secretary.

Mrs Kuaihelani Campbell
Peresidena—President.

	INOA—NAME.	AGE.		INOA—NAME.	AGE.
1	Mrs. P Hose	57		Moikeni	60
2	" " Kaialono	29		" " Mokilima	37
3	" " Kaulili	21		" Mary	15
4	" " Hana Sheldon	36		" Akiniki	14
5	Miss H. Sheldon	15		" Kaliko	24
6	Rachel Cumings	14		" Kuleikaalani	26
7	" " Sheldon	24		" Kealomoku	37
8	Mrs E K Kaimualii	53		" Kaipuakaili	61
9	" Kauki	59		" Pipili	43
10	" Pokahi	21		" " Laikanwa	18
11	Paahao	21		" Esmela	18
12	Laila	17		" Malaniawa	14
13	" " Moke	23		" " Kahiki	21
14	" " S B Kahelilu	17		" Kealakuamu	18
15	" Kaha	38		" Abbie K. Kaawa	35
16	" Kaahanui	36		" Pakanila	30
17	" " Maikeni	34		" Kaialaukapa	21
18	" " Kalua	45		" Nawinka	34
19	" " Kaulaokahi	34		" Julia Kuiaana	24
20	" Poohiwiawa	18		Harriet K. Hardy	31
21	" Hookano	16		Mrs S. Cummings	23
22	" Mary Waialeale	19		" Phoebe Cummings	36
23	" Pilihua	34		" Kaana	43
24	" Mary Schwstaf	20	24	Harriet Isaina	14

Figure 2 1897 Anti-Annexation Women's Petition - Kawaihau, Kaua`i



PALAPALA HOOPII KUE HOOHUIAINA.

I ka Mea Mahaloia WILLIAM McKINLEY, Peresidena, a me ka Aha Senate, o Amerika Huipuia.

ME KA MAHALO —

NO KA MEA, ua waiho ia aku imua o ka Aha Senate o Amerika Huipuia he Kuikahi no ka Hoohui aku ia Hawaii nei ia Amerika Huipuia i oleloia, no ka noonoo ia ma kona kau mau iloko o Dekemaba, M. H. 1897; nolaila,

O MAKOU, na poe no lakou na inoa malalo iho, na wahine Hawaii oiwi, he poe makaainana a poe noho hoi no ka Apana o Kawaihau, Mokupuni o Kauai, he poe lala no ka AHAHUI ALOHA AINA HAWAII O NA WAHINE O KO HAWAII PAEAINA, a me na wahine e ae i like ka manao makee me ko ka Ahahui i oleloia, ke kue aku nei me ka manao ikaika loa i ka hoohui ia aku o ko Hawaii Paeaina i oleloia ia Amerika Huipuia i oleloia ma kekahi ano a loina paha.

IKEA—ATTEST Mrs Kilea Ahole
Kakauolelo—Secretary.

PETITION AGAINST ANNEXATION. 108

To His Excellency WILLIAM McKINLEY, President, and the Senate, of the United States of America.

GREETING —

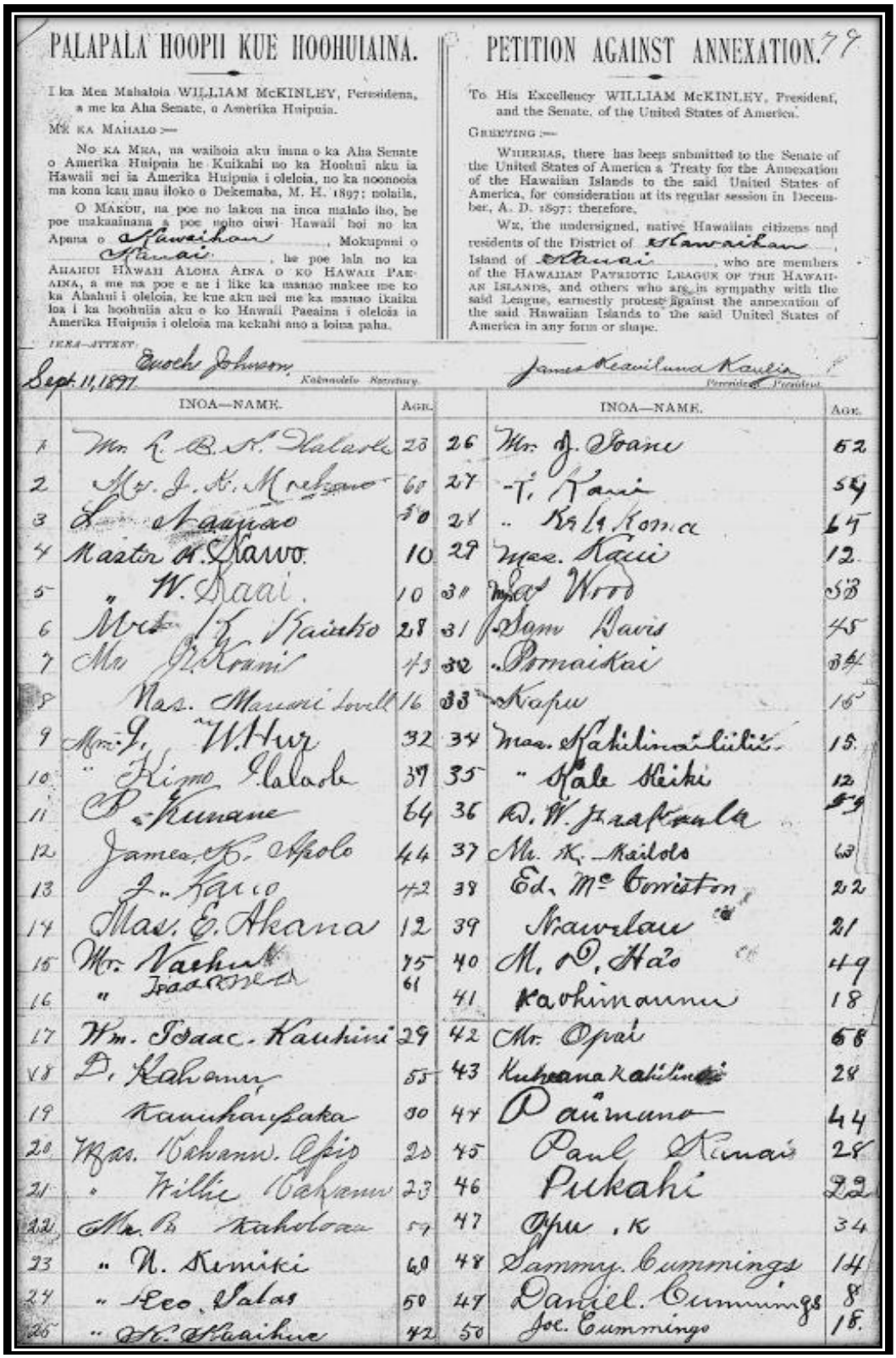
WHEREAS, there has been submitted to the Senate of the United States of America a Treaty for the Annexation of the Hawaiian Islands to the said United States of America, for consideration at its regular session in December, A. D. 1897; therefore,

WE, the undersigned, native Hawaiian women, citizens and residents of the District of [illegible], Island of [illegible], who are members of the WOMEN'S HAWAIIAN PATRIOTIC LEAGUE OF THE HAWAIIAN ISLANDS, and other women who are in sympathy with the said League, earnestly protest against the annexation of the said Hawaiian Islands to the said United States of America in any form or shape.

Mrs Kuaihelani Campbell
Peresidena—President.

	INOA—NAME	AGE		INOA—NAME	AGE
1	Mrs Minnie Lovell	25		Mrs Akamu	35
2	Mrs Becky Kino	38		Mrs K. Kapa	64
3	Mrs Kailiponi Lovell	43		Miss A. Keapuni	14
4	" " Pilila Lovell	18		Mrs K. Kunia	55
5	" " Julia Lovell	20		Miss Kalua Keawe	16
6	" Poni Lovell	14		Miss Carrie Warner	18
7	" Keamalu	15		Noah Hp Kane	43
8	" " Kaukau Kahuila	20		Naomi Apollo	55
9	" " Kini Keanu	18		K. Kamo	28
10	" Namilo Frank	14		Mrs K. Kino	48
11	" Hattie Frank	15		Meliaka	35
12	" " Kaalahauli	65		Kamilakahanu	61
13	" " E. Huddy	21		Mrs K. Pelipo	28
14	" " Laa Auhu	64		Mrs H. Kaan	13
15	" " P. Mehunla	48		Mrs S. Wood	16
16	" " B. Kanaloa	55		K. Akana	38
17	" Kekaula	12		K. Zachu	60
18	" Kikila	14		Mrs K. Kamaka	15
19	" Kinikane	15		Hapai Keapuni	32
20	" " Kahai	42		Mrs Kaua Keapuni	14
21	" " Kaukaweloali	43		Mrs Kaaka	35
22	" " Makahawai	22		Mrs Kahanu	40
23	" " Kaiaka	75		Mrs Mele Paka	21
24	" Kilia Makal	14		Haha Christian	12
25	Mrs A. Halaulo	20	25	Mrs Anna Kaou	24

Figure 3 1897 Anti-Annexation Women's Petition - Kawaihau, Kaua`i



PALAPALA HOOPII KUE HOOHUIAINA.

I ka Mea Mahaloia WILLIAM McKINLEY, Peresidena, a me ka Aha Senate, o Amerika Huipuia.

ME KA MAHALO :—

No KA MEA, na waiboia aku imua o ka Aha Senate o Amerika Huipuia he Kuikahi no ka Hoohui aku ia Hawaii nei ia Amerika Huipuia i oleloia, no ka noonooia ma kona kau mau iloko o Dekemaba, M. H. 1897; nolaila,

O MAKOU, na poe no lakou na inoa malalo iho, he poe makaainana a poe noho oiwi Hawaii boi no ka Apana o Kawaihau, Mokupuni o Kauai, he poe lala no ka AHAHUI HAWAII ALOHA AINA O KO HAWAII PAEAINA, a me na poe e ae i like ka manao makee me ko ka Ahahui i oleloia, ke kue aku nei me ka manao ikaika loa i ka hoohuiia aku o ko Hawaii Paeaina i oleloia ia Amerika Huipuia i oleloia ma kekahi ano a loina paha.

PETITION AGAINST ANNEXATION.

To His Excellency WILLIAM McKINLEY, President, and the Senate, of the United States of America.

GREETING :—

WHEREAS, there has been submitted to the Senate of the United States of America a Treaty for the Annexation of the Hawaiian Islands to the said United States of America, for consideration at its regular session in December, A. D. 1897; therefore,

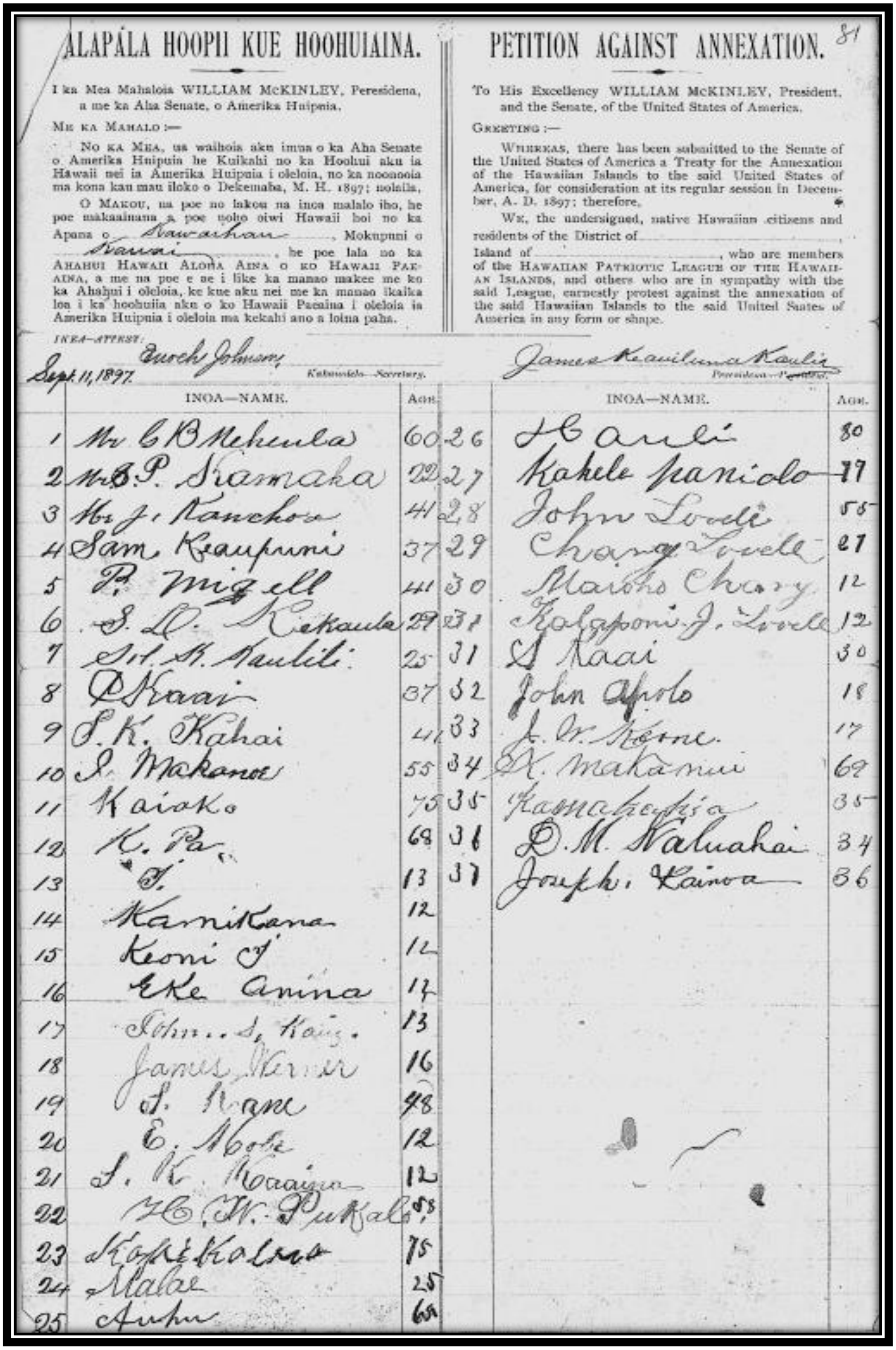
WE, the undersigned, native Hawaiian citizens and residents of the District of Kawaihau, Island of Kauai, who are members of the HAWAIIAN PATRIOTIC LEAGUE OF THE HAWAIIAN ISLANDS, and others who are in sympathy with the said League, earnestly protest against the annexation of the said Hawaiian Islands to the said United States of America in any form or shape.

ITEA—ATTEST.

Sept 11, 1897. Enoch Johnson, Kakauolelo Secretary. James Keauiluna Kaulia, Peresidena, President.

	INOA—NAME.	AGE.		INOA—NAME.	AGE.
1	Wm. K. B. K. Kalaole	23	26	Mr. J. Soane	52
2	Mr. J. K. Melzaro	60	27	" T. Kani	54
3	Kaapuo	50	28	" Ka La Koma	64
4	Master A. Kawo	10	29	Miss. Kaui	12
5	" W. Kaai	10	30	Mr. Wood	58
6	Mrs. L. Kaiuko	28	31	Sam Davis	45
7	Mr. J. Koani	43	32	" Pomaikai	34
8	Miss. Manani Lovell	16	33	" Kapu	16
9	Mrs. J. W. Hue	32	34	Miss. Kahilinaiiliili	15
10	" Kipu Kalaole	37	35	" Kale Keiki	12
11	" Kunane	64	36	Rev. W. Kaaloula	59
12	James K. Apolo	44	37	Mr. K. Kailoli	63
13	J. Kaio	42	38	Ed. Mc Corriston	22
14	Mrs. E. Akana	12	39	Knowlau	21
15	Mr. Kaehu	75	40	M. D. Hao	49
16	" Isaac Reed	61	41	Kaohimaunu	18
17	Wm. Isaac. Kaukini	29	42	Mr. Opai	68
18	D. Kahanu	55	43	Kuhoana Kahilinui	28
19	Kauhanpaka	30	44	Paumano	44
20	Mrs. Kahanu. Apio	20	45	Paul Kuaia	28
21	" Willie Kahanu	23	46	Pukahi	22
22	Mr. B. Kaholoa	57	47	Apu. K	34
23	" N. Kuniki	60	48	Sammy. Cummings	14
24	" Leo. Salas	50	49	Daniel. Cummings	8
25	" H. Kuaihua	42	50	Joe. Cummings	18

Figure 4 1897 Anti-Annexation Men's Petition - Kawaihau, Kaua`i



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ALAPÀLA HOOPII KUE HOOHUIAINA.

I ka Mea Mahaloia WILLIAM McKINLEY, Peresidena, a me ka Aha Senate, o Amerika Huipuia.

ME KA MAHALO :—

NO KA MEA, ua waihoia aku imua o ka Aha Senate o Amerika Huipuia he Kuikahi no ka Hoohui aku ia Hawaii nei ia Amerika Huipuia i oleloia, no ka noonooia ma kona kau mau iloko o Dekemaba, M. H. 1897; nolaila,

O MAKOU, na poe no lakou na inoa malalo iho, he poe makaainana a poe noho oiwi Hawaii hoi no ka Apana o Kawaihau, Mokupuni o Kauai, he poe lala no ka AHAHUI HAWAII ALOHA AINA O KO HAWAII PAE-AINA, a me na poe e ae i like ka manao makee me ko ka Ahahui i oleloia, ke kue aku nei me ka manao ikaika loa i ka hoohuiia aku o ko Hawaii Paeaina i oleloia ia Amerika Huipuia i oleloia ma kekahi ano a loina paha.

PETITION AGAINST ANNEXATION.

To His Excellency WILLIAM McKINLEY, President, and the Senate, of the United States of America.

GREETING :—

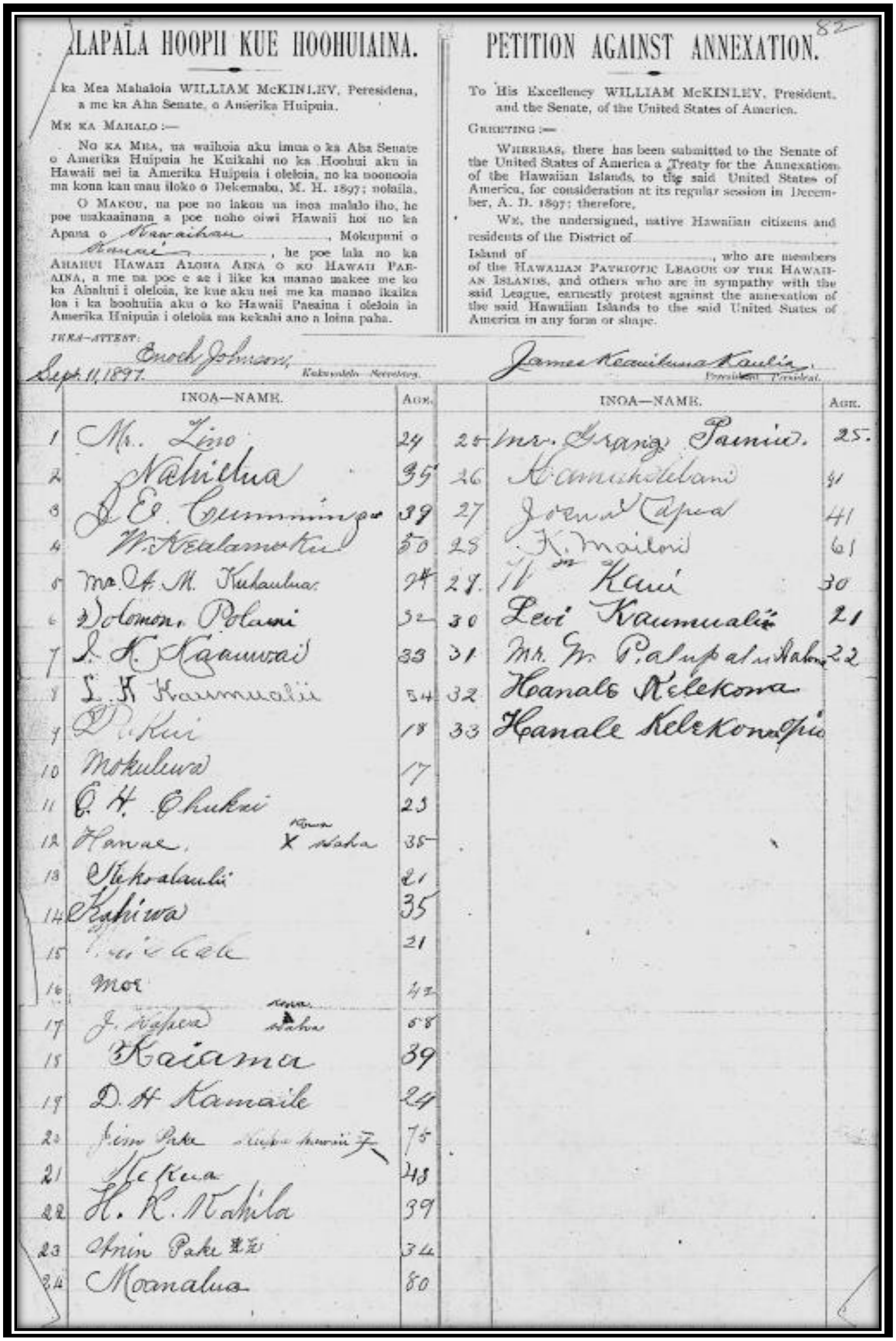
WHEREAS, there has been submitted to the Senate of the United States of America a Treaty for the Annexation of the Hawaiian Islands to the said United States of America, for consideration at its regular session in December, A. D. 1897; therefore,

WE, the undersigned, native Hawaiian citizens and residents of the District of ...., Island of ...., who are members of the HAWAIIAN PATRIOTIC LEAGUE OF THE HAWAIIAN ISLANDS, and others who are in sympathy with the said League, earnestly protest against the annexation of the said Hawaiian Islands to the said United States of America in any form or shape.

IKEA—ATTEST:
Sept. 11, 1897. Enoch Johnson, Kakauolelo—Secretary.

James Keauiluna Kaulia, Peresidena—President.

	INOA—NAME.	AGE.		INOA—NAME.	AGE.
1	Mr C B Mehula	60	26	J C Auli	80
2	Mr B. P. Kamaka	22	27	Kahele Paniolo	77
3	Mr J. Kanehoa	41	28	John Lovell	55
4	Sam. Keaupuni	37	29	Chang Lovell	27
5	P. Migell	41	30	Maiaho Chang	12
6	S. W. Keikaula	29	31	Kalaponi J. Lovell	12
7	S. K. Kaulili	25	31	S Kaai	30
8	D Kaai	37	32	John Apolo	18
9	S. K. Kahai	41	33	J. W. Keone	17
10	S. Makanoe	55	34	K. Makanui	69
11	Kaiako	75	35	Kamakaukia	35
12	K. Pa	68	36	D. M. Naluahai	34
13	S.	13	37	Joseph Kainoa	36
14	Kanikana	12			
15	Keoni S.	12			
16	Eke Anina	14			
17	John S. Kaiu	13			
18	James Werner	16			
19	S. Kane	48			
20	E. Mole	12			
21	S. K. Kaaina	12			
22	H. C. W. Pukalo	58			
23	Kopikokolua	75			
24	Malae	25			
25	Aiohu	60			



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ALAPALA HOOPII KUE HOOHUIAINA.

I ka Mea Mahaloia WILLIAM McKINLEY, Peresidena, a me ka Aha Senate, o Amerika Huipuia.

ME KA MAHALO :—

NO KA MEA, ua waihoia aku imua o ka Aha Senate o Amerika Huipuia he Kuikahi no ka Hoohui aku ia Hawaii nei ia Amerika Huipuia i oleloia, no ka noonooia ma kona kau mau iloko o Dekemaba, M. H. 1897; nolaila,

O MAKOU, na poe no lakou na inoa malalo iho, he poe makaainana a poe noho oiwi Hawaii hoi no ka Apana o Kawaihau, Mokupuni o Kauai, he poe lala no ka AHAHUI HAWAII ALOHA AINA O KO HAWAII PAEAINA, a me na poe e ae i like ka manao makee me ko ka Ahahui i oleloia, ke kue aku nei me ka manao ikaika loa i ka hoohuiia aku o ko Hawaii Paeaina i oleloia ia Amerika Huipuia i oleloia ma kekahi ano a loina paha.

IKEA—ATTEST: Enoch Johnson, Kakauolelo Secretary.
Sept. 11, 1897.

PETITION AGAINST ANNEXATION.

To His Excellency WILLIAM McKINLEY, President, and the Senate, of the United States of America.

GREETING :—

WHEREAS, there has been submitted to the Senate of the United States of America a Treaty for the Annexation of the Hawaiian Islands to the said United States of America, for consideration at its regular session in December, A. D. 1897; therefore,

WE, the undersigned, native Hawaiian citizens and residents of the District of ______ Island of ______, who are members of the HAWAIIAN PATRIOTIC LEAGUE OF THE HAWAIIAN ISLANDS, and others who are in sympathy with the said League, earnestly protest against the annexation of the said Hawaiian Islands to the said United States of America in any form or shape.

James Keauiluna Kaulia, Peresidena President.

	INOA—NAME.	AGE.		INOA—NAME.	AGE.
1	Mr. Lino	24	25	Mr. Grang Paniu.	25.
2	Nahiehua	35	26	Kamukalani	41
3	J. E. Cummings	39	27	Joena Kapea	41
4	W. Kealamokua	50	28	K. Mailoi	61
5	Mr. A. M. Kuhaulua	24	29	W. Kaui	30
6	Solomon Polani	52	30	Levi Kaumualii	21
7	J. K. Kaauwai	33	31	Mr. Wm. Palupalu Nahe	22
8	L. K. Kaumualii	54	32	Hanale Kelekona	
9	D. Kui	18	33	Hanale Kelekona Opio	
10	Mokuleua	17			
11	E. H. Ehukai	23			
12	Hanae, Kona X Waha	35			
13	Nakoalauli	21			
14	Kahiwa	35			
15	[illegible]	21			
16	Mor	42			
17	J. Kapena, Kona Waha	58			
18	Kaiama	39			
19	D. H. Kamaile	24			
20	Lim Pake [illegible]	75			
21	Nekua	48			
22	H. K. Nahila	39			
23	Ahin Pake	34			
24	Moanalua	80			

Figure 6 1897 Anti-Annexation Men's Petition - Ko`olau, Kaua`i

Official Protest to the Treaty of Annexation

I, LILIUOKALANI OF HAWAII, by the Will of God named heir-apparent on the tenth day of April, A.D. 1877, and by the grace of God Queen of the Hawaiian Islands on the seventeenth day of January, A.D. 1893, do hereby protest against the ratification of a certain treaty, which, so *I* am informed, has been signed at Washington by Messrs, Hatch, Thurston, and Kinney, purporting to cede those Islands to the territory and dominion of the United States. I declare such a treaty to be an act of -wrong toward the native and part-native people of Hawaii, an invasion of the rights of the ruling chiefs, in violation of international rights both toward my people and toward friendly nations with whom they have made treaties, the perpetuation of the fraud whereby the constitutional government was overthrown, and, finally, an act of gross injustice to me.

BECAUSE the official protests made by me on the seventeenth day of January, 1893, to the so-called Provisional Government was signed by me, and received by said government with the assurance that the case was referred to the United States of America for arbitration.

BECAUSE that protest and my communications to the United States Government immediately thereafter expressly declare that I yielded my authority to the forces of the United States in order to avoid bloodshed, and because I recognized the futility of a conflict with so formidable a power.

BECAUSE the President of the United States, the Secretary of State, and an envoy commissioned by them reported in official documents that my government was unlawfully coerced by the forces, diplomatic and naval, of the United States; that I was at the date of their investigations the constitutional ruler of my people.

BECAUSE neither the above-named commission nor the government which sends it has ever received any such authority from the registered voters of Hawaii, but derives its assumed powers from the so-called committee of public safety, organized on or about the seventeenth-day of January, 1893, said committee being composed largely of persons claiming American citizenship, and not one single Hawaiian was a member thereof, or in any way participated in the demonstration leading to its existence.

BECAUSE my people, about forty thousand in number, have in no way been consulted by those, three thousand in number, who claim the right to destroy the independence of Hawaii. My people constitute four-fifths of the legally qualified voters of Hawaii, and excluding those imported for the demands of labor, about the same proportion of the inhabitants.

BECAUSE said treaty ignores, not only the civic rights of my people, but, further, the hereditary property of their chiefs. Of the 4,000,000 acres composing the territory said treaty offers to annex, 1,000,000 or 915,000 acres has in no way been heretofore recognized as other than the private property of the constitutional monarch, subject to a control in now way differing from other items of a private estate.

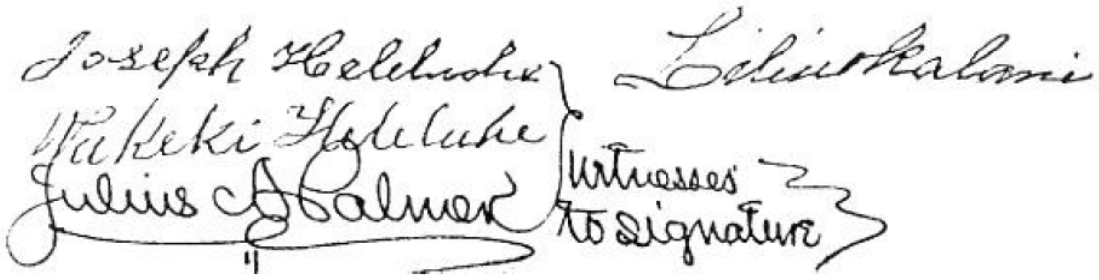
BECAUSE it is proposed by said treaty to confiscate said property, technically called the crown lands, those legally entitled thereto, either now or in succession, receiving no consideration whatever for estates, their title to which has been always undisputed, and which is legitimately in my name at this date.

Note: The typed narrative that appears here shows an error in the date as April A.D. 1877. The correct year is 1897.

BECAUSE said treaty ignores, not only all professions of perpetual amity and good faith made by the United States in former treaties with the sovereigns representing the Hawaiian people, but all treaties made by those sovereigns with other and friendly powers, and it is thereby in violation of international law.

BECAUSE, by treating with the parties claiming at this time the right to cede said territory of Hawaii, the Government of the United States receives such territory from the hands of those whom its own magistrates (legally elected by the people of the United States, and in office in 1893) pronounced fraudulently in power and unconstitutionally ruling Hawaii.

this seventeenth day of June, in the year eighteen hundred and ninety-seven.



Ke Ali`i Maka`ainana - the Peoples' Prince
The Hawaiian Homestead Act of 1920

Figure 7 A young Prince Kūhiō
Courtesy of Hawai`i State Archives

Jonah Kūhiō Kalaniana`ole (1871 – 1922) was the son of High Chief, David Kahalepouli Pi`ikoi and Princess Kinoike Kekaulike II. Born on March 26, 1871 at Hō`ai in the ahupua`a and district of Kōloa on Kaua`i Island, he was named after his grandfather, Kūhiō Kalaniana`ole, a high chief of Hilo and Jonah Pi`ikoi, his paternal grandfather who too, was a high chief of Kaua`i. His mother was the granddaughter of Kaua`i's last sovereign king, Kaumuali`i and the sister of Julia Kapi`olani, the Queen Consort of King David Kalākaua. Kapi`olani and Kalākaua would later *hānai*, raise him and his brothers as their foster sons upon the passing of Kūhiō's mother, Princess Kinoiki Kekauike II.

Along with his older brothers - David Kawānanakoa Pi`ikoi and Edward Abnel Keali`iahui Pi`ikoi, Jonah Kūhiō Kalaniana`ole attended the Royal School on Oahu, originally called the Chief's Children School. They also attended St. Allban's College, Punahou and also studied for four years at St. Matthew's College - a private Episcopal military school in San Mateo, California. They would continue their education at the Royal Agricultural College in Cirencester, England, and then eventually graduated from a business school also in England. King Kalakaua's purpose in educating the Princes at the best schools and in England was to prepare them to hold high offices in the kingdom, or eventually wear the crown as heir to the throne.

Upon their return from England, Prince David Kawanakoa was given a clerkship position in the Ministry of Foreign Affairs and Prince Kūhiō was placed in Ministry of Interior and the Customs Service.

In 1895 following the overthrow of the Hawaiian Kingdom, Kūhiō and other native Hawaiians and supporters of Lili`uokalani attempted to restore the monarchy. The endeavor was unsuccessful and Prince Kūhiō was sentenced to a year in prison while others were executed for treason against the republic. Upon his release from prison, he married Elizabeth Ka`auwai Kahanu and left Hawai`i to travel throughout Europe and Africa.

Kūhiō later returned from his self-imposed exile to dedicate the rest of his life to politics. By September 1, 1902, Kūhiō decided to align himself with the powerful Republican Party.

Although the Republican Party represented business interests and included people who took part in the original overthrow of the Monarchy, Kūhiō felt that the move would provide the best advantage to pursue his agenda for helping native Hawaiians. He was appointed as Hawai`i's lone congressional delegate in 1903, a position that he held until his passing in 1921. Kūhiō was called, *"Ke Ali`i Maka`ainana" - the citizens' prince* for his efforts to preserve and strengthen the Hawaiian people.

Kūhiō's greatest accomplishment came in 1920 with the drafting of the Hawaiian Homes Commission Act, an ambitious measure that would make 200,000 acres of land available for Native Hawaiian use. The Hawaiian Homes Commission Act was signed by President Warren Harding in 1921.

He is also noted for reorganizing the Royal Order of Kamehameha in 1903, as well as being the founder of the first Hawaiian Civic Club on December 7, 1918.

Figure 9 (L) Prince Kuhio Campaign Trail. Congressional visit in 1915. Pictured from left to right are Rep. Carter Glass; Speaker of the House Holstein; Delegate Prince Jonah Kuhio Kalanianaole; Rep. Phil Campbell of Kansas; and Mayor John C. Lane of Honolulu. Courtesy of the Hawai`i State Archives.

Other contributions of Kūhiō included the introduction of the first-ever Hawai`i Statehood Act in 1919. Another 40 years would lapse before statehood was realized for Hawai`i.

Prince Jonah Kūhiō Kalaniana`ole died at the age of 50 on January 7, 1922. Six months after his passing, David Kamai became the very first Hawaiian homesteader to move to the Kalaniana`ole Settlement on Moloka`i.

On Kaua`i, native Hawaiian homesteading in Anahola was established in 1957. DHHL's inventory of lands in Anahola and Kamalomalo`o total 4,228 acres, making it the largest Hawaiian homestead community on Kaua`i.

Other DHHL regions on Kaua`i include:

Moloa`a
Wailua
Hanapēpē
Kekaha

The Hawaiian Homes Commission Act

Section 101, "Purpose", of the Hawaiian Homes Commission Act explains the aims of the Hawaiian Homelands program as follows:

> (a) ... to enable native Hawaiians to return to their lands in order to fully support self-sufficiency for native Hawaiians and the self-determination of native Hawaiians in the administration of this Act, and the preservation of the values, traditions, and culture of native Hawaiians.
>
> (b) The principal purposes of this Act include but are not limited to:
>
> (1) Establishing a permanent land base for the benefit and use of native Hawaiians, upon which they may live, farm, ranch, and otherwise engage in commercial or industrial or any other activities as authorized in this Act;
>
> (2) Placing native Hawaiians on the lands set aside under this Act in a prompt and efficient manner and assuring long-term tenancy to beneficiaries of this Act and their successors;
>
> (3) Preventing alienation of the fee title to the lands set aside under this Act so that these lands will always be held in trust for continued use by native Hawaiians in perpetuity;
>
> (4) Providing adequate amounts of water and supporting infrastructure, so that homestead lands will always be usable and accessible; and
>
> (5) Providing financial support and technical assistance to native Hawaiian beneficiaries of this Act so that by pursuing strategies to enhance economic self-sufficiency and promote community-based development, the traditions, culture and quality of life of native Hawaiians shall be forever self-sustaining.
>
> (c) In recognition of the solemn trust created by this Act, and the historical government to government relationship between the United States and Kingdom of Hawaii, the United States and the State of Hawaii hereby acknowledge the trust established under this Act and affirm their fiduciary duty to faithfully administer the provisions of this Act on behalf of the native Hawaiian beneficiaries of the Act.
>
> (d) Nothing in this Act shall be construed to:
>
> (1) Affect the rights of the descendants of the indigenous citizens of the Kingdom of Hawaii to seek redress of any wrongful activities associated with the overthrow of the Kingdom of Hawaii; or
>
> (2) Alter the obligations of the United States and the State of Hawaii to carry out their public trust responsibilities under section 5 of the Admission Act to native Hawaiians and other descendants of the indigenous citizens of the Kingdom of Hawaii. [L 1990, c 349, §1]

The Department of Hawaiian Home Lands is governed by the Hawaiian Homes Commission Act of 1920, enacted by the U.S. Congress to protect and improve the lives of native Hawaiians.

The act created a Hawaiian Homes Commission to administer certain public lands, called Hawaiian home lands, for homesteads.

The Act was incorporated as a provision in the State Constitution in 1959 when Hawai'i was granted statehood. Responsibility for the Commission and the Hawaiian Home Lands was transferred to the State of Hawai`i at that time. Except for provisions that increase benefits to lessees or relate to administration of the Act, the law can be amended ONLY with the consent of Congress.

INDEX OF DESIGNATED LANDS FOR THE HHCA OF 1920

DESCRIPTION OF LANDS CHOSEN FOR HOMESTEADING UNDER HAWAIIAN HOME ACT*
ISLAND ACREAGE LAND POTENTIAL

Source: Albert Horner, Letter to Governor Charles J. McCarthy, 14 February 1921, Delegate Kalaniana`ole File on Rehabilitation

Island/Locations	Acreage	Land Potential
Hawai'i Island		
Kama'oa Puueo	11,000	Useful for grazing only for a few months a year. No water for domestic use.
Pu'ukapu	1,200	Land adjacent to site where a Hawaiian rehabilitation project had been attempted and had failed. Most suitable of available lands for homesteading.
Kawaihae I rocks.	10,000	Same as Kama'oa, except less soil covering
Pauahi	750	Same as above.
Kamoku	12,350	Third class agricultural in part, and Kapulena- balance second class pasture. Water for Nienie domestic use would have to be piped in some miles.
Humu'ula	53,000	Fourth class grazing; no water supply; beyond reach of water; almost entirely lava waste with no agricultural land.
Pi'ihonua	2,000	Second class agricultural; annual rainfall 250 inches.
Ka'ohe Maku'u	2,000	Rocky, almost solid lava; fertile soil, well situated for fishing.
Kaua`i Island		
Kaua'i Upper Waimea	15,000	Third class grazing; valueless without fattening lands, rough, rocky, very dry; could produce crops if $1 million spent to bring water.
Moloa'a	2,500	No agricultural or grazing lands.
Anahola & Kamalomalo	5,000	Second class agricultural land; would require irrigation; large part planted to cane and irrigated.

APPENDIX—*Cont 'd*
ISLAND ACREAGE LAND POTENTIAL

Maui Island		
Maui Kahikinui	25,000	Third class grazing when held in large tracts; most of land can be grazed only few months of year due to frequent dry spells; steep and rocky.
Maui Island		
Kula	6,000	Second class agricultural land; crops can be expected one year out of three.
Moloka'i		
Pala'au	11,400	With irrigation would produce abundant crops, without water is poor grazing land; irrigation project estimated to cost $2 million.
Kapa'akea	2,000	Steep part of mountain; worthless for agriculture
Kamiloloa I and II	3,600	Same.
Makakupa'ia	2,200	Same.
Kalama'ula	6,000	Upper half, second class agricultural land; lower same as Pala'au.
O'ahu		
Nanakuli	3,000	Rough, rocky, dry; no value except for its proximity to sea, and fishing rights.
Lualualei	2,000	Same.
Waimanalo might be first class.	4,000	Second class agricultural or cane lands, with water

Timeline of Historic Political Events

0-1778	Polynesians settle Hawai'i (0-500 AD). A vibrant, sustainable Hawaiian society evolves from its ancestral roots. Hawaiian fishponds, agricultural systems, complex governing mechanisms, feather work, hula, and a host of other Hawaiian innovations emerge.
1778	British naval Captain James Cook encounters Hawai'i. The Native Hawaiian population is estimated at the time to be between 400,000 and 800,000. European and U.S. ships arrive following Cook's "discovery." Hawaiians are exposed to foreign diseases and succumb to these by the tens of thousands through the next century.
1810	Kamehameha I politically unifies Hawai'i, establishing the Hawaiian Kingdom.
1819	Kamehameha I dies. Kamehameha II ascends to the throne. Ka`ahumanu assumes the position of Kuhina Nui and publicly announces her joint ruler ship status as Queen Regent alongside Liholiho- Kamehameha II. Influenced by Ka`ahumanu and his mother Keōpuolani, Liholiho "abolishes" the kapu system by breaking the old law of eating with his female mākuahine.
1820	American Protestant missionaries arrive. Western education and commerce assume growing importance.
1840	Kamehameha III, the Council of Chiefs, and key Western advisors collaborate on the first constitution, codifying in written form citizens' rights and establishing a process by which Hawaiian Kingdom laws are adopted.
1843	France and Britain issue a joint declaration formally recognizing the Hawaiian Kingdom as an independent sovereign nation.
1848	The Māhele begins to transform the Hawaiian land tenure system to a Western one based on private property ownership. Private land ownership paves the way for lucrative sugar plantations operated by businessmen of American and European descent.
1850	The U.S. and the Hawaiian Kingdom enter into the Hawaiian-American Treaty of Friendship, Commerce, and Navigation of 1849, committing the nations to peaceful political and economic interaction.
1873	Hawai'i's first elected king, William Lunalilo, reigns for one year before his untimely death. He establishes the first of the Ali'i Trusts. His trust is dedicated to caring for Hawaiian elderly.

1875 The U.S. and the Kingdom of Hawai'i ratify a reciprocity treaty, allowing for duty-free entry of Hawai'i sugar to the U.S. As a result, the sugar industry enjoys phenomenal profits and expands at an exponential rate.

1887 Sugar business interests assert the passage of a new constitution. Though it is never lawfully ratified, the sugar interests in the Hawaiian government apply this constitution to limit Native Hawaiian voting rights and the powers of the king. This facilitates the passage of a new treaty with the U.S. that offers the U.S. exclusive use of Pearl Harbor in exchange for continued duty-free entry of sugar from Hawai'i to the U.S.

1890 New U.S. legislation ends the competitive advantages that earlier treaties afforded the Hawai'i sugar industry, dealing the sugar businessmen in Hawai'i a devastating blow. They start planning for the annexation of Hawai'i to the U.S. as a permanent solution to ensure their continued profits.

1893 Responding to requests from her people, Queen Lili'uokalani prepares a new constitution to restore voting rights to Native Hawaiians and naturalized citizens and to reinstate the former authorities of the ruling monarch. Sugar business interests initiate their plan, orchestrated with U.S. Minister John Stevens, to have Hawai'i annexed to the U.S. In violation of established Hawaiian-American treaties, Stevens orders that U.S. marines land and station themselves adjacent to the main Hawaiian government building. With this shield, the annexationists proclaim that the Hawaiian Kingdom is ended and that a Provisional Government is established until annexation with the U.S. occurs. Stevens declares the Provisional Government as the legitimate government.

To avoid armed conflict with the U.S. marines under Stevens' authority, Lili'uokalani, under protest, conditionally yields her sovereign authority to the U.S. until the U.S. completes an investigation of its agents' involvement and undoes the actions of those agents.

President Cleveland withdraws the annexation treaty from Congress. U.S. Special Commissioner James Blount is sent to Hawai'i to investigate and finds that U.S. representatives were responsible for the overthrow. President Cleveland refers to the United States' involvement as "an act of war" and requests Congress to support the reinstatement of the Hawaiian Kingdom.

1896 The Republic of Hawai'i legislates that English be the medium of instruction in public and private schools, severely restricting the continuity of Hawaiian as the most common mode of communication.

1897	Grover Cleveland leaves office having served two terms. William McKinley, having won over William Jennings Bryan, becomes President. Proponents of annexation forward a new annexation treaty to President McKinley. Representatives from Hawaiian patriotic leagues travel to Washington D.C. and present two related anti-annexation petitions with a total of 38,000 signatures. The annexation treaty fails.
1898	The Spanish American War begins. Hawai'i is seen as an essential acquisition for U.S. military purposes. Annexationists attempt to have Hawai'i annexed via a joint resolution, a form of legislation that affects only internal U.S. matters. The joint resolution passes with a simple majority vote instead of the two-thirds required to pass a treaty. The U.S. proceeds with an annexation ceremony on August 12. On August 13, the U.S. military occupies Hawai'i to prepare for its engagement in the Philippines. The Republic of Hawai'i cedes to the U.S. 1.8 million acres of Hawaiian Kingdom government lands and crown lands (lands of the ruling monarch).
1920	The Native Hawaiian population is estimated at 41,750 out of 255,900 total Hawai'i residents. Prince Kūhiō introduces the Hawaiian Homes Commission Act to Congress.
1921	Affirming a special relationship between the U.S. and Native Hawaiians, the U.S. enacts the Hawaiian Homes Commission Act of 1920. It reserves for Native Hawaiian homesteading over 180,000 acres of the ceded Hawaiian Kingdom crown and government lands that were deemed unusable for growing sugar.
1959	Hawai'i becomes a state. Reaffirming the U.S. trust obligation to Native Hawaiians, the U.S. cedes to the State of Hawai'i 1.4 million acres of Hawaiian Kingdom crown and government lands, requiring that it be used for five purposes, including "the betterment of the conditions of Native Hawaiians."
1993	The U.S. enacts Public Law 103-150 apologizing for the U.S. role in the overthrow and the "suppression of the inherent sovereignty of the Native Hawaiian people."
1978	Hawaiian leaders organize in the Hawai'i State Constitutional Convention to have the State honor its obligation to use some of its ceded lands revenues to improve the condition of Native Hawaiians, which ultimately establishes the Office of Hawaiian Affairs.
1999-2000	U.S. Dept. of Justice and Dept. of Interior holds hearings and recommend establishing a process of federal recognition for Native Hawaiians.

2000-2010	Native Hawaiian Government Reorganization Act (NHGRA) introduced and considered by U.S. Congress.
2010	Passage of NHGRA is pending in U.S. Senate, after passing U.S. House of Representatives. President Obama has committed to sign the bill into law upon its passage through Congress.

Native Hawaiian Cultural Consultation

It is the policy of the State of Hawaii under Chapter 343, HRS, to alert developers and 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.

One of the most important parts of conducting a cultural Impact assessment and study is to hold consultation with Native Hawaiian kūpuna or elders, Hawaiian cultural organizations, cultural practitioners and individuals from the community who potentially have knowledge of traditional Hawaiian sites, resources and cultural practices that are related to the project area as well as to the adjacent and extended land areas of the Kamalomalo`o and Anahola ahupua`a. Ultimately, the goal of Native Kaua`i LLC as preparers of this CIA is to produce a document that can be used to protect and preserve the valuable knowledge and traditional practices of nā `ōiwi kānaka, the Native Hawaiian people of these places.

Our goal was to meet with and interview a cross-section of indigenous Hawaiian people from the community; first and foremost, with kūpuna or elders that have memories and personal experiences of the project area and the surrounding lands in Kamalomalo`o, as well as the adjacent lands of Anahola ahupua`a. In addition, we were hopeful to receive their `ike or insight and knowledge about customary practices and traditional places associated with or relating to the project area and Native Hawaiian Homestead community that will be hosting the solar development.

We also aimed to seek out and speak with those of the mākua or parent generation who had potential knowledge, ties and experiences linked to the project area and Anahola. Ages of interviewees varied from individuals in their early 40s to 86.

In the window allocated to complete this cultural impact assessment study, Native Kaua`i interviewed a total of 15 indigenous Hawaiians. Majority are residents of Anahola on homestead lands. Two individuals live outside of Anahola. Some of the interviewees and informants are Kūpuna or elders, educators, activists and cultural practitioners. Some of them fall into 2 or more categories. All are of Native Hawaiian ancestry with personal ties and connection to Anahola.

In this particular endeavor to "interview" Native Hawaiians, we chose to do so in a Hawaiian manner of kukākukā or through "talk-story". We speak with interviewees without being nīele or as a prying meddler (as my kūpuna would say) by being annoyingly inquisitive. While we have specific points of interest for questions that we hope to lead our discussions, it is important that we engage with each person in a manner that is respectful and without imposing pressure. To the Native Hawaiian, a nīele person will never get anywhere by being bold, blunt and direct. However, he or she can be successful by leading up to a subject through indirection and a more `olu`olu or gracious approach. We make every attempt to avoid being maha`oi or presumptuous, brazen and insensitively forward. Ah, but this is how we were raised in the traditional Hawaiian household that was led by kūpuna and mākua who were adamant that the values of aloha (love), ha`aha`a (humility), ahonui (patience)and hō`ihi (respect) apply to the way that we behave and interact with others. This is especially so when talking and meeting with kūpuna, for with the slightest tone of pejorative stance or speech, they will cease to share their valuable insight and experiences. It helps tremendously to have some sort of association with individuals as well, for more is shared when there is a level of comfort, trust and familiarity.

Thus, excessive note-taking and the use of recording devices such as video cameras and tape recorders are not utilized. Downside consequences were avoided by having a Hawaiian face; choosing to utilize colloquial jargons and speaking in the vernacular; making links through genealogy; by NOT having a tape recorder; being understanding and empathetic; using kama`āina as interviewers; judicious note-taking when necessary; by keeping our promise not to divulge any interview comments if requested by the subject; and of course, by not being nīele or maha`oi.

One kūpuna - Uncle Val Ako insisted and encouraged that we use a recording device as he felt that it was best to capture all of the information that he was willing to share. This was extremely helpful, as our conversation continued for 3 hours. Yet, had he not suggested and insisted, we would not have recorded our discussion.

If the interviews had been conducted using a Western format these questions would be asked straight forwardly:

1. What type of cultural practices and cultural beliefs do/did your family practice?

2. Where do/did these cultural practices occur?

3. How do/did the area's sites features or land affect you or your family's cultural practices and beliefs?

4. How would the plans to develop the Solar Energy Project affect you or your family's cultural beliefs and cultural practices?

Instead, we chose to engaged in talk-story sessions with interviewees in individual and semi-group settings that were comfortable for the participants. Oftentimes our discussion took place in their yard, or at their home, or with the case of some of the kūpuna, as a group at their Ke Ola No Nā Kūpuna program that is held at the Anahola Clubhouse. Already well-aware of the extra-sensitivity of asking such questions would be a rude approach of nīele and maha`oi, we allowed our conversations to flow and be directed in ways that were most appropriate and pono for those who were kind to extend us their time, energy and mana`o.

The interviewees that we engaged with for this CIA are:

1.	Mr. Valentine Ako	Kūpuna, Practitioner	Wailua, Kaua`i
2.	Mr. Frank Cummings	Homesteader, Practitioner	Anahola, Kaua`i
3.	Mr. John Pia	Homesteader, Practitioner	Anahola, Kaua`i
4.	Mr. John Ka`ohelauli`i	Homesteader, Practitioner	Anahola, Kaua`i
5.	Mr. Kawika Cutcher	Homesteader, Practitioner	Anahola, Kaua`i
6.	Mrs. Healani Trembath	Kūpuna, Practitioner	Hule`ia, Kaua`i
7.	Mrs. Leonora Kelekoma	Homesteader, Kūpuna, Practitioner	Anahola, Kaua`i
8.	Ms. Jodi Omo	Homesteader, Practitioner	Anahola, Kaua`i

9.	Mr. Chono Fernandez	Homesteader, Practitioner	Anahola, Kaua`i
10.	Mrs. Diana Lovell O'Reilly	Homesteader, Kūpuna	Anahola, Kaua`i
11.	Mrs. Carol Mano`i	Kūpuna	Anahola, Kaua`i
12.	Ms. Essie Williams	Homesteader	Anahola, Kaua`i
13.	Mr. Llewelyn Woodward	Homesteader, Practitioner	Anahola, Kaua`i
14.	Mr. Kamealoha Smith	Educator	Anahola, Kaua`i
15.	Mr. Leroy Ka`ona	Educator, Homestead `Ohana	Anahola, Kaua`i

Other Interviews:

16.	Mr. Kawika Winter	NTBG Limahuli Garden & Preserve	Hā`ena, Kauai
17.	Mr. David "Kawika" Viets	Kaua`i Native Plant Society	Anahola, Kaua`i

All interviews were conducted by `Aikāne Alapa`i and Kēhaulani Kekua between February 15 and April 28, 2012. Subsequently, we found that just about all of the interviewees were more interested in first and foremost, learning about the project itself. Many felt that they were not informed and were cautious to share their mana`o or thoughts and knowledge with us.

As such, the priority topics needed to conduct this CIA of cultural resources and impacts were overshadowed. It was a challenge to steer conversations into that direction without appearing to be presumptuous and insensitive to the needs of the interviewers to be informed of hte project. Native Kaua`i spent a considerable amount of time attempting to provide an overview of the project which was not our area of expertise. Native Hawaiian informants/DHHL homesteaders were encouraged to contact AHHA or KIUC directly for details and information about the solar development project.

Frank Cummings and Kawika Cutcher were the most acquainted with the project as they have been actively involved in participating in outreach meetings, planning discussions, etc. Uncle John Pia and Uncle Val Ako provided incredible insight and their personal experiences of cultural practices and traditions, as well on Anahola history, wahi pana and more. Their contributions are invaluable to this study.

In addition to the 15 individuals listed on the previous page that graciously participated as interviewees for this CIA, we sought out the assistance of Native

Hawaiian Plant experts, Kawika Winter of the NTBG Limahuli Garden & Preserve and David "Kawika" Viets of the Kaua`i Native Plant Society. Their willingness to aid us in our quest to find living specimens of the Native `auhuhu plant was, and still is vital to our research and study; for it is key to understanding the traditions and direct links to both place name and cultural practice of Ancient Anahola.

Mahalo a nui loa iā `oukou for your generous support to contribute and collaborate to this success of this cultural impact assessment and study.

Interviews with Indigenous Hawaiians

Esther "Essie" Kaleialoha Williams was born and raised in Anahola Village and is the daughter of Teddy and Rebecca Williams. She recalled that she was a little girl when the first three houses went upon newly developed homestead land in Anahola.

"The first three homes that came up included Blossom Kauanui's house, Ah Wan Goo and Uncle Jerry Kaialoa on lots immediately ma uka of Kūhiō Highway. The second set of homes included your grandma and grandpa's [Helen and Miki Waiau], Uncle Isaac Poe, and Aunty Mabel Huddy".

Aunty Essie was not really aware of the details concerning the Anahola Solar Project and had several questions regarding its location and proximity to the highway. Her concern was the possibility of traffic distractions caused by the glare off of solar panels. When NK Interviewers shared an overview of the project in Kamalomalo`o, she was relieved and felt that it was pono or good for the benefit of everyone. Aunty Essie stated that whatever sites may have been there have long been destroyed by previous years of sugar and pineapple cultivation, saying that many of these lands were bulldozed and cleared for planting.

She was appreciative that a cultural impact assessment was being conducted by Native Hawaiians and residents of Anahola who had personal experiences of the old folks and the community in its early beginnings. She reminisced of the kūpuna who were integral in building the Anahola Hawaiian Homestead community and of their knowledge, values and life ways that naturally encouraged a great sense of love and `ohana.

When asked about cultural sites or resources, place names , etc. Aunty Essie reconfirmed that there was none associated with the project area. She was interested in passing on more information "when the time was right" at a later date perhaps.

**Leroy Ka`ona** has worked as a teacher at Kapa`a Middle School for many years and has volunteered his time as a soccer and basketball coach for school and community leagues. Uncle Leroy is in support of the solar project and he feels that it would benefit not only the Hawaiian people but also others. He also feels that it would restore the pride of the people and give them good opportunity for jobs. We had an opportunity to speak with him on his nephew's ma uka

homestead farm lot located on Hōkū`ālele Road. We inquired if he was familiar with any of the places names associated with the Kalalea mountain range or any of the heiau sites that exist in the area. Although he was not, he was very interested in learning all that there is about them. He mentioned that some years back someone from the community had volunteered to research and share of the place names. However, to date he hadn't heard of any progress being made. Uncle Leroy feels that knowledge and information of Anahola and Kaua`i place names and its traditional places are extremely important for it will help to instill a sense of place and connection for all Native Hawaiians and others who live in Anahola and on Kaua`i. He was very supportive and gracious to offer his help in disseminating information, flyers, announcements, etc. to the community if needed.

Llewelyn "Blondie" Woodward moved from the north shore to Anahola in the mid 90s. He expressed that he was very thankful that he has a home and homestead land in Anahola. However, at the same time he felt unsettling about a lot of planning and visioning efforts that the community has participated in, in the past that has changed. He inquired about how the Anahola community and residents will benefit from this development in the future moving forward. Particularly, if and how revenues generated will support and benefit the hosting homestead community.

We also spoke briefly about the wahi pana and heiau of `Aikanaka located just beyond the pasture land ma kai of his house. He said that his neighbors from the across of the street had cleared some of the overgrown brush and vegetation so that it is in view from their homes. That way, they can all sort of watch over it to make sure that no one vandalizes or causes any disturbances to the place. Without having to say anything in detail, it was evident to us that there was sense of connection and interest to mālama or care for and respect this sacred area.

Blondie's `ohana are lawai`a, practitioners of the imu, and preparers of Hawaiian food for `aha `āina and lū`au. In all of my years of growing up as a keiki in Anahola, the Woodwards have always been part of many family lū`au. They have helped to support and take the lead on kuleana of more than 3 generations of significant `aha `āina for our `ohana (Kekua, Waiau and Mahi families), including `Aha `Āina Pālala, `Aha `Āina Make, and `Aha `Āina Laulima. These were traditional commemorative Hawaiian feasts that marked significant milestone occasions for certain members of our familly in their respective birth to death life cycles.

The Hawaiian tradition of preparing food for occasions such as those mentioned above, engage in various cultural practices. In many cases, preparing duties are shared by members of the family, whether it requires mahi`ai that farm and plant taro, uala and other food plants, lawai`a - gathering limu, `ōpihi, wana, he`e, i`a, papa`i, hā`uke`uke, etc. Certain members of the `ohana are assigned specific tasks for gathering, preparation and serving of food items. And it is also something that members are trained and raised in as part of their upbringing.

The Woodward family are also renown and respected for their excellent catering services, which is an extension of their cultural upbringing and practices in `aha `āina traditions.

Kawika Cutcher continues to be an active member of the Anahola community and is fully aware of the Anahola Solar Project. He has participated in the meetings and community information processes that has been taking place over the past months. It is his mana`o or opinion that this is a positive project that will benefit the Anahola Hawaiian community in many ways. He feels that it is important for him to be a part of it for it is something that for his family and everybody that he is related to. It is far better to participate and help the community in opposed to just complaining. He sees this as a viable step toward independence and sustainability. "If we get the solar, we can make water," he said. "It too is another source to make electricity too. But if we get the water than we can get the lo`i back in working order again."

Kawika shared that there will always be somebody that is going to complain that there is a better way, but if there was, it would have been done a long time ago. Instead of complaining, he encourages others to participate and get involved. He is excited about the progress that has been done through AHHA and sees that the Market Place project alongside the highway is a positive example in the community.

When asked about possible cultural impacts that could be triggered by the development, he felt that the project area was long clear because of previous sugar and pineapple plantation disturbances upon the land. He is still adamant however, that Native Hawaiians practice their culture.

"We need to cut our selves away from the western stuff… know it. Make sure you know how to fish, hunt, grow garden, grow taro, get salt, pick `ōpihi, hā`uke`uke know when for go, when not for go".

Kawika thinks that the project is 99% good overall and 1% bad. Bad because there will always be someone that will be complain and be hard to please. It would be good to include the sun… especially the morning sun, the rising sun… even the moon, the solar can catch all of this. It's always so hot in that area. Kawika feels that the vision should be, "If one gets ahead they can help the next family and the next family…and it doesn't mean we have to be like the Jones's. It just that we need to be akamai… that's my mana`o".

John Ka`ohelauli`i was awarded his homestead lease in Anahola in 1991 and has long been an advocate for building community. He was somewhat familiar with the Anahola Solar Energy project as he had attended at least one meeting on the subject. He did not go into further detail, except to say that available funding for the purpose of informing community be used in different ways to encourage and engage the community in discussions for important issues and opportunities such as this. With peoples' work schedules and other things going on, it is very challenging to organize meeting opportunities that work for everyone. Perhaps there are other ways in which to achieve community outreach and participation. In all, he felt that the project does have great potential to benefit not only the Anahola homestead community, but the rest of the island as well.

We have had the opportunity to engage and work with John on various cultural projects in the past - mostly having to do with cultural education endeavors. He is a practitioner of crafting `ohe hano ihu or traditional Hawaiian nose flutes. Although simple in appearance, it is one of a few wind instruments that was used by our Hawaiian ancestors. John's knowledge of its culture and history, along with ancient mo`olelo or oral traditions of its creation and use is vast and valuable.

John Ka`ohelauli`i is also the foremost master on Kaua`i today of Kōnane - a strategic and analytical tradition that is often assumed to be a simple game that is compared to checkers. Kōnane was a chiefly pursuit that required skill and focus. Formerly useful in preparation, execution and application during times of peace and war, kōnane is an excellent means of socializing today. Especially so for fine-tuning one's concentration, patience and endurance.

John has made great strides on Kaua`i and throughout Hawai`i to revive this long forgotten ancient Hawaiian tradition. John is also an accomplished and published writer of short stories and contemporary mo`olelo.

Chono Fernandez is one of four children born to Lynette and George Fernandez Sr. He was born and raised in the Anahola Village and continues to live there today. His `ohana has resided in Anahola for many generations adjacent to the Anahola Village Park.

He is highly aware of the solar energy project due to his attendance at some of the community meetings. He is in support of the project, and emphasizes the urgent need and importance of opening up DHHL lands for agricultural use. His mother/family has been on the waiting list for an AG land lease since the 70s. He emphasized that with the opening up of more house lots in recent years that the community has expanded greatly. "This is great for Hawaiians to be put back on to the lands. However, as the population grows and more infrastructure is needed to support that population, it is absolutely necessary to already have in place plans to activate sustainable projects within the homestead community. This should be done by dedicating land for agricultural use to plant and grow food; vegetables, raise livestock such as cattle, pigs, poultry, etc."

He sees that there is an excessive amount of land that is not being used, he gestured to the hillside above of Anahola village park and said that if given the opportunity the entire hillside can be removed of invasive trees and vegetation and replaced with ulu, kukui, uala, squash, and other edible plants and vegetables. Aside of the hau that is growing there right now, everything we see is invasive and cannot feed our people.

Chono also has great concern for changes occurring ma uka that has greatly impacted the fresh water resources and it's natural flow patterns. He has noticed that the lower river is warmer in temperature than it is further up where it is closer to the source. He sees that this is bad for the fish stocks in the river as especially so in the muliwai. He said that these are signs of negative impacts caused by diversion of fresh water resources higher up on the ma uka lands. He is an adamant advocate for restoring water to the lands and the Hawaiian people in Anahola. He also shared that all inside of the heavily overgrown area beyond the Anahola Village Park are fresh water springs that people are not aware of. As newcomers purchase land in Anahola and alter the `āina, they impact the springs by filling them in and covering them up. He said that raising this awareness is vital to the land and the future generations of Anahola. He is unsure of whose kuleana or responsibility it is to maintain these areas. However, in speaking with the older uncles who are kūpuna today, they shared with him that in former times, everyone from the community simply got together and "made it happen". There was no heavy or fancy equipment. Just a sickle and

cane knife. It was done all by hand. The vegetation today is much more invasive and aggressive as compared to the past. The community is much larger and a lot of people don't know each other like before. Having a renewed sense of `ohana would be excellent for the community.

Chono is a lawai'a and engages in hunting and gathering - both on land in the ocean. He always sees mano in the same channels and ocean locations when he goes diving and throw net fishing. He recognizes and respects that these manō are true kama`āaina to these places and that their role is to serve as guardians of the ocean resources. In his frequent encounters with them he has never had any negative experiences, nor does he feel threatened by them in any way.

When asked about the various place names or other cultural practices associated with Anahola, he suggested speaking to other kūpuna in the area. Although he regrets that he did not have knowledge of the various Anahola place names, he is deeply interested in learning them soon. "Some of these things we just didn't think of its importance when we were growing up," he said. "But it's never too late to learn." Chono was happy to learn that a Cultural Impact Assessment was being done Native Hawaiian consultants kama`āina to Anahola. He looks forward to learning more when the studies (including the EA) are completed.

Kamealoha Smith is a Native Hawaiian whose focus is on Bilingual Cultural Education. He currently serves as the Director of the Ke Kaiaulu O Anahola Bilingual Educational Outreach Program that is based at the Ko`olau Hui`ia Church in Anahola. The program is designed to build support for community-based ocean resource management plans for the kai areas of traditional ahupua`a in the Puna and Ko`olau districts. The programs emphasize Hawaiian language, traditional fishing practices and marine science. He also helps/works with the immersion programs at Kawaikini Charter School and Kapa`a School. Currently, they have approximately 55 students enrolled to the program, ranging from ages 8 to 18. Approximately 10 adults aid and participate in the program as well.

Kamealoha is the son of Henry and Lillian Smith. As a young child, they lived in California, but spent summers in Anahola. When his parents were awarded a homestead lease in the 70s, their family moved back to Kaua`i to Anahola. He shared that his family has practiced fishing in Anahola for generations. Today he resides in Wailua.

When asked about any possible impacts - negative and/or positive that the Solar Development may have, he said, "Overall, I guess that it is a good thing since it was pretty much a done deal. It's hard to say anything negative, as we should move forward in support of it." Kamealoha is not for or against development. He wishes that the Hawaiian people could get a better deal out of it. He does feel strongly that revenue sharing should benefit the Hawaiian people. Especially so in support of educational programs. He sees a need for continued restoration of the lands - `Āina Ho`opulapula. He is primarily focused on the ma kai or ocean areas of Anahola and `Aliomanu and the districts on Puna and Ko`olau districts. As far as Kamalomalo`o is concerned, Kamealoha doesn't think that any cultural sites or resources still exist there due to the negative impacts already imposed upon the lands throughout the Plantation era.

NK Interviewers asked if he had any insight on traditional wahi pana, place names or mo`olelo that he might know of that he could share. Either pertaining directly to the project area in Kamolomalo`o, as well as in Anahola and `Aliomanu; from ma uka to ma kai regions.

Kamealoha expressed that there is so much to be uncovered. He mentioned of a traditional trail that they took between Keālia to Anahola but does not know if there was a name. When asked if it followed or was adjacent to the old cane haul road, he said that it wasn't. He simply refers to it as, "Ke Ala Hele O Nā Kūpuna" or "the trail trailed upon by the ancestors."

"I'm excited that every day that I get to spend time in our wahi pana and doing some things...you know, uncovering names, giving names to places that we don't have names for, just going with temporary names. So we've done a lot of renaming - just because we don't have a lot of information. But that'll change as soon as we get a little more information."

He responded that there were many places from Kahala to Palikū and that most people don't know.

"We've only speculated on the names that we have in Anahola. And for instance, like Pillars, I don't know what the traditional name is. But we just call it 'Ka Lae O Ma Waenakonu' which just means 'Middles' basically in Hawaiian. So a lot of it is taking the English names that we have now, and that's an example, instead of calling it 'Smith's Beach' I prefer that we call it 'Kai One O Kalika' even though that's the literal translation. But at least it's Hawaiian."

Kamealoha also shared that they don't have any information or names of the reef system that is in Anahola.

According to Kamealoha, "We are just calling it Papa Iki' which is the smaller brother of Papa Loa which is the ocean boundary for Anahola. You have Ka Lae Līpoa and Papaloa. So it's just making some common sense decisions. In talking with the kūpuna that we work with, I try to piece together what they are saying. The kūpuna that we've been working with include Uncle Vern Kauanui and Kumu Sharon Pomroy. A lot of it is based on experiences, right? We go by what peoples' experiences are and those are family-related. So, whether it is the appropriate way or not, we don't know. At least until I can get in and eventually have access to more information".

Native Kaua`i asked if Kamealoha had any knowledge of heiau in the project area as well as throughout the Anahola. We also asked if during his years as a Hawaiian language student in college or perhaps in designing the Kekaiaulu program if he may have come across any mo`olelo or traditional stories that mention Anahola, or are based in Anahola. Kamealoha replied that he didn't know of any names of heiau in the project area or in Anahola. He also advised that he hasn't been able to access any information regarding traditional mo`olelo.

John Pia was born and raised in the ahupua`a of Hanamā`ulu. As a teenager, he worked in the Pineapple industry on Kaua`i for Hawaiian Canneries when he was 14 years old...3 summers to age 17. So he is very familiar with the project area, all the way up to Waipahe`e (Keālia) in Anahola and the neighboring land divisions. He also worked in the pineapple fields up behind of Kalepa Ridge. It was hard work, 8 to 10 hour days and the wage was only 82 cents an hour. He explained, "We got paid every 2 weeks and all of the money went to help support our family". Of his pay checks, he only kept $5 or $10 at the most.

He was awarded a Hawaiian Homestead Lease in Anahola and moved to his Haku`āina Street home in the 70s - around 1978. Uncle John is also the caretaker that manages the non-profit Anahola Ancient Hawaiian Culture Exchange on land located in Anahola Valley alongside the Anahola Stream. It has long been a gathering place for the community since the 70s. He and his organization have also offered a Summer Ho`okahua program for children in the Anahola community.

Asked if he was familiar with Kalalea Mountain. He said that he has hiked and hunted to many places throughout Kaua`i and that he has spent a lot of time up at Kalalea. They primarily accessed the mountain through the backside or rear of the mountain. To access the mountain from the front, they would hike up through Ka`iwa Gulch.

On one of his treks to Kalalea long ago, he encountered an 8 foot beehive. He believes that the man who fell to his death some years back, (in his attempt to climb to the highest peak on the mountain) probably encountered a swarm of bees which he thinks was the cause of his fall. He said there are only certain times of the year when you can actually go up there without stumbling across hordes of bees.

In the 1970s, he and a friend, Mike Rhoades were the last ones to hike all the way up to the "Puka" or the "Hole in the Mountain". They would go up there to clean it out. When asked how large the hole was, he gestured and said that "it was huge" big enough to walk through and that more than one person could easily fit inside of it. Native Kaua`i estimated the hole size as described by Uncle John was at least 12 to 15 feet in diameter. After a rocky shelf eroded and collapsed, partially blocking the puka, he and Mike had intended to return up to the mountain to clear it. However, Mike moved to the mainland and they never got around to it.

Native Kaua`i spoke about the first pu`u in the Kalalea Mountain Range where there is a distinctive stone that can be seen from below. Uncle John made reference to a legend that there was a man who was running away from pursuers for a committing a wrongdoing. The man was turned into stone atop of the mountain. Uncle John didn't know the name of the pōhaku or anything further about the mo`olelo.

Uncle John described about 3 "lumps" up on the ridge, there is a platform that is a site. I brought Francis Warther, expert astrologer that has done extensive research on heiau sites on Kaua`i to the Taro Patch some years back to show and ask him about a site on his property. According to Uncle John, Mr. Warther told him that the features on his property directly correlated and was relevant to Kalalea Mountain.

Regarding Kīko`o - Name of Road to Taro Patch and Place Name on Kalalea

In the conversation, Native Kaua`i asked about the road named Kīko`o that leads to the Taro Patch; along with its meaning and if it is one of the mountain peaks that is part of the Kalalea mountain range.

According to Uncle John, Kīko`o is a stone that is attached to a rope that you throw to the shore to lash and secure the canoe to the shore. He also said that Kīko`o is not a peak. However, there is a marker on the third pu`u or rise. It is one of the natural landmarks that cites the boundary line of the division of the Anahola ahupua`a.

When referring to United States Department of the Interior Geological Survey Topographic Map of 1912, Kīko`o is noted as a triangulation station. There is a direct line from the ma kai boundary point of Lae Kuaehu to Kīko`o on Kalalea Ridge. This is the delineated boundary line that is adjoins the ahupua`a of Anahola to the south and `Aliōmanu to the north.

Regarding Taro Patches, Heiau and Cultural Sites of Anahola River Valley

Uncle John shared that in the old days, the entire valley was covered with taro patches. Later, they were converted into rice paddies and fields. There was an old rice mill in the valley just across of the river from his Taro Patch property. It was one of several in the vicinity.

Uncle John stated that according to some of the old maps of Anahola that he has, that there was a heiau by the name of Paeaea inside of the valley. Supposedly it was somewhere in the vicinity of the Taro Patch. However, to date he has never found the heiau or any remnants of the ancient site. He mentioned another heiau site that he located a long time ago on the bluff above of `Aliomanu overlooking Anahola river. This was prior to any of the homes being built in the area. (Today this is the Anahola Farm Lots) No walls intact, just remnants and stones that were formerly part of the structure remained when he first went there. He doesn't recall the name or any details associated with the site. He did say that today it is located on private property.

Regarding Plants Used for Traditional Lawai`a Practice of Hola

Native Kaua`i inquired of Uncle John's familiarity with the ancient fishing practice of hola that utilized Native plants such as `auhuhu and `akia. At first, he didn't recognize the plant names or the Hawaiian name of the ancient fishing method. However, when NK went into detail and described the plants and the process of preparation and application, Uncle John knew exactly what the interviewer was referring to. He was familiar with `akia, but not `auhuhu. Uncle John said that the name that they called the plant was "Beretonia" and that it was a vine. However, we were unable to find any reference or listing for a plant by that name. No description or additional information was given by Uncle John.

He did say that when this method was applied, all of the red fish were more affected by the plant than others. He said that it is the best practice for the reefs - especially in rocky shorelines such as those in Anahola and along the coastline. He also shared of another fishing method that included the use of the `ala`ala. or the ink sac of the he`e or octapus. Although he did not identify the method, we are familiar with this traditional fishing custom as, "Melomelo". Uncle John offered the following:

"*You use the `ala bag from the he`e. You cook it and burn it then rub it on a guava stick that has notches in it. You tie a rope to it and throw it in to the ocean. Then all the fish go to the stick. We would then fish in this way.*"

Regarding the Solar Project Development

John Pia is in favor of solar energy and renewable systems. However, he is strongly against the Anahola Solar Energy Development project on Hawaiian Homes Lands. He feels that DHHL lands are so limited and should be prioritized as lands for housing of Native Hawaiians instead of using 60+ acres for the solar project. For him, it is an issue with the shortage and availability of land for Native Hawaiians. Solar is good, but it doesn't outweigh the value of land. According to Uncle John, there are no cultural sites on or around the immediate project area. If there were any, they were destroyed long ago, prior to or at the time that the lands were designated for the cultivation of pineapple.

Kuini Smith Contrades was born here on Kaua`i in 1935. In 1938 their family moved to O`ahu where she grew up in Honolulu. Her father was William Smith and who married a Lovell. Through his side of the family, they are related to Hanohano Pa who was renowned for his knowledge and expertise of the entire Nā Pali coastline, Kalalau, Hā`ena and all of the fishing places, etc. He was also an excellent hunter and planter as well that lived and sustained his family off of the land and ocean resources. As a young child, she learned and studied hula under the late hula master, Sally Wood Naluai. She later married Franklin Manu Contrades, and after having four of their children moved to live in San Francisco in 1957. 11 years later in 1968 they were given an opportunity to lease homestead property on Makaio Road in Anahola where they raised the rest of their family. She and her husband Manu made sure to immerse their children with an upbringing of Hawaiian values and love for their culture. She made sure that all of them learned to sing and play Hawaiian music, as well as dance hula (both sons and daughters). Eventually, they all grew up to perform professionally in different shows and venues throughout Kaua`i. It was not unusual to see mother, father, sons and daughters sharing the same stage.

In addition Aunty Kuini continues to sell leis on another small DHHL leased parcel across of Whalers General Store and the Post Office in Anahola just ma uka of Kūhiō Highway. She has been a lei maker all of her life and continues to enjoy it today. She shared a story of how a couple of young Hawaiian boys had ran out of gas on the highway. They came to her lei stand and told her that they had run out of gas and had no money on them. Upon their asking to borrow $5 to go and buy gas for their car, she asked them to pick plumerias off of the tree near her lei stand. Afterwards, she told them that they could sew two leis and that she would buy the leis from them instead. When both of the boys replied that they had never sewn a lei before, she proceeded to teach them how to do it. After the impromptu lei making lesson was over and two beautiful leis were completed, Aunty Kuini "bought" the leis from them for $10.

At the end, not only were they able to fill their stalled car with gas, but they had reaped the privilege of encountering a gracious kūpuna who imparted a valuable lesson of Hawaiian values by sharing, teaching and coming to their aid.

Aunty Kuini reminisced of the old days in Anahola which was not nearly as populated as it is today. She remembers as a little girl all of the rice paddies that were formerly taro patches from long ago. "We liked that type of life that we had back then," she said. And still feels that she could ease into that simple lifestyle again

When asked about the Solar Project development area immediate south of Anahola on DHHL lands, Aunty Kuini mentioned that she had heard about it but really didn't know anything about it.

Diane Lovell O'Reilly resides down in Anahola Village alongside and nearby many of her relatives that have lived in Anahola for generations. She had deep concerns about the Solar Energy Project and felt that 60+ acres was a lot of land that should be used to develop housing for Native Hawaiians as well. She questioned why couldn't KIUC find land closer to town. "This area that the solar farm is going to built, it's flat land," she said. "It's more suitable and greater to put up at least 10 families." She felt that so many Hawaiians have already been waitlisted to be awarded a homestead lease and that it was unfortunate that this large amount of precious land would not be used for that instead.

"So many of our people have been waiting 20-plus year, even more than that to get on to the land," she shared about Hawaiian people who have applied for

DHHL homestead land leases. "Using the land for housing or even agriculture would benefit our people more".

As she was unfamiliar with what a solar energy farm development would look like, we showed her the example of the solar project that has been built in Kapa`a. She was pleasantly surprised at the low density of such a project and felt that it'd wouldn't be such an infringement on the visual impacts in the area that has been targeted for solar development in Anahola. She did raise other questions, including cost and maintenance responsibilities and how that would affect Native Hawaiians in Anahola.

When asked if she was familiar with any cultural resources or possible impacts - whether negative or positive upon Native Hawaiian cultural practices, she shared that "the area should be cleared and replanted with Native Hawaiian plants that were culturally useful for our people." Aunty Diana also shared that her Aunt - her father's sister, was Rosalie Lokālia Lovell Montgomery, the famous hula master who was instrumental in reviving hula kahiko as a traditional cultural practice. When asked if she or anyone else in her `ohana learned and/or carried on Aunty Lokālia's hula traditions, she said that there was no one that did. She explained that she was named after her, but she too did not learn. She said that Aunty Lokālia moved to O`ahu and then later to Kona on Hawai`i Island to oversee the Hulihe`e Palace. "She [Aunty Lokālia] was very famous and she and her troupe traveled all over the world to perform."

Healani Trembath is a keiki o ka `āina of the Hule`ia Valley and ahupua`a. She is the Manager of Alu Like's Kūpuna Program for Native Hawaiian Elders called, "Ke Ola Pono No Nā Kūpuna". She has been managing both the Anahola and program was well attended by a large number of kūpuna - consistently filling at least 2 or 3 full-size vans. Formerly, the program was held 3 times a week on Monday, Wednesday and Fridays. Due the decline of kūpuna enrolled in the program, and more so, due to drastically cut budgets, the Anahola program only meets once a week on Wednesdays. They average anywhere between 5 to 8 kūpuna a week nowadays.

Aunty Healani expressed a deep interest with several very important questions, first, wanting to clarify if there was a clear title to the ownership of the land dedicated to the Solar Energy Project. "Who owns the land? Is it ceded lands? Has the title and ownership of that land been verified?"

NK Interviewers explained that the land technically falls in the Kamalomalo`o ahupua`a and that the project area in on Department of Hawaiian Homes Lands. It was also shared that 6 project-specific community meetings were held in Anahola to discuss the Solar Energy development.

Aunty Healani also said that not much has been heard about the project aside of the one article that appeared in the Garden Island Newspaper. And like the others, are not clear on the project and what the larger scope of the development entails. She suggested that a posting calling for lineal descendants who may have genealogical ties to the lands be put out to the media i.e., OHA Newsletter, Local and Statewide newspapers, etc. Even if the project area was previously cultivated in sugarcane and pineapple, she is still concerned about possible disturbance of iwi kupuna and unmarked graves that could very well be there.

Leonora Kelekoma is 82 years old and along with her husband, Clay Kelekoma was awarded their Anahola Homestead Lease in the 60s. She lives adjacent to the Anahola Clubhouse and Park. She has raised all of her children and grandchildren in Anahola. Aunty Leonora recalls that the project land area was mostly used in the past for sugarcane and pineapple. Her family are active lawai`a or fishermen and she too, still goes "holoholo" or shoreline gathering and fishing in Anahola till today. While Aunty Leonora did not say too much about the project specifically, she did speak a lot of how Anahola was like in the early years of the community being built. She and her husband moved into Anahola when the second or third unit of homes were built ma uka of Kūhiō Highway on Kalalea Road. One of the things that was very important to the people in the community at that time was to establish a place where they could meet and gather. With a lot of drive and persistency, the Anahola Clubhouse was built and the surrounding 4.95 acres of land was designated as a park. She feels that places and opportunities to have the community come together is very important.

Note: Native Kaua`i later found that Aunty Leonora's husband, Clay Kelekoma has a pastoral parcel that is likely to be affected by the solar development project. This did not come up in our discussion with Aunty Leonora, nor did we have an opportunity to arrange to interview her husband due to time constraints of meeting the draft CIA deadline.

**Carol Mano`i** was the youngest in the group at 64 years of age. She is of Hawaiian and Portuguese ancestry and currently resides in Kalāheo on the south side of Kaua`i. She actively attends the Alu Like Kūpuna program that is held in Anahola every week. Aunty Carol shared that she has seen the Solar Energy Farm that is located up in Kapa`a and that she thought they did a good job in setting it up the way that they have it. "You can hardly notice it as they have planted around it," so it doesn't have too much if any, visual impacts in my opinion.

NK Interviewers shared that part of the plan of the Anahola Solar Energy Project is to include facilities within the service center that will be available for community use.

Jodi Hashimoto-Omo is a homestead lessee in Anahola where she has made her home for many years. Her family has a long history of lawai`a practices associated with fishing and the ocean, as well as with mahi`ai cultivation of kalo.

She sees solar as a renewable energy source that is primarily good and positive for the community. However, she is not aware of the details concerning the Anahola Solar Energy Development project. She mentioned that she had once participated in meetings that were announced to the community as urgent. But it was not on the Solar Energy Development. The topic of that meeting involved Federal grants that were being looked at for the funding of the Bike Path that would connect the existing path in Keālia to Anahola.

"We had grave concerns about that because of the negative impacts on our fishing practices and traditions, access issues, etc," Jodi explained. " It seemed so rushed with a lot of pressure to go after the funding and meet posted deadlines by pressing the community to buy into the [bike path] project."

Jodi has many questions and concerns about the Solar Energy Development project. She also wants to learn more about it and of its potential affects. Native Kaua`i shared that the project was already in progress and in the stage of completing the necessary biological and archaeology studies, as well as the cultural impact assessment, etc. done as part of the required draft Environmental Assessment. Jodi was concerned at the limited timeline to press forward, stating that it seemed so similar to the previous "rush" to gather input from the community to meet Federal Grants and other funding deadlines. "People need to be given ample time to really assess the whole project," she said.

She asked if there were any water sources that would affect anybody in the Anahola community. We touched briefly on the inoperable reservoirs that are on DHHL's Anahola and Kamalomalo`o lands and of the vision to repair and rejuvenate those sources so that they can support agricultural leases and projects.

She is not opposed to sustainable and renewable energy development, but there is still concern for more outreach into community. Like others, she really wants to learn more. She also has questions and concerns about possible health and environmental impacts. Jodi asked if any other studies have been done to address long term affects of solar systems of this magnitude? These are her immediate concerns at this time. Native Kaua`i advised that there will be opportunity to review and comment on the Draft EA when it becomes available in the near future.

She is happy to discuss further, other points associated with cultural practices and resources later. But for now, this is her mana`o and what is most urgent to her.

Frank Cummings Jr. is lifelong resident and lessee on Anahola Homestead land. He is the hiapo or eldest offspring of Gary Frank Cummings Sr. and Ruby Cummings of Anahola. He has actively participated in the community and AHHA meetings and is thoroughly informed of the Solar Energy Development project. Frank sees that this is a great opportunity for the community with many short and long term benefits.

He was gracious to provide a historical overview of the DHHL Kamalomalo`o lands that has been designated for the Solar Energy Development project.

"For more than 70 years, the Plantation had full use and control of the lands from ma uka all the way to ma kai. In 1997 with the closing of the plantation, the land came back to the DHHL inventory. The plantation was paying only $17,000 a year on an annual lease for approximately 5000 acres. Through the negotiations led by HCDC and KIUC for this project, a 20 year license to lease trust lands for non-homesteading purposes would yield $3.2 million."
Under the prior scenario with the Plantation's lease of only $17,000 year for 5,000 acres, DHHL would yield only $340,000 in revenues over for a 20-year period.

"There are other benefits that have been negotiated for in the Homestead Benefits Agreement Summary. It will include employment and business

contracting opportunities, internships, fellowships and employment training, engage local residents including homesteaders and their businesses to perform short and long term operations and maintenance contracts to name a few."

We spoke with Frank if he had any recollections or knowledge of cultural and historic properties on or adjacent to the project area. He advised that he had accompanied the archaeology survey team lead by Thomas Dye and that there were no findings at all of the test sites.

When asked about any additional sites or cultural resources anywhere throughout the Kamalomalo`o and Anahola ahupua`a regions, he touched upon the following:

He pointed to a map explaining the location that he referred to as "Beach House" and asked if we had ever been to a spot overlooking the bay. We acknowledged that we were familiar with the area and know it as Keanapālau. Frank also shared that he has hunted and hiked Kalalea mountain via Ka`awa which is an access point on the front or ma kai face. Many hunters are also familiar with the terrain. Frank shared that Kalalea is also a source for maile; different from the kind that grows in Kōke`e, but nonetheless, fragrant and beautiful.

*Native Kaua`i: I recalled how my hānai brothers and sisters of the Gardner `ohana next door would always have maile and even mokihana from Kalalea for May Day each year. I was perhaps 4 or 5 at the time, but the memory is vivid and clear!

Frank also shared about pristine streams, ancient lo`i terraces and a ko`i or adz shaping quarry in deeper upper valleys of Anahola ahupua`a.
What is a high priority item for Frank is working with AHHA to move forward with moving forward with plans to return flowing water to DHHL's agricultural lands of Kamalomalo`o and Anahola. He explained that the reservoirs have been dried up and have not been maintained since the closing of the Plantation. There is great potential to repair and restore waterways, ditches and reservoirs so that the water can nourish the lands again. Frank pointed out that it was important to at least find a way to get to the point where the reservoirs can be partially filled so that the aquifers can be replenished again. The system is designed and engineered to support one another. This is essential to the future and success of our people on Hawaiian Homelands.

Frank exclaimed, "Water is important, because water is life, right?!!!"

Valentine Ako is a Native Hawaiian kūpuna born in 1926 in Kona on Hawai`i Island. He has made his home on Kaua`i for more than 60 years, having married his wife Elizabeth who is a Native of Kaua`i. Today, at 86 years old, Uncle Val is one of Kaua`i's most knowledgeable kūpuna living today. He was raised in a different time in a traditional and sustainable lifestyle that was dependent on ocean resources and good relationships with `ohana . `Ohana to Uncle Val not only includes immediate relatives, but extended "family" members in the ma uka or upland areas who were farmers and planters. He grew up in a coastal Kona village before electricity and in-door plumbing. After the sun set, light sources were provided by kukui hele pō (kerosine lanterns), kukui lamakū (torches). There were many Hawaiians and no one was considered "poor". Everybody was well fed, for they depended on the ocean and used to barter with the people up ma uka in the kuahiwi. Throughout his upbringing, he was exposed to the old traditions and cultural practices that were very much alive during his childhood and adolescent years.

VA: Because you are sincerely interested in whatever is discussed, I am willing to share. So what is the agenda for today?

We explain that we are working on a CIA for a Solar Energy Development project immediately south of Anahola ahupua`a where there's a large open space ma uka of Kūhiō Highway. Uncle Val immediately responds knowingly, "Kamalomalo`o area?" We continue with an overview of the project and provide him with as many details.

VA: My mana`o now is, I disagree with that because who is it going to benefit? Not the Hawaiians. They are using our land for their benefit. I've been in four corporations and four of them had fizzle out. Number 1, the financial part of the corporation the members don't get any of the information like what KIUC is doing. I want to know how much a person makes?. That's my question. When they form these corporations the members should know what the heck is going on. My mana`o as far as electricity on Kaua`i is to sell the corporation to a state entity like Hawaiian Electric, so now Hawaiian Electric can have Honolulu, Maui, Hawai`i and Kaua`i.

When I first moved to Kaua`i we had Kaua`i Electric and Kapa`a Electric. You know where that Otsuka building is? Right there, that is where the plant was back in the 50s. The owners of Kapa`a Electric was Otsuka and the Fernandes family, so now only Kapa`a had electric, Anahola never had yet… it wasn't until Kaua`i Electric took over then Anahola had. You know the folks in Wainiha had

electricity because of the power plant. This was the only two places that had electricity.

KK: And this is in the 50's?

VA: Yeah, so I'm familiar with all this electric entities entering the State of Hawai`i.

KK: Mahalo nui, Uncle. When we spoke on the phone the other day, you shared a bit of your experiences and knowledge about Anahola. Is it possible for you to touch upon that again? And maybe, even anything you feel is important for us to know about Kamalomalo`o?

VA: Yes, for sure I can. I'm very happy to. Before I do that let's have `ohana first.

Note: `Ohana is a traditional term used by Hawaiian kūpuna or elders to gather for family prayers. It is short for pule `ohana. When we are pau, Uncle continues:

VA: I want to share with you why I do this. You know why I do this? I was baptized in the Protestant Church. Mama and Daddy taught me tradition and culture. As I grew older Mama and Daddy started teaching little more. Number 1 is tradition. One thing I give them credit for is that they always told us, 'Don't spoil the name of the family and do not lie and do not steal and to respect the elders'… and that stuck with me until this very day. And whatever we have we must share… never to hoard, and this is my life style and whatever you folks have to ask, whatever I know I will share with you. No strings attached, it's part of my life.

KK: We are very grateful we have you to share and teach us, a lot of what I know today is because of kūpuna like you who was generous enough to share the information. It's harder for us because we did not grow up in that time… but you did. It's so valuable to us.

VA: I was brought up in a big family. There were 7 boys and 7 girls. There were 21 of us altogether which included children from my father's other relationships," explained Uncle Val. "I was sort of a loner," he said. "And felt rebellious as a child sometimes because I was often singled out.

Uncle Val spoke of his father who was a lā`au lapa`au man who was very well versed and knowledgeable in the ancient practices of herbal

VA: healing. He was quite a prominent man in the village. Out of all of the children in the family, as a young boy, Uncle Val was always the one who had to gather all of the herbs. He said that everything was done secretly and that he was not allowed to ask questions. One simply paid attention, listened, and followed instructions. That was his personal experience with his `ohana.

I had quite an experience, my mama was a very talented person, and everything she did was all self made you know that lauhala hat that's her, she was the designer.

His makuahine or mother was very skilled in working with her hands, especially so when it came to the weaving of lau hala. He explained how as a child, he was the one that had to do all of the dirty work; including gathering, sorting, cleaning and removing the kukū or thorns from leaf edges and midrib of the lauhala. After that was all done, he would have to straighten and soften the leaves with a wooden roller, then assemble them neatly into a kūka`a which is a rolled pack of lauhala fronds ready for plaiting. She wove many different items out of lauhala. However, the one thing Uncle Val continues to be amazed with was a very unusual sleeping mattress (not a mat) that she wove out of lauhala. They called it a "nu`a" but it was not simply a pile of mats as the word is defined in the Hawaiian dictionary. This nu`a was intricately designed and woven with sides that could expand somewhat like an accordion. It was a uniquely woven lauhala mattress that was filled with stuffing to make it soft. Uncle Val has never seen it anywhere else.

Uncle's sister is, Elizabeth Ako Lee who is one of Hawai`i's most renown masters of lauhala weaving. As a child, she was hānai'ed to her aunt and uncle in Kona. By the age of 6, she had learned to gather lauhala and was weaving simple mats and other items.

VA: Like I said I was baptized in the Protestant Church but Mama and Daddy's god was not our lord… my mother's god was Pele, my daddy's god was the manō.

Uncle Val explained how the old folks were so intelligent and smart. He often wondered how they managed to know exactly how, where and when to go out and catch certain types of fish. He witnessed old methods and techniques of fishing that are still extremely valuable today. His kūpuna and mākua communicated and interacted with large resident manō who would assist the lawai`a by herding and chasing fish into their nets. There was a reciprocal

relationship between the people and the shark. One looked after and took care of the needs of the other.

VA: My most important part of life is to educate my children because I wasn't educated, I never played politics. As far as fishing it is so important today that the younger generation accept what our kūpuna's have to share, never to say no that's for your day. There's certain methods of fishing you cannot change that we learned the hard way from our kūpuna and I am willing to share with you anytime. You know I've had competitions with the biologists. There are so many things that they will not accept or believe about things of the ocean that I know and learned from my kūpunas. So now, I don't bother to try and convince them [biologists].

There is particular species of fish called manini. Manini doest hatch manini. I learned through the kūpuna that during whale season the whale spits out a sack - jelly fish like, and it floats toward the shore. And the wave bashes it up against the pali and all the little manini swim into the little tidal pools, we call that kaheka. That manini you can get, at sunrise you can find the sack. When the sack busts open the only way you can identify this manini is the eye and the `ōpū, the rest is transparent.

(NK note: Hāuli is the Hawaiian word for small fish with formerly transparent body beginning to darken; it is also the term used for the embryo of a human or animal)

AA: How small and how many are there in the sack?

VA: There are millions of them. Then, as soon as the sun strikes, then they turn green. I have observed this with my own eyes time and time again growing up. This is not a common thing. It is extremely rare, but nonetheless, a very special one.

AA: Do they come out of the whale in the sack already?

VA: Yeah, that was the relation between my kūpuna and me. The manini in Wake Island is by the acres. But that is a mystery that nobody knows. The biologist from the mainland says that the wahine manini going spread her sperm on the bottom of the ocean… that's full of bologna.
There's a lot of mysteries that happens here on Kauai, like Lumaha`i, over there get sand beach… there's one type of crab that we call Paiea that stays inside of the water.

KK: Does it have a hard shell?

VA: Yes, and its brown and fuzzy. For some reason which we cannot understand, there are times this group of pai`ea form into a ball and they roll onto the sand. That only happens down at Lumaha`i.

KK: What about in Kona? Does this same phenomena occur with the Pai`ea there?

VA: No, Kona get Paiea but just a little at a time. There are a lot of things that happen on Kaua`i that is different elsewhere…I learned all that from the kūpuna over there you know. Have you ever heard of the fish they call Kawalea?

AA: Yes that's the Hellards barracuda.

VA: Yeah, that is the best fish for poke and kaula`i for dry, how many people know.

AA: They travel in schools yeah?

VA: Yes, that is one of the best eating fish, but how many of the young mākua know this.

AA: Nobody. I myself had never heard of it being desirable this way.

VA: A good example: Hā`ena the haoles call that place "Tunnels"… that's Mākua, these are names that we should retain.

KK: Ae. You bring up a good mana`o about place names, Uncle. People do not realize that in the traditional names are stories and pertinent information that are so important to us today. Kama`āina and malihini alike. Our kūpuna were closely connected to these places and they held special aloha for their birth lands. Mākua is an excellent example because it reminds us of that connection that the kupa or Native Hawaiians of Hā`ena have with that place. Mākua is the name of the reef that is there. In the waters around it, inside and on its papa (reef) are i`a (fish, shellfish and sea creatures) and limu (seaweed) that feed and nourish the people. To the Hawaiian people, the ocean and reef life are Mākua to them...just as a parent feeds and nourishes his/her children; Mākua - the place, provides all that is needed for the people.

VA: Pololei. How we got involved with Anahola… Aunty's (his wife, Aunty Elizabeth) great-grandfather was the pastor for Ko`olau Hui`ia Church.

KK: The one in Mola`a or in Anahola, because originally it was in Moloa`a right?

VA: Yeah, it was up in Ko`olau… there's a lot of history there. When I read the scriptures it says "milk and meat" they fed our ancestors in Christianity only milk… and had they shared the meat our choices would have grown. The most important part of Christianity is the meat. The ministers today only give the people spiritual milk. I've been a Protestant member of Ko`olau Huia church for 59 years and I have seen pastors come and go and none of the pastors ever shared spiritual meat it was always milk… and that is why the Protestant churches has dwindled until this very day. When the missionaries came to Hawai`i, the name that was used was "Kalawina" Presbyterian… as they captured all the Hawaiians into Christianity they became congregational. Then in the seventies they wanted to abolish the past congregational and became the "United Church of Christ."

VA: Were talking about Anahola, now the people in the village were not right. Anahola was called `Āina Ma`i, it was a sick village.

KK: About what time period is this?

VA: I would say about from the 1800's. From Ko`olau when they moved to Anahola.

KK: Why do you think they moved from Ko`olau to Anahola?

VA: The population was dwindling and the lease in the village at one time was 999 years. The whole village had a 999 year lease. There was only Hawaiians inside there, this is history.

KK: What kind of sick did they have in the area that was referred to as "`Āina ma`i?"

VA: They had TB (Tuberculosis) etc.

KK: Do you remember some of the original families that lived in Anahola Village?

VA: I can name all the families that lived there… There were the Kaleiohi's, Uncle George Kaleiohi, Ephram Kaleiohi, the Williams `ohana, the Valpoons and others.

VA: I don't know if you ever heard of Ben Ohai?

KK: Yes I have. I have heard his name before. Is he not the `ohana of Levon Ohai? If he is his kūpuna kāne (grandfather), then this is the same Ben Ohai that he learned lā`au lapa`au from.

VA: Ben Ohai was our leader, we got together and fought for Anahola, Kekaha, Moloka`i, and Big Island through the Hawaiian Civic Club. We pushed Hawaiian Homes to get the land back to the people. When we got the land, who is the one that told us, "pālau lelo, you tell tales and exaggerate. No waste your time!" They were the ones that got the land, the people that doubted us. Through our effort they got the land, I was young and looking forward to our Hawaiians to get land because we never had land. The first increments were 1 acre parcels and then they had cut em down to little over 1/2 acre.

KK: Where did they first build?

VA: Up ma uka, you know where the… up on the hill, we fought hard for that, only to get that remark… Pālau lelo, you not going get nothing. All of us fighting already had land. We were fighting for those who did not have land. I want to go to the meeting and explain to the commission to explain that they need to recognize Uncle Ben Ohai… he was the forerunner for all the land here on Kaua`i associated with Hawaiian homes, they never recognized him… and he always told us "no give up".

Now getting back to fishing… Uncle Andrew Lovell, he was the head kilo man for Anahola. As long as Uncle Lovell lived, Anahola always had akule,and his aina was from Anahola to Kāhili… that was his `āina. When I first came to Kaua`i, I was very observant. One kūpuna in Hā`ena showed me all the Ku`unas from Hā`ena to Nu`alolo. Ka`aka`aniu is the true name for what they call, "Larsen's Beach". Larsen was the manager of Kīlauea Plantation. That place is Ko`olau. Above of the beach the name is Lepeuli.

VA: As far as Anahola goes, it was always noted for akule. That kūpuna (Uncle Andrew Lovell) had show me all of the ku`una's… but where I come from, my Tūtū always told us, "When you are in a strange place do not abuse."

I felt that it is true, so I never shared with anybody, not even my mo`opuna. All the ku`una, I felt belongs to the people there of that place.

KK: I remember many hukilau and how the entire community would go down to the beach to help bring in the akule nets. Word spread like wildfire when they would surround the akule in Anahola Bay. I was a little girl, but I always used go with my grandparents. It was so exciting and there was so many fish! Literally, enough to feed the entire community.

VA: And in Moloa`a, that's another place, the akule used to come inside. If the akule stays outside he (Uncle Andrew Lovell) would have "mihi" on the beach and he would tell the families that somebody is grumbling. After we have the `ohana *(`ohana pule, ceremonial prayer)* the akule come right on shore, they no need big net. I was watching some of those people, so stingy! In those days the women used to wear bloomers right?

KK: Yes

VA: They scoop all the fish into the bloomers then they run up the beach to dig hole and bury the fish, and then go back and get some more. In the mean time everybody is stepping all over and they forget where they buried their fish. When they go back and look they cannot find um. Uncle Andrew never did retaliate, everybody got fish and the leftover he would sell… that's how.

There is an old saying that the kūpuna shared with me:
"The fish have eyes to see and ears to hear," and as long as you grumble they not going come in. So I had access to all this that the kūpuna's related to me, the fishing methods. Uncle Andrew Lovell was a very loving person.

Later on, after Aunty's great-grandfather died, Uncle Andrews family and I used to clean that land by the church (Ko`olau Hui`ia), all the plum trees… so big you cannot put your arms around them. Took me 4 years of my own time to cut and burn them. I took care of the graves for 28 years, when I turned 70, I had to stop.

KK: When did uncle Andrew pass away?

VA: Way back in the 70s.

AA: Uncle Val, the other day when we were talking on the phone, I asked you if you were familiar with a Native Hawaiian plant called, `auhuhu? If you don't mind, we'd like to revisit that topic and perhaps expand upon the ancient fishing tradition and method of hola.

VA: Yes, I am very familiar with that. In Kona, they had plenty of that plant. We would gather it, and pound it to make the juice come out. The smashed plants are then put into an `eke (bag) and then into the water where you shake the bag around to release the poison. This is done around the pukas (fish holes) tide pools and reefs along the coast. The juice from the lā`au is strong and it stuns the fish. We put the net around the puka and the fish just float up. The poison only affects the fish. It doesn't affect the taste or humans. The fish is fine to eat and there isn't affects at all.

VA: We would fish like this only in certain areas, not often. After pau, you leave that pace alone for at least 3 months to conserve and replenish the fish supply.

VA: You (gesturing to `Aikāne) are a young mākua that loves the ocean and lawai`a. Another thing that I learned and I want to pass on to you is this: Whatever you catch, if you see a kūpuna on the beach, you take your best fish (or fishes) and you and give it to them. You don't ask. You just give. If you live your life this way you will always be blessed.

`Aikāne and I both mahalo Uncle Val for sharing so generously of his `ike and experiences with us. With the formal interview completed, we spend a few minutes talking story with Uncle Val about his perfected process of making `inamona.

Other Interviews

Kawika Winter is the Executive Director of National Tropical Botanical Gardens' Limahuli Garden and Preserve which is located in Hā`ena on the north shore of Kaua`i. He was specifically contacted to inquire of the `auhuhu plant and any information that he may have regarding its use for traditional fishing practices. Via e-mail response, Kawika confirmed that he knew of the `auhuhu plant. This is his response:

RE: Auhuhu Plant

Tuesday, April 24, 2012 12:25 PM
From:
"Kawika Winter" <kwinter@ntbg.org>
View contact details
To:
"Kehaulani Kekua" <kehaulani.kekua@kaieie.org>

Aloha mai kaua e ke kumu,

Sorry it took me a few days to get back to you. I went to Hana for their taro festival and a hale-construction workshop.

Yes, I know `auhuhu. As I was taught, stunning fish in tide pools using either this or `akia was a practice reserved for the kupuna who were too old and feeble to go very far to get fish. Here's a picture: http://data.bishopmuseum.org/ethnobotanydb/ethnobotany.php?b=d&ID=auhuhu

We don't have any here. I've been wanting to get some, so your inquiry gives me some good motivation. Did you need some soon?

And those dates work well for us. During the work week would be better for us if it can fit into your schedule.

Ke aloha no,

Kawika Winter, Director

Limahuli Garden and Preserve

David "Kawika" Viets is a horticulturist, specializing in native Hawaiian plants and trees. As an artistic landscaper, knowledge of native species and unique tropical plants that are best suited for a location are his primary tools for creating distinctive gardens. Kawika loves to see plants and communities growing together. He is a resident of Anahola on Kaua`i as well, and has long served as a supporter of Kanuikapono Charter School in Anahola where he assists with its Native Plant programs and nursery. Kawika is also the proprietor of Koki`o`ula Nursery and Landscaping.

We contacted Kawika to ask him if he knew of the `auhuhu plant as we had searched throughout Anahola from day one on the project to no avail. Kawika was familiar with `ākia and its similar uses and affects in traditional Hawaiian fishing methods. However, `auhuhu was not known to him. Alternative plant names for the `auhuhu including `auhola, hola, and pōpō `auhuhu were also provided to Kawika in the event he was able to locate the plant through his own additional research or networking efforts.

Summary of Findings

Guidelines for Assessing Cultural Impacts

Number	*Requirement*	*Discussion*
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.	Consultation Methodology & Results
2	Descriptions of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.	Selection of Interview Subjects
3	Ethnographic and oral history interview procedures, including the circumstances which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.	Ethnographi-Oral History Methodology
4	Biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area.	Biographical Information of Interviewees
5	A discussion concerning historical and cultural source materials consulted, the institutions and repositories searched, and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations, or biases.	Historical & Archival Research
6	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.	Cultural Resources & Practices Identified
7	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.	Cultural Resources & Practices Identified

8	A discussion of confidential information that has been withheld from public disclosure in the assessment.	Confidential Information
9	A discussion concerning any conflicting information in regard to identified cultural resources, practices, and beliefs.	Confidential Information
9	A discussion concerning any conflicting information in regard to identified cultural resources, practices, and beliefs.	Confidential Information
10	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.	Analysis of Impacts
11	A bibliography of references, and attached records of interviews which were allowed to be disclosed.	Bibliography
Source: State of Hawai'i Environmental Council, *Guidelines for Assessing Cultural Impacts* (1997)		

The remainder of this chapter summarizes Native Kaua'i, LLC's findings with respect to each of the required topics. Each informational requirement identified in the above table is discussed in its own subsection, with a summary of findings and conclusions and, where appropriate, relates the requirement to other sections of the document.

Consultation Methodology & Results

As with the composition of the CIA document, consultants from Native Kaua'i, LLC employed interview methods consistent with indigenous Hawaiian values (cf. pp. 1-12, pg. 152). Specific values and methods applied to the interview process included:

Kukākukā, also known among locals as "talking story", is a quintessentially Hawaiian approach to sharing information intended to avoid being seen as *nīele* (i.e., nosy or meddling) and instead being perceived as *'olu'olu*—gracious—in conduct. By approaching the specific interview topics in an indirect manner, Native Kaua'i LLC's interviewers communicated a level of sincerity and respect for the interviewee and subject matter and so avoided their curiosity being interpreted as *maha'oi*, i.e., brazen and forward.

Aloha, or love and abiding regard for the Hawaiian landscape and culture formed the basis for the interview process, communicating deep affection for the subject matter and individuals involved.

Ha'aha'a, or a sense of humility, particularly when speaking with *kūpuna*, where a single pejorative act or statement could create a sense of offense in the interview subject which would lead them to withhold their insight and experience.

Ahonui, or patience, and a measured tempo to the contact and interview process which allows for a sense of comfort, familiarity, and trust to emerge.

Hō'ihi, respect, both for the interviewee and for the subject matter were kept at the very heart of the interview process and shaped the methods employed by Native Kaua'i, LLC.

To these ends, the use of recording devices and a standardized questionnaire were not employed unless requested to do so. Interviews were conducted in individual and small-group settings in homes and back yards, or at the Ke Ola No Nā Kūpuna program at Anahola Clubhouse. Conversations were allowed to flow toward, and at times away from, the specific subject of the Anahola Solar Project as the interview subjects deemed appropriate. Finally, the interviews have not been made public but are instead summarized in this report, so that interviewees may have an opportunity to read and if desired, correct or readdress the presentation of their *mana'o* or viewpoint.

Selection of Interview Subjects

As noted on pg. 151 *Native Hawaiian Cultural Consultation*, an assessment of cultural impacts gathers information about cultural practices and cultural features that may be affected by actions subject to HRS Chapter 343, and promotes responsible decision-making. This process is informed by meeting and talking with members of the indigenous Hawaiian community in the area affected by the proposed action. In the preparation of this CIA, representatives of Native Kaua'i, LLC identified certain criteria which guided the process of identifying individuals familiar with cultural practices and features in, or near, Anahola and Kamalomalo'o ahupua'a (cf. pg. 151). Factors which were considered in the evaluation of potential informants were:

- Was the candidate an Indigenous Hawaiian?
- Was the candidate from the Anahola-Kamalomalo'o area?
- Was the candidate a *kūpuna* or elder, with memories and personal experiences of the project area?
- Was the candidate a *mākua*, or member of the parent generation, with potential knowledge, ties, or experiences of the project area and the Anahola-Kamalomalo'o region?
- Was the candidate familiar with, or possessing insight into, the customary practices and traditional places in or near to the project area?

If a candidate met one or more of the above criteria and was willing to share his or her perspective, the person was considered an appropriate candidate for the interview process. In the timeframe available for the preparation of the CIA, representatives of Native Kaua'i, LLC met with 15 native Hawaiians all with personal ties to Anahola; they also met with 2 additional non-Hawaiian interview subjects possessed of unique knowledge relevant to the assessment. All interviews were conducts between February 15 and April 28, 2012. The majority of interviewees were residents of Anahola, living on homestead lands. The age of interviewees ranged from 40 to 86. Summaries of the results of each of the interviews are provided on pp. 156 -183 of this report.

Ethnographic-Oral History Methodology

As noted previously under Consultation Methodology & Results, the interview procedures employed by Native Kaua'i, LLC were specifically chosen to be consistent with native Hawaiian concepts of propriety. Interviewers avoided use

of electronic recording devices such as cassette tape or digital voice recorders, cameras, or video cameras.

Both interviewers, L. Kēhaulani Kekua and A. ʻAikāne Alapaʻi, are themselves indigenous Hawaiian cultural consultants and practitioners able to speak in the vernacular, familiar with the area, and capable of the traditional process of identifying links through genealogy. The interviews were conducted conversationally in informal surrounds; interviewees were encouraged to ask, as well as answer, questions.

If, as the CIA notes (cf. pg. 152) the interviews had been conducted in a standardized Western scholarly format without reference to Hawaiian cultural values, the questions might have been uniformly presented and limited to the topics most relevant to the project, such as:

- What type of cultural practices and cultural beliefs do/did your family practice?
- Where do/did these cultural practices occur?
- How do/did the area's sites, features, or land affect your or your family's cultural practices and beliefs?
- How would the plans to develop the solar energy project affect you or your family's cultural beliefs and cultural practices?

However, this approach was considered inappropriate for the reasons discussed in Consultation Methodology & Results. A constraint, or limitation, of the low-pressure approach preferred by the interviewers was that many of the interviewees were interested in learning more about the solar project proposed by Kauaʻi Island Utility Cooperative. In these cases, the interview priority of identifying and evaluating impacts to cultural practices and resources were sometimes overshadowed by the interviewer's need to inform interviewees about plans for their community. Native Kauaʻi, LLC recognizes the challenge of gently steering conversations towards topics of project relevance without being presumptuous or insensitive to the needs of the interviewees, but believes that the benefits of its approach outweigh any possible drawbacks.

Biographical Information of Interviewees

The names of interview subjects, their qualifications (see criteria for selection of interviewees, above) for inclusion, and their place of residence are provided in tabular form on pp. 153-154 of this CIA. In addition, a brief biographical sketch,

including information relevant to the interview process is provided on pp. 156 - 183. Relevant information includes, but is not limited to, interviewees' historical or genealogical relationships with the project area, cultural knowledge, and expertise.

Historical & Archival Research

Primary research references used in this study include, but are not limited to— land use records, including those obtained from an extensive review of Hawaiian Land Commission Awards (LCA) records from the 1848 Great Māhele, territorial land patent grants, oral history interviews preserved in the Bishop Museum Archive, and an extensive review of historical texts authored or compiled by D. Malo (1951), M.K. Pukui (1972), Handy and Handy with Pukui (1972), and Marti-Kini (2009). The study also relied on accounts from Hawaiian language newspapers such as *Ka Na'i Aupuni* and *Ka Nupepa Ku'oko'a* (translated by P. Nogelmeir, M.K. Pukui, and Native Kaua`i LLC). Other sources examined and incorporated include regional planning documents, modern English language newspapers, travel writers familiar with the Anahola region, and important testimony of elder kama 'āina of the lands of the Anahola-Kamalomalo'o region.

Researchers also took full advantage of historical and archival resources from the collections of the Bishop Museum, Kaua`i Museum, Kaua`i Historical Society, Ka`ie`ie Foundation, Kaua`i Heritage Center and Hālau Palaihiwa O Kaipuwai. All information is cited by the author in the bibliography included in this CIA.

Research of published and unpublished written literature, as well as Hawaiian language documents, maps and photographs found in public and private collections for references and other relevant information were explored. Additionally, the examination of indigenous Hawaiian chants and interviews conducted with kūpuna or Native Hawaiian elders were extraordinarily revealing and valuable to producing this cultural study.

One of the cultural sinews that have remained intact for millennia is the continuation of `aiha`a. Later more commonly known as hula, the practice maintained the complexities of ancient history and knowledge through the oral traditions of chants, dances, genealogies, ceremonies and more.

It is through the extensive teachings of Hālau Palaihiwa O Kaipuwai – a traditional Kaua`i hula seminary rooted in the sacred practices of `aiha`a that

the initiative for approaching this cultural study from the perspectives of Native Hawaiian scholarship and practices are made. Founded in 1945 by the late hula master, Helen Kaipuwai Kekua, the hālau was established as a means of perpetuating and disseminating Hawaiian ancestral knowledge beyond the sacred restrictions held within her family's traditional practices of hula kapu. She and her husband, the late Edgar Miki Waiau were amongst the first DHHL homesteaders in Anahola in the late 1950s. The Waiaus built an enclosed hula studio in back of their Makaio Road home in Anahola where Mrs. Waiau based her hālau and continued her teachings through her passing in 1988. This is also the location at which raised her granddaughter, Kēhaulani Kekua in the traditions of hānai and immersed her in the formalities of strict hula training from the early age of 2. This upbringing would set the foundation for a lifelong commitment of cultural practice and preservation of traditional Hawaiian knowledge for the successive generations of the Kekua `ohana.

In the capacity of their collective practice of `aiha`a and hula, the research and investigative team also represents the leadership of Hālau Palaihiwa O Kaipuwai with Kekua as Kumu Hula (hula master) and Alapa`i as Alaka`i (Senior Apprentice). Hālau Palaihiwa O Kaipuwai is a cultural repository of traditional teachings that has continued with uninterrupted practice for countless generations. It is from the expertise of this ancient house of knowledge that the structure and contents of this cultural study articulates upon indigenous beliefs and religious perspectives, customary practices, art forms and cultural traditions.

Sources of information for this project, which were not otherwise referenced, are from the personal life ways, traditional training and cultural practice experiences of the Native Kaua`i research team received from *`ohana* or family traditions, *kumu loea* (masters) and *kūpuna* (ancestors and elders).

Cultural Resources & Practices Identified

Neither the literature sources consulted nor the interviews conducted identified any ongoing native Hawaiian cultural resources or practices located on the Anahola Solar Project site. As indicated by background research and many of the interviewees, the broad Anahola-Kamalomalo‘o region has a rich history replete with *mo’olelo* (legends) and *wahi pana* (traditional place names and their stories) however none of these have any significant direct or indirect connection to the project site. In addition, the long history of intensive industrial-scale sugarcane and pineapple agriculture in this area has likely destroyed any cultural materials and prevented in cultural practices which might have been

present in the past. This is confirmed by the Archaeological Inventory Survey prepare by T.S. Dye & Colleagues for the Anahola Solar Project.

Confidential Information

Native Kaua'i, LLC has not disclosed the entirety of all of its interviews to be made public in verbatim form. Some of the interviews pertain to sensitive cultural practices and beliefs which they consider sacred and profound. It is, therefore, the prerogative of interviewees to allow or disallow full disclosure of their interviews (cf. pg. 152). However, despite the confidential nature of the interviews, with regard to the presence of ongoing cultural practices, resources, or beliefs in or related to the project site there were no significant conflicting testimonies.

Analysis of Impacts

The Anahola-Kamalomalo'o region, which includes the area proposed for the Anahola Solar Project, is a place of prehistoric and historic significance in the Hawaiian civilization. Oral histories and written records tell of the continuing traditions, beliefs, and cultural practices of the region. However, none of the background research, archaeological evidence, or interviews conducted in the preparation of this Cultural Impact Assessment indicates that the cultural practices, resources, or beliefs are tied to the proposed project site, which has long been used for modern agricultural purposes. This longstanding agricultural use of the area may be one reason for the absence of cultural properties and resources in a region which has seen many centuries of habitation by native Hawaiians. The site has been significantly graded in the past, and until recently was used intermittently as a pasture for animals.

The information summarized in this report indicates that there are no known extant historic cultural resources within the immediate vicinity of the project site that may be impacted as a result of the proposed project. More specifically: The lands on which the Anahola Solar Project would be situated have been significantly altered from their original condition by industrial-scale agriculture. Conclusions from the recent Archaeological Inventory Survey prepared for this project by T.S. Dye & Colleagues (Dye and Sholin, 2012) suggest that historic-era alterations involved large-scale ground disturbance to the extent that no archaeological resources are likely to be found in the general vicinity. Traditional Hawaiian uses of the lands in the Kamalomalo'o and Anahola ahupua'a are known from prehistoric times. Such uses, including habitation,

agriculture, and gathering continues throughout the region, but none is known to exist within the project site. Access to sensitive *wahi pana*, streams, the shoreline, or the mountains will not be compromised by the Anahola Solar Project.

Native Hawaiian beliefs and traditions associated with the Kamalomalo'o and Anahola *ahupua'a* persist but these are general associations not specific to the project site. No *kūpuna* (elders) or *mākua* (parents) could be located that had knowledge of traditional beliefs or practices specific to the project site.

Despite the absence of cultural practices and resources within the project area, kūpuna and mākua informants interviewed for this CIA expressed concern and questioned why the land being dedicated to the Anahola Solar Energy Project was not being used to take native Hawaiians off of extensive waiting lists and on to the land for residential and/or agricultural use. As a result of these queries, Native Kaua`i researchers felt an obligation to include an overview of Hawai`i's political history and the events surrounding the loss, control and use of Native Hawaiian lands.

This CIA has been prepared in accordance with the guidelines set forth by the State of Hawai'i Environmental Council for the completion of Cultural Impact Assessments and the requirements of HRS Chapter 343 and HAR §11-200. There are no known cultural resources or practices with the potential to be negatively impacted as a result of the proposed project.

Closing Comments & Recommendations

Cultural impacts upon Native Hawaiian people, customary practices and religious beliefs have infiltrated the history of Hawai`i Nei for more than 200 years since the arrival of Captain James Cook in 1778. Within a period of 40 short years, the Kapu system was abolished by Kamehameha II - Alexander Liholiho and the Queen Regent, Ka`ahumanu bringing an end to the strength of the closely knit Hawaiian religion and political system of Hawai`i. With the arrival of Calvinist missionaries in 1820 came a new god and religion which leveraged the beginnings of severing the native Hawaiians' veneration of the natural world.

By the 1890s, subsistence lifestyles, agriculture and rural communalism had entirely been replaced by commercialism, urbanization and individualism as key features of life in the Hawaiian Islands. Foreign sugar plantation moguls usurped control of Hawai`i's prime agricultural lands and fresh water sources to sustain their crops. Miles and miles of irrigation ditches were engineered to redirect the natural flow of water out of the ahupua`a; forever changing the balance of environments and lifestyles of generations of native Hawaiian families.

By and large, the issues of cultural impacts in Hawai`i are rooted in the loss of access and use of Hawai`i's land and natural resources as formerly practiced in pre-contact Hawai`i. It is a deep-seated dilemma caused by the intrusion of forced principles brought on by Westernization and the rise of a monetary economy.

Despite the absence of cultural practices and resources within the project area, kūpuna and mākua informants interviewed for this CIA expressed concern and questioned why the land being dedicated to the Anahola Solar Energy Project was not being used to take native Hawaiians off of extensive waiting lists and on to the land for residential and/or agricultural use.

As a result of these queries, Native Kaua`i researchers felt an obligation to include an entire section entitled, *"Origins of Change and Cultural Impacts"* to provide an overview of western influences, invasion and occupation of lands in Hawai`i. Included are lists of kūpuna's names and descriptions of their kuleana land claims presented to the Land Commission following the Great Mahele in 1848. Additionally, copies of the 1897 anti-annexation petitions showing the actual signatures of kūpuna from the Kawaihau and Ko`olau districts here on Kaua`i are included as well.

Many of these families still exist and inhabit the lands of Anahola today. Several of those interviewed by the researchers and authors of this CIA are descendants of the very kūpuna who stood in solidarity to protest the annexation of their beloved birth lands to foreign control and occupation. There was great love, passion and attachment to protect the lands and resources that had breathed life into generation upon generation of Hawaiian families of this region. The overthrow of the Hawaiian Kingdom and the admission of the Hawaiian Islands into the United States of America as the "50th State" still resonate with unrest for many indigenous Hawaiians.

However, the lasting affects upon native Hawaiian people that have resulted in their disconnect to traditional practices, beliefs and knowledge of place goes back further to the introduction of Christian tenets that prohibits veneration and expression of nature or ancestor worship in any way, shape or form. There is great anxiety amongst contemporary Hawaiians to embrace the values and ideologies of their ancient ancestors out of fear instilled by the doctrines of the dominant western religion which most have adopted. This alone, largely contributed to the depreciation of interest to learn and maintain family genealogies, enroll to formal training in cultural practices that engage in ceremony and spiritual processes, etc.

All forms of traditional Hawaiian cultural practice included religious and spiritual processes of protocols, ceremonies, prayers and prescribed tabus and restrictions. The removal of this crucial part of Hawaiian cultural expression separated and dissolved the sacred and profound of the practice itself. It also eliminates the individual's conscious connection to the environment which is also considered as a sacred and profound aspect of the practice itself.

For example, hula is mostly taught today strictly as a dance form, without the formalities of the hula altar. The contrasting experience of the hula disciple that engages in the practice of the kuahu is stimulated by a deeper understanding of his/her role that also appeals, meditates and prays for protection and nourishment of the atmosphere and environment. The offering of prescribed plants from the native Hawaiian forest and the articulation of accompanying prayers and chants are directly associated with the spiritual processes and adulation of forested watersheds that provide us with live giving water. The main focus of the hula practitioner is to engage and encourage for the health and wellbeing of the land and resources, as well as that of the populace by spiritually petitioning for the continuum of life cycles.

Additionally, they were historians and archivists, who preserved details of history, genealogies, migrations, ceremonies, names of winds and rains, places and more in volumes of oral traditions that were documented to memory and conveyed to following generations through the teachings of chants, dances and oratory.

One of the primary goals of Native Kaua`i was to complete a comprehensive CIA study that would satisfy the requirements of HRS Chapter 343 and HAR §11-200 by following the guideline established by the State of Hawai`i Environmental Council for the completion of Cultural Impact Assessments. Another was to thoroughly research, compile and complete a thorough cultural document that would serve as a valuable and informative resource for the people of Anahola.

As developments continue to occur throughout Kaua`i and Hawai`i, the required processes of conducting environmental reviews and cultural impact assessments such as this, will continue to seek out indigenous Hawaiian informants who possess the expertise and knowledge about their cultural practices, religious beliefs and storied places. While it is great that researchers and authors of CIAs have the potential to produce documents with invaluable information, it is no longer uncommon to find end results of studies determine no known cultural resources or practices are occurring today.

There is a sense of urgency for native Hawaiians to rejuvenate themselves in the cultural practices, teachings and knowledge of the ancients of these islands. There will continue to be findings of "no negative cultural impacts" if cultural practices are no longer occurring. And precious lands of our ancestors will be surrendered future developments that may ultimately erase every bit of cultural value. Perhaps it may be that many contemporary indigenous Hawaiians have forgotten or have never received transmission from elders of the previous generations of mo`olelo, mo`okū`auhau, wahi pana and other `ike or knowledge that are pertinent to Hawaiian cultural practices. However, it is never too late to learn and embrace the teachings of ancestral intelligence that is the birthright of every living and yet to be born Hawaiian. Native Hawaiians have the mana and the ability to participate and articulate upon the intricacies of Hawaiian knowledge and intelligence. Not only were our forefathers expert fishermen and planters, but they were priests and master genealogists, navigators, biologists, geologists, artists, craftsmen, astronomers and more whose scholarship of the land, environment and atmosphere was insightful and profound in ways unimaginable today.

To reiterate the use of the word, *minamina* on page 6: A considerable amount of focus was put toward the research of traditional places, their names and stories when preparing this study. It is ***minamina,*** a sad and unfortunate loss when valuable information is lost or forgotten. There is an urgent need to preserve and pass on ancestral knowledge that was widely known just a few generations ago. Kaua`i's unique culture and heritage associated with traditional places are key to nurturing a sense of place and connectivity. It is a vital component to the health and wellbeing of native Hawaiians, as well as the perpetuation of native Hawaiian life ways and culture.

In closing, Native Kaua`i offers another translation of minamina as:

> 2. To prize greatly, value greatly, especially of something in danger of being lost; to value, place great value on; value, worth.

The Anahola Solar Project presents an exceptional opportunity for its development partners to join together in an effort to support the revival and rejuvenation of traditional Hawaiian cultural education for the host community families of Anahola. Potential ideas recommended for consideration include:

- Encourage for the uniting of development partners in traditional Hawaiian ceremony to launch ground breaking and dedication of land and facilities

- Provide use of on-site indoor and outdoor facilities to accommodate a variety of cultural education programs for the community

- Cultural lectures and workshops presented by Hawaiian cultural experts, kūpuna and master practitioners on various subjects, art forms and cultural practices

- Rejuvenation of land within and surrounding the project area that promote the values of aloha `āina and mālama `āina

- Create opportunity for landscape design of the project area that utilizes native Hawaiian plants that teach and reflect upon cultural values and practices for healing, subsistence, dyes, making of traditional tools and utilitarian materials

- Create opportunity for interior design concepts that honor and celebrate the wahi pana of the Kamalomalo`o - Anahola region through pictorial exhibits, commissioned art pieces created by native Hawaiian artists,

DHHL homesteaders and children enrolled to the Kamehameha Pre-School and Kanuikapono Charter School.

- Sponsor Anahola's Hōkū`ālele Canoe Club, as well as other seasonal sports teams including soccer, basketball, t-ball, baseball, etc. that promote health and fitness for children, adults and elders in the community

- Support Ke Ala No Nā Kūpuna program and provide opportunity to bring elder kūpuna, mākua, `ōpio and keiki together in kūkākūkā activities to reinvigorate a sense of place for Anahola and its incredible history and culture

- Sponsorship of Anahola kumu hula, master craftspeople, artists, fishermen, healers, etc. to provide teaching opportunities for youth and adult members of the community in master-apprentice programs or in group settings

- Create a training programs and curriculum that merges ancient Hawaiian paradigms of cultural knowledge and practices associated with the sun and the modern workings and technology of solar energy production systems

- Sponsor seasonal and annual events that correlate with the vernal and autumnal equinoxes as well as the summer and winter solstices that are significant and auspicious sun occurrences throughout the year

- Encourage family and community participation in observances, ceremonies and gatherings that celebrate Hawaiian culture, ancestral knowledge of other traditions such as the opening and closing of Makahiki

- Support the need for on-going cultural and historical research of the topics highlighted in this study. This CIA document is only a mere example and fraction of the vast land and seascapes that have yet to be explored and articulated upon in this Kamalomalo`o - Anahola region

Ho`i hou i ka `iwi kuamo`o

Return to the backbone

An `ōlelo no`eau or ancient Hawaiian proverb and poetical saying to return to the homeland or family after being away. This doesn't only pertain to a physical departure or absence from the `āina hānau (birth lands) or `ohana (family). It especially speaks to the importance of immersing oneself in his or her cultural practices, traditions and values. It is a reminder of the fundamental relationships and inherent connections Native Hawaiians have to their ancestral homelands that are based on environmental kinship and land wisdom.

Na wai ho`i ka `ole o ke akamai,
He ala nui i ma`a i ka hele `ia e o`u mau kupuna?

Why shouldn't we know this, when it was a road often traveled by our ancestors?

Glossary of Hawaiian Words

ahu.pua‘a
n. 1. Land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (ahu) of stones surmounted by an image of a pig (pua‘a), or because a pig or other tribute was laid on the altar as tax to the chief. The landlord or owner of an ahupua‘a might be a konohiki. 2. The altar on which the pig was laid as payment to the chief for use of the ahupua‘a land.

`āina
n. Land, earth. Cf. *‘ai*, to eat.

ā.iwaiwa
vs. Inexplicable, mysterious, marvelous, strange, amazing, fantastic, fathomless, incomprehensible, wonderful because of divinity; wonderfully proficient or skilled; weirdly bad, notorious.

‘ā.kia
n. Endemic shrubs and trees (Wikstroemia spp.) with small leaves, tiny yellowish flowers, and yellow to red, small, ovoid one-seeded fruits. The bark yields a fiber; the bark, roots, and leaves (as W. oahuensis) a narcotic used for fish poisoning (Neal 616), and according to Kep., used in ‘anā‘anā sorcery. Varieties are qualified by the terms lau nui. mānalo, and pehu. Also kauhi.

akua
1. vs. God, goddess, spirit, ghost, devil, image, idol, corpse; divine, supernatural, godly.
2. *(Cap.)* n. God (Christian).
3. n. “It” in a game of tag or hide-and-seek.
4. *(Cap.)* Name of the 14th night of the full moon. (PEP ‘Atua.)

akule
n. Big-eyed or goggle-eyed scad fish (Trachurops crumenophthalmus), Stages of growth are pā‘ā‘ā, halalū or hahalalū, and akule.

‘ala‘ala
n. Ink sac in octopus or squid; after salting, drying, and broiling on the fire, it is mixed with ‘inamona or chili peppers and eaten; mixed with ‘auhuhu juice it is used as bait. **Fig.**, useless.

ali‘i
nvs. Chief, chiefess, officer, ruler, monarch, peer, headman, noble, aristocrat, king, queen, commander; royal, regal, aristocratic, kingly; to rule or act as a chief, govern, reign; to become a chief. *Fig.*, kind

ali‘i ‘ai moku
n. Chief who rules a moku (district)

aloha
nvt., nvs. Aloha, love, affection, compassion, mercy, sympathy, pity, kindness, sentiment, grace, charity; greeting, salutation, regards; sweetheart, lover, loved one; beloved, loving, kind, compassionate, charitable, lovable; to love, be fond of; to show kindness, mercy, pity, charity, affection; to venerate; to remember with affection; to greet, hail. Greetings! Hello! Good-by! Farewell! Alas!

ʻano
n. Kind, variety, nature, character, disposition, bearing, type, brand, likeness, sort, way, manner, shape, tendency, fashion, style, mode, circumstance, condition, resemblance, image, color, moral quality, denomination, meaning.

ao
1. nvi. Light, day, daylight, dawn; to dawn, grow light; enlightened; to regain consciousness.
a. To marry; marriage (old term, probably *lit.*, to stay until daylight).
b. *(Cap.)* Night of the day called Huna, eleventh night of the month, when the hoʻāo nuptials took place. (PPN ʻaho.)
2. n. Any kind of a cloud, including ʻōpua, but specifically, high clouds that when wind-blown scud along (kaʻa).
3. n. World, earth, realm.
4. vt. To be careful, beware, watch out.

ʻau.hola
Same as ʻauhuhu., a shrub.

ʻau.huhu
n. A slender, shrubby legume (Tephrosia purpurea syn. T. piscatoria), 30 to 60 cm high, with small, compound leaves, small white or purplish flowers, and narrow pods, used for poisoning fish. The plant is known from tropical Asia eastward into Polynesia. (Neal 448–9.) Also ʻauhola, hola. Cf. *pōpō ʻauhuhu*.

ʻau.makua
nvt. Family or personal gods, deified ancestors who might assume the shape of sharks, owls, hawks, ʻelepaio, ʻiwi, mudhens, octopuses, eels, mice, rats, dogs, caterpillars, rocks, cowries, clouds, or plants. A symbiotic relationship existed; mortals did not harm or eat ʻaumākua (they fed sharks), and ʻaumākua warned and reprimanded mortals in dreams, visions, and calls. (Beckwith, 1970, pp. 124–43, 559; Nānā 38.) **Fig.**., a trustworthy person. (Probably **lit.**., ʻau 4, group, + makua, parent.) `aumākua is plural.

ʻawa
n. The kava (Piper methysticum), a shrub 1.2 to 3.5 m tall with green jointed stems and heart-shaped leaves, native to Pacific islands, the root being the source of a narcotic drink of the same name used in ceremonies (Neal 291), prepared formerly by chewing, later by pounding. The comminuted particles were mixed with water and strained, When drunk to excess it caused drowsiness and, rarely, scaliness of the skin and bloodshot eyes. Kava was also used medicinally.

awāwa
n. Valley, gulch, ravine.

hā
1. num. Four, fourth (commonly preceded by the numeral-marking prefixes, as ʻehā keiki, four children; Pōʻahā, Thursday; *lit.*, fourth day). Hā and multiples of four are sacred or formulistic numbers
2. nvi. To breathe, exhale; to breathe upon, as kava after praying and before prognosticating; breath, life.
3. nvs. Stalk that supports the leaf and enfolds the stem of certain plants, as taro, sugar cane; layers in a banana stump. Cf. *ʻohana*. (PPN faʻa.)
4. nvi. Trough, ditch, sluice; to form a ditch or trough. Hā wai, water ditch or trough.
5. n. Stick or furrowed stone used as a sinker, with hooks attached. Also hā lawaiʻa.
6. n. A native tree (Eugenia [Syzygium] sandwicensis), with red, edible fruit about 8.5 mm. in diameter, related to the mountain apple, ʻōhiʻa ʻai. The bark was used to color tapa black. Also ʻōhiʻa hā, and pāʻihi (on Maui). (Neal 635.)

haʻa
1. nvs. Low; dwarf; man or animal of short stature. hoʻo.haʻa To lower; humble.
2. n. A dance with bent knees; dancing.

hale
nvi. House, building, institution, lodge, station, hall; to have a house.

hā.loa
1. vs. Far-reaching, long, everlasting, eternal.
2. n. Poetic name for lauloa taro.
3. n. A variety of sweet potato.
4. n. A type of prayer. (For. 6:37) *Lit.*, long breath.

hā.nai
1. nvs. Foster child, adopted child; foster, adopted. Keiki hānai, foster child. Lawe hānai, to adopt a child. Makua hānai, foster parent. Kāna hānai, his adopted child.
2. nvt. To raise, rear, feed, nourish, sustain; provider, caretaker (said affectionately of chiefs by members of the court).
3. n. Body of a kōkō net carrier, and cords attached to it; fish net or trap, as for ʻoʻopu fish; kite.
4. Same as hanahanai.
5. n. Hawaiʻi name for mānai, needle.

hā.nau
nvi. To give birth; to lay (an egg); born; offspring, child, childbirth; productive, fertile. Hānau ʻo Hina, Hina gave birth. Hānau ʻia ʻo Hina , Hina was born. ʻIliʻili hānau, reproducing pebbles. Welo hānau, productive or prolific family.

hanauna
n. Generation; relative whose relationship was established several generations previously; ancestry, birth. Hanauna like, relative of the same generation; of the same generation, contemporary. Makuahine hanauna, aunt, female cousin of one's father or mother. Keiki hanauna, nephew, niece. Kaikuahine hanauna, female cousin of a male. Pili ma ka hanauna, related through having a common ancestor. Nā makua kāne hanauna (For. 4:161), uncles, fathers, brothers and male cousins.

haole
nvs. White person, American, Englishman, Caucasian; American, English; formerly, any foreigner; foreign, introduced, of foreign origin, as plants, pigs, chickens; entirely white, of pigs (Malo 37; perhaps Malo actually means of foreign introduction). See *kolea* 1. References in traditional literature are few, but these have been noted: He haole nui maka ʻālohilohi (FS 201), a big foreigner with bright eyes [referring to Kama-pua'a, the pig demigod]. Hānau ke poʻo haole, he haole kēlā (KL. line 505), born was the stranger's head, that was strange. Hoʻokahi o Tahiti kānaka, he haole (Kua-liʻi chant, For. 4:375) only one people in Tahiti, foreigners. ʻĀina haole, foreign land. ʻŌlelo haole, European language, especially English. hoʻo.haole To act like a white person, to ape the white people, or assume airs of superiority [often said disparagingly, especially of half-whites]. Hoʻohaole ʻia, Americanized, Europeanized; to have become like a white person or have adopted the ways of a white man.

haumana, haumāna
n. Student, pupil, apprentice, recruit, disciple

heiau
n. Pre-Christian place of worship, shrine; some heiau were elaborately constructed stone platforms, others simple earth terraces. Many are preserved today.

hiki
1. nvs. Can, may; to be able; ability; possible. Cf. *hiki nō*, *hikiwale*, *hikiwawe*, Gram. 4.4. Hiki ʻole, impossible, can't do. Pau ka hiki, no longer able to do; impotent. Hiki iāia ke hele mai, he can come; he may [has permission to] come. E hiki ana, when possible. Ka lā e hiki ana, any possible day. Ka manawa e hiki ana, any possible time.
2. interj. All right, O.K. (in sense of "able to do"), certainly, surely (used alone or preceding nō).
3. vi. To get to or reach a place, come, arrive, approach, appear, arise.

hikina
n. East

hina
1. nvs. To fall, tumble, or topple over from an upright position (cf. *hāʻule*, to drop); to be "controlled," as a disease (Kam. 64:102); to fall morally; to throw down.
2. vi. To blow in a straight course, of wind. Ke hina maila ka makani mai uka mai, the wind is now blowing steadily from the uplands.
3. vs. Gray- or white-haired; gray.
4. A goddess. (PPN Sina.)

Hoku
n. Night of the full moon. When this moon set before daylight it was called Hoku Palemo, Hoku that slips away. When it set after daylight it was called Hoku Ili, grounded Hoku.

hō.kū
n. Star.

hola
nvt. Same as hohola, to spread. Cf. *kauhola*, *mahola*, *pāhola*. (PPN fola.) 2. Same as ʻauhuhu; to drug fish with this poison. ʻUpena hola, net used with this poison. Hele nō i ka hola iʻa i ka lā, go to poison fish in the daytime [more efficient to work by day]. Niʻihau.

hua.kaʻi
nvi. Trip, voyage, journey, mission, procession, parade; to travel.

hula
1. nvt. The hula, a hula dancer; to dance the hula.
2. nvt. Song or chant used for the hula; to sing or chant for a hula.
3. vi. To twitch, as a muscle or eyelid; to palpitate, throb. (PCP (f,s)ula.)

huki.lau
nvi. A seine; to fish with the seine. *Lit.*, pull ropes (lau).

iʻa
n. 1. Fish or any marine animal, as eel, oyster, crab, whale.
2. Meat or any flesh food.
3. Any food eaten as a relish with the staple (poi, taro, sweet potato, breadfruit), including meat, vegetable, or even salt. Also ʻīnaʻi.
4. *(Cap.)* Milky Way. Ka Iʻa ui o ka lani, the turning Milky Way of the heavens. Ua huli ka Iʻa, the Milky Way has turned [changed position; it is past midnight].

ʻike
1. nvt. To see, know, feel, greet, recognize, perceive, experience, be aware, understand; to receive revelations from the gods; knowledge, awareness, understanding, recognition, comprehension and hence learning; sense, as of hearing or sight; sensory, perceptive, vision. ʻIke hoʻomaopopo, conscious, consciousness.
a. To show, make known, display, tell, exhibit, reveal, indicate, inform, report, notify, explain, testify, cause to know or seen, discover, announce, allege; acquaint; testimony, notice, information; identifying characteristics, as of land claims; proof, token guide, exhibition.

ʻili
1. n. Skin, complexion, hide, pelt, scalp, bark, rind, peel.
2. Leather. ʻIli lahilahi, thin leather. ʻIli mānoanoa, thick leather.
3. Surface, area. Cf. *ʻili ʻāina*, *ʻilikai*.

ʻili
4. Binding, cover. ʻIli paʻa, hard cover (of a book).
5. Land section, next in importance to ahupuaʻa and usually a subdivision of an ahupuaʻa.
6. Strap of any kind, as reins, harness, fan belt, machine belt; hose. Cf. *alaʻume*.
7. Pebble (less used than ʻiliʻili); kōnane pebble.
8. vs. Square, as in measurements. Ana ʻili, square measurements.

ʻī.naʻi
nvi. Accompaniment to poi, usually meat, fish, or vegetable; to serve as ʻīnaʻi. *Fig*., to flavor, garnish, spice.

ʻina.mona
n. Relish made of the cooked kernel of candlenut (kukui) mashed with salt (perhaps a contraction of ʻīnaʻi momona, sweet garnish). (Neal 506.) Also ʻakimona.

kaha.wai
n. Stream, creek, river; valley, ravine, gulch, whether wet or dry.

kaha.kai
loc.n. Beach, seashore, seacoast, seaside strand.

kā.heka
n. Pool, especially a rock basin where the sea washes in through an opening and salt forms; salt pan.

kahiki
1. n. Tahiti. Cf. *holokahiki*. Holo i Kahiki, sail to Tahiti. The sky was divided (Malo 10) into five areas beginning with the term Kahiki: Kahiki-moe, horizon; *lit.*, prostrate Kahiki. Kahiki-kū, sky just above the horizon; *lit.*, upright Kahiki. Kahiki-ka-papa-nuʻu, the next layer; *lit.*, Kahiki the elevated stratum. Kahikikapapa-lani, high in the sky, almost directly overhead; *lit.*, Kahiki the sky (or god) stratum. Kahiki-kapu-i-Hōlani-ke-kuʻina, the sky directly overhead; *lit.*, sacred Kahiki at Hōlani the meeting place.
2. *(Not cap.)* nvs. Any foreign country, abroad, foreign. (PCP tafiti.)
3. n. A variety of banana, common wild on Maui. Kinds are kahiki hae, kahiki mauki, and kahiki puhi.

kahiko
nvs. Old, ancient, antique, primitive, long ago, beforehand; to age; old person. Wā kahiko, old times. Wahi a kahiko (Kel. 50), said the old people.

kahuna
nvi. Priest, sorcerer, magician, wizard, minister, expert in any profession (whether male or female).

kalo
n. Taro (Colocasia esculenta), a kind of aroid cultivated since ancient times for food, spreading widely from the tropics of the Old World. In Hawaiʻi, taro has been the staple from earliest times to the present,

and here its culture developed greatly, including more than 300 forms. All parts of the plant are eaten, its starchy root principally as poi, and its leaves as lū‘au. It is a perennial herb consisting of a cluster of long-stemmed, heart-shaped leaves rising 30 cm. or more from underground tubers or corms.

kama.‘āina
nvi. Native-born, one born in a place, host; native plant; acquainted, familiar, *Lit.*, land child.

kanaka
nvs. Human being, man, person, individual, party, mankind, population; subject, as of a chief; laborer, servant, helper; attendant or retainer in a family.

kā.nā.wai
nvs. Law, code, rule, statute, act, regulation, ordinance, decree, edict; legal; to obey a law; to be prohibited; to learn from experience.

kāne
1. n. Male, husband, male sweetheart, man; brother-in-law of a woman; male, masculine; to be a husband or brother-in-law of a woman.
2. *(Cap.)* n. The leading of the four great Hawaiian gods.
3. *(Cap.)* n. Name of the 27th night of the lunar month.
4. *(Cap.)* n. Name of a sacred star.

Kapu
nvs. Taboo, prohibition; special privilege or exemption from ordinary taboo; sacredness; prohibited, forbidden; sacred, holy, consecrated; no trespassing, keep out.

keiki
1. nvi. Child, offspring, descendant, progeny, boy, youngster, son, lad, nephew, son of a dear friend; calf, colt, kid, cub; worker; shoot or sucker, as of taro; to have or obtain a child; to be or become a child. Cf. *keiki kāne*. Kāu keiki, your son. Keiki a ka pueo, child of the owl [one whose father is not known]. Keiki hānau o ka ‘āina, a native son, one born on the land.

kī
1. n. Ti, a woody plant (Cordyline terminalis) in the lily family, native to tropical Asia and Australia. It consists of a branched or unbranched, slender, ringed stem, ending in a cluster of narrow-oblong, leaves 30 to 60 cm long, from among which at times rises a large panicle of small, light-colored flowers. The leaves were put to many uses by the Hawaiians, as for house thatch, food wrappers, hula skirts, sandals; the thick, sweet roots were baked for food or distilled for brandy. (Neal 203-4.) Besides green-leaved tis, which rarely fruit, many ornamental varieties are grown in gardens, having leaves wide to narrow, large to small, the colors purple, crimson, scarlet, rust, pink, or green, striped or plain. Red tis may have red flowers and berries. Green ti leaves are still believed to afford protection from spirits and to purify a menstruating woman.

kilo
nvt. Stargazer, reader of omens, seer, astrologer, necromancer; kind of looking glass **(rare)**; to watch closely, spy, examine, look around, observe, forecast. Kilo i`a, Fish spotter.

kino lau
n. Many forms taken by a supernatural body

ko`i.honua
nvi. Genealogical chant; to sing such chants.

kona
nvs. Leeward sides of the Hawaiian Islands; leeward (PPN Tonga.) 2. nvi. A famous leeward wind; to blow, of this wind. Many names of Kona winds follow. See ex., *Kapakū*. 3. n. Name of a star.

kono.hiki
n. 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.

ko‘o.lau
n. Windward sides of the Hawaiian Islands. 2. *(Not cap.)* Short for ko‘oko‘olau. 3. Wind between Ni‘ihau and Kaua‘i. (For. 5:95.)

kope
1. nvt. Rake, shovel (Nah. 4.14), dredge; to rake, scratch; scoop, as of a canoe paddle (For. 5:557). Fig., to dislike, disregard. Moku kope awa, harbor dredge. (PPN tope.)
2. n. Coffee, coffee beans. *Eng.* Kope lā, sun-dried coffee beans. Kope wai, fresh, undried coffee beans in the hull.
3. nvt. Copy, duplicate; to copy or duplicate. *Eng.* Cf. *ponokope*. Ke‘ena kākau kope, copyright office; office where deeds are copied.

kua.hiwi
n. Mountain, high hill.

kua.lono
1. n. Region near the mountaintop, ridge.
2. vt. To overturn, as an unfinished canoe. *Rare*.

kū.kā
nvi. Consultation, discussion; to consult, confer, discuss, deliberate. Cf. *kūkākūkā*.

kukui
n. 1. Candlenut tree (Aleurites moluccana), a large tree in the spurge family bearing nuts containing while, oily kernels which were formerly used for lights; hence the tree is a symbol of enlightenment. The nuts are

still cooked for a relish (‘inamona). The soft wood was used for canoes, and gum from the bark for painting tapa; black dye was obtained from nut coats and from roots, (Nuts were chewed and spat into the sea by men fishing with nets for parrot fish (kākā uhu) in order to calm the sea (FS 38–9): see ex., *pili* 1). Polished nuts are strung in leis; the silvery leaves and small white flowers are strung in leis as representative of Moloka‘i, as designated in 1923 by the Territorial legislature. The kukui was named the

kukui
official emblem for the State of Hawaii in 1959 because of its many uses and its symbolic value. Kukui is one of the plant forms of Kama-pua‘a that comes to help him (FS 215). Called kuikui on Ni‘ihau. (Neal 504–7.) See *lei kukui*. He ali‘i no ka malu kukui, a chief of the candlenut shade [chief of uncertain genealogy].
2. Lamp, light, torch. Fig., guide, leader.

hale ipu.kukui
n. Lighthouse

kula
1.n. Plain, field, open country, pasture. An act of 1884 distinguished dry or kula land from wet or taro land. 2. n. Source; container. 3. n. Basket-like fish trap. *Rare*. 4. nvi. School, academy; to teach school, go to school; to hold school or class sessions. 5. Also gula nvs. Gold; golden. *Eng.*

kulā.iwi
nvs. Native land, homeland; native. Cf. *iwi*, *‘ōiwi*. Ku‘u home kulāiwi, my own homeland.

kule.ana
nvt. Right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province; reason, cause, function, justification; small piece of property, as within an ahupua‘a; blood relative through whom a relationship to less close relatives is traced, as to in-laws.

kupuna
n. 1. Grandparent, ancestor, relative or close friend of the grandparent's generation, grandaunt, granduncle. ho‘o.kupuna To take a person as a grandparent or grandaunt or granduncle because of affection; an adopted grandparent; to act as a grandparent. (PPN tupuna.)
2. Starting point, source; growing.

kūpuna
Plural of kupuna 1. Mai nā kūpuna mai, from the ancestors, traditional. Pili ma nā kūpuna, related through a common ancestor. (PCP tuupuna.)

kumu
n.1. Bottom, base, foundation, basis, title (as to land), main stalk of a tree, trunk, handle, root (in arithmetic); basic; hereditary, fundamental. Kumupali, base foot of a cliff. ‘Ike kumu, basic, fundamental knowledge. Ali‘i kumu, hereditary chief. Alanui kumu, main street. ‘Auikumu, nominative case. Kumu

kāhili, staff of a kāhili. Kumu nalu, source of waves, as where surfing starts. Mai ke kumu ā ka wēlau, from trunk to tip [all, entirely]. (PPN tumu.)

2. Teacher, tutor, manual, primer, model, pattern. Kumu alakaʻi, guide, model, example. Kaʻu kumu, my teacher. Kumu hoʻohālike, pattern, example, model. Kumu hula, hula teacher. Kumu kuʻi, boxing teacher. 3. Beginning, source, origin; starting point of plaiting. hoʻo.kumu To make a beginning, originate, create, commence, establish, inaugurate, initiate, institute, found, start.

kumu
4. Reason, cause, goal, justification, motive, grounds, purpose, object, why. Kumu no ka ʻoki male, grounds for divorce. Kumu ʻole, without reason or cause.

kuʻuna
1. nvs. Slope of a hill; let down, descended. *Fig.*, traditional, hereditary. Maʻi kuʻuna, inherited disease
2. n. Place where a net is set in the sea; to let down a fish net. 3. vs. Relaxed, relieved. Kuʻuna ka naʻau, the heart is relieved.

lā
1. nvs. Sun, sun heat; sunny, solar. See ex., *lolo*, brain. hoʻo.lā To sun, put out in the sunlight. (PPN ʻlaʻaa.)
2. n. Day, date. Kēia lā, today. Lāpule, Sunday. Ia lā aʻe, ia lā aʻe, from day to day. Ka lā i ala hou ai ka Haku, the day the Lord rose; Easter (Protestant). Poʻe Hoʻāno o nā Lā Hope Nei, Latter-Day Saints; *lit.*, saint people of these last days. Lā kākou i kēia lā, we have much sun today. (PEP laa.)
3. n. A sail. (PPN laa.)
4. n. Fin. Kua lā, dorsal fin. Cf. *lālākea*.
5. n. Each of two cross sticks holding corners of the dip net called ʻupena ʻākiʻikiʻi.
6. Common demon. occurring after both nouns and verbs, and as the last part of the demon. kēlā that (far, see table 12 in Gram. 7.2) and pēlā, like that; following directionals it is usually unstressed and written as the concluding part of the directional (aʻela, akula, ihola, maila). It occurs also in the sequence ua (noun) lā, that aforementioned. A var. is ala 4. (Gram. 7.4.) He kanaka kēlā, that's a human. Maikaʻi pēlā, [it's] good that way. Hele maila ʻoia, he came. Ua kanaka lā, that aforementioned person. (PNP laa.)
7. Part. expressing doubt, uncertainty. See Gram. 7.5. Pehea lā! How, I don't know.
8. n. The letter "l". *Eng.*
9. n. Sixth note on the musical scale, la. *Eng.*
10. interj. Common refrain in songs, as in Elbert and Mahoe 90.

lā.ʻau
nvs. Tree, plant, wood, timber, forest, stick, pole, rod, splinter, thicket, club; blow or stroke of a club; strength, rigidness, hardness; male erection; to have formed mature wood, as of a seedling; wooden, woody; stiff, as wood. Kumulāʻau, tree.

lā.ʻau lapa.ʻau
n. Medicine. *Lit.*, curing medicine

lae
1.n. Forehead, brow. Nalulu ka lae, to have a headache. (PPN laʻe.)
2. Cape, headland, point, promontory. (PEP laʻe.)
3. Wisdom; mental or emotional qualities

lawaiʻa
1. nvi. Fisherman; fishing technique; to fish, to catch fish. ʻO ka hī aku ka lawaiʻa nui a ʻUmi-a-Līloa (FS 173), casting for bonito was ʻUmi-a-Līloa's principal means of fishing. (PCP lawaika).
2. *(Cap.)* n. Name of a group of seven stars.

limu
n. A general name for all kinds of plants living under water, both fresh and salt, also algae growing in any damp place in the air, as on the ground, on rocks, and on other plants; also mosses, liverworts, lichens.

loea
nvs. Skill, ingenuity, cleverness; expert, clever, ingenious, adept, deft, technical, skillful, dexterous, handy, skilled; skilled person. ʻIke loea, technical knowledge, knowledge of skills.

loʻi
n. Irrigated terrace, especially for taro, but also for rice; paddy.

lomi.lomi
Redup. of lomi; masseur, masseuse.

lono
1.n. News, report, tidings, remembrance (Kanl. 32.26), rumor (sometimes formerly preceded by ke). Kuʻi ka lono, the news spread. hoʻo.lono To listen, hear, obey; obedient, attentive. Kuʻi ka lono i Pelekane, hoʻolono ke kuini o Palani (song), the news spread to England, the queen of France heard. (PPN rongo.)
2. *(Cap.)* One of the four major gods brought from Kahiki.
3. *(Cap.)* The 28th day of the lunar month. (PEP Longo.)
4. *(Cap.)* Name of a star.

mahalo
nvt. 1. Thanks, gratitude; to thank. Mahalo nui loa, thanks [you] very much. ʻŌlelo mahalo, compliment. Mahalo ā nui, thanks very much. (PPN masalo.)
2. Admiration, praise, esteem, regards, respects; to admire, praise, appreciate.

māhele
Division, piece, portion, department, category, part, land division; to divide, apportion.

mahi ʻai
nvt. Farmer, planter; to farm, cultivate; agricultural. ʻOihana mahi ʻai, agricultural industry, farming.

mahina
1.n. Moon, month; moonlight.
2.n. Crescent-shaped fishhook.

mai.ka‘i
nvs. Good, fine, all right, well; good-looking; handsome, beautiful; goodness, righteousness, benefit, well-being, morality; good looks, good health.

maka.‘āi.nana
n. Commoner, populace, people in general; citizen, subject. Cf. lunamaka ‘āinana. *Lit.*, people that attend the land.

makani
nvs. Wind, breeze; gas in the stomach, flatulent wind; windy; to blow. Fig. anger, gossip; to show anger. Cf. *ani*. Makani nui, strong wind, gale. Makani ‘olu‘olu, fair wind.

makua
nvs. Parent, any relative of the parents' generation, as uncle, aunt, cousin; progenitor; Catholic father; main stalk of a plant; adult; full-grown, mature, older, senior. *Fig.*, benefactor, provider, anyone who cares for one. Mākua - plural.

māla
n. Garden, plantation, patch, cultivated field, as māla ‘ai, māla kalo, māla kō, māla kūlina.

mā.lama
nvt. To take care of, tend, attend, care for, preserve, protect, beware, save, maintain; to keep or observe, as a taboo; to conduct, as a service; to serve, honor, as God; care, preservation, support, fidelity, loyalty; custodian, caretaker, keeper.

malo
1.n. Male's loincloth
2.n. Leaf sheath that protects the young leaves of the breadfruit tree, sometimes called malo ‘ulu.

malo‘o
nvs. Dry, dried up, evaporated, juiceless, desiccated; stale, as bread; drought, dryness. ho‘o.malo‘o To dry out.

mana
nvs. Supernatural or divine power, mana, miraculous power; a powerful nation, authority; to give mana to, to make powerful; to have mana, power, authority; authorization, privilege; miraculous, divinely powerful, spiritual; possessed of mana, power.

māna.leo
n. Native speaker. *Lit.*, voice of authority.

mele
nvt. Song, anthem, or chant of any kind; poem, poetry; to sing, chant (preceded by both ke and ka).

mihi
nvt. Repentance, remorse; to repent, apologize, be sorry, contrite; to regret; to confess, as to a priest.

mina.mina
1. nvt. To regret, be sorry, deplore; to grieve for something that is lost; regret, sorrow.

2. To prize greatly, value greatly, especially of something in danger of being lost; to value, place great value on; value, worth.

moku
1. vs. To be cut, severed, amputated, broken in two, as a rope; broken loose, as a stream after heavy rains, or as a bound person; to punctuate. **2. n. District, island, islet, section,** forest, grove, clump, severed portion, fragment, cut, laceration, scene in a play. Cf. *mokupuni*, *momoku*. Moku lehua, lehua forest. 3. n. Ship, schooner, vessel, boat, said to be so called because the first European ships suggested islands. Many types are listed below. 4. n. A stage of pounded poi (such poi sticks together as a mass and can be separated cleanly (moku) from the pounding board). (Kep. 165.)

moʻo
1. n. Lizard, reptile of any kind, dragon, serpent; water spirit
2. n. Succession, series, especially a genealogical line, lineage.
3. n.Story, tradition, legend (less common than moʻolelo).
4. n. Narrow strip of land, smaller than an ʻili. Also moʻo ʻāina.
5. n. Small fragment, as of tapa, not attached to a large piece. Cf. *moʻomoʻo*.
6. n. Narrow path, track; raised surface extending lengthwise between irrigation streamlets.
7. n. Ridge, as of a mountain. Moʻo muku, ridge that is cut off.
8. n. Young, as of pigs, dogs; grandchild. Kuʻu moʻo lei, my beloved grandchild.

moʻokūʻauhau
kik Genealogy. Dic., sp. var. Moʻolelo moʻokūʻauhau. Genealogical story.

moʻo.lelo
n.. Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting. (From moʻo ʻōlelo, succession of talk; all stories were oral, not written.)

naʻau.ao
nvs. Learned, enlightened, intelligent, wise; learning, knowledge, wisdom, science. *Lit.*, daylight mind.

nā.nā
vt. To look at, observe, see, notice, inspect; to care for, pay attention to, take care of. Cf. *kūnānā*, *nānā ʻole*. Mai nānā i kānā ʻōlelo, don't pay any attention to what he says. He keiki nānā mākua, a son who cares for his parents.

niu
1. n. The coconut (Cocos nucifera), a common palm in tropical islands of the Pacific and warm parts of eastern Asia; coconut meat or oil. Hawaiians used all parts of the tree. (Neal 119–2l.) Coconut water and coconut cream (the white liquid squeezed front ripegrated coconuts) were both called wai niu and wai o ka niu. In For. 5:596 niu ā wali was translated 'milk of the coconut'.
2. vs. Spinning, whirling, dizzy. Cf. *niniu*, *niua*, *niuniu*, *make ulu niu*.

noʻe.au
vs. Clever, skillful, dexterous, wise, artistic, talented, expert, technical. ʻŌlelo noʻeau, wise or entertaining proverb, saying. He wahine noʻeau i ka haku lei hulu, a woman skillful at making feather leis.

noni
n. The Indian mulberry (Morinda citrifolia), a small tree or shrub in the coffee family, a native of Asia, Australia, and islands of the Pacific. Leaves are large, shiny, deep-veined. Many small flowers are borne on round heads, which become pale-yellow unpleasant-tasting fruits. Formerly Hawaiians obtained dyes and medicine from many parts of the tree.

nuku
n. Beak, snout, tip, end; spout, beak of a pitcher; mouth or entrance, as of a harbor, river, or mountain pass or gap.

ʻohana
1. nvs. Family, relative, kin group; related. ʻOhana holoʻokoʻa, ʻohana nui, extended family, clan.
2. vi. To gather for family prayers (short for pule ʻohana).

ʻohe
n. 1. All kinds of bamboo; reed (Mat. 27.48); flute; pipe, hose, tube; bamboo tube for preserving fish.
2. A coarse, jointed, native grass (Isachne distichophylla), to 190 cm high, with stiff, pointed leaves and open flowering panicle.
3. A native bamboo-like plant (Joinvillea ascendens), with stem about 3 m high, 2.5 cm or less in diameter, unbranched; leaf blades 60 to 90 cm by 8 to 13 cm, pointed and plaited; flowering panicle about 30 cm long. (Neal 166.)
4. A native tree (Reynoldsia sandwicesis), an araliad, with leaves about 30 cm long, each leaf with seven to eleven broad leaflets with scalloped edges. (Neal 652.) The wood of this kind of tree growing at Mauna Loa, Molokaʻi, was reputed to be poisonous, was used for making poison images, and is the tree form of Kapo, a goddess. See *kālaipāhoa*, *kauila*. This tree growing elsewhere was not considered poisonous and was used for making stilts, hence it was also called ʻohe kukuluaeʻo or ʻohe-o-kai or ʻohe-ma-kai.
5. A native variety of taro, thriving at altitudes above 450 m; leaf stem light-green, tinged with reddish-brown (perhaps like some variety of bamboo); the corm pink-tinted, making excellent poi. (Whitney 58.) The term may be qualified by the colors ʻeleʻele, kea or keʻokeʻo, ʻulaʻula. Lele nō ka ʻohe i kona lua, the ʻohe leaps into its hole [a legendary reference; each in his own place].
6. Variety of fish (no data).

ʻō.iwi
1. nvs. Native, native son. Cf. *iwi*, bone; kulāiwi. Hui ʻōiwi, society of native sons. ho.ʻō.iwi To pass oneself off as a native son; like a native son. (PCP kooiwi.)
2. nvi. Physique, appearance; to appear. Lamalama ka ʻōiwi, a physique glowing with health. Maikaʻi hoʻi kō ia ala ʻōiwi kino, he certainly has a fine physique.

ola
nvs. Life, health, well-being, living, livelihood, means of support, salvation; alive, living; curable, spared, recovered; healed; to live; to spare, save, heal, grant life, survive, thrive.

ʻō.lelo
nvt. Language, speech, word, quotation, statement, utterance, term, tidings; to speak, say, state, talk, mention, quote, converse, tell; oral, verbatim, verbal, motion.

oli
nvt. Chant that was not danced to, especially with prolonged phrases chanted in one breath, often with a trill (ʻiʻi) at the end of each phrase; to chant thus.

ʻō.lohe
1. vs. Bare, naked, barren; hairless, as a dog; bald; destitute, needy. Ka lua ʻōlohe o ke ālialia, the barren pit of the salt marsh. ho.ʻō.lohe Caus/sim.
2. nvs. Skilled, especially in lua fighting, so called perhaps because the beards of lua fighters were plucked and their bodies greased; bones of hairless men were desired for fish hooks because such men were thought stronger; also said of hula experts; skilled fighter.

ʻō.pae
n. General name for shrimp. For some persons, ʻōpae were ʻaumakua.

ʻō.pio
nvs. Youth, juvenile; youngster; young, junior.

paea.ea
nvi. 1. To fish with a light pole affshore; polefishing. 2. nvi. A chant of supplication; to chant thus, perhaps so called as a means of "fishing" for something. (PH 149.)

pā.ea.ea
1. vs. Smooth, calm, as the sea. 2. n. A variety of fish mentioned as having sharp protuberances (Malo 46). 3. vt. To signal with the arms. *Rare*.

pali
nvs., nvi. Cliff, precipice, steep hill or slope suitable for olonā or wauke; full of cliffs; to be a cliff. *Fig.*, an obstacle, difficulty; haughty or disdainful.

Pele
1. nvs. Lava flow, volcano, eruption; volcanic (named for the volcano goddess, Pele.
2. vs. Soft, swollen, fat; pounded or kneaded soft, as poi or dough.
3. n. Choice Kauaʻi tapa (FS 252–3), scented with maile and kūpaoa, said to be gray and dyed with charcoal made of burned sugar cane mixed with coconut water (preceded by ke). Pele ʻiliahi (GP 8), pele tapa scented with sandalwood and associated with Kahana, Kauaʻi.
4. vs. A term qualifying koʻi (adze), similar to kūpele.

pili
nvi. To cling, stick, adhere, touch, join, adjoin, cleave to, associate with, be with, be close or adjacent; clinging, sticking; close relationship, relative; thing belonging to.

pō.haku
nvs. Rock, stone, mineral, tablet; sinker; thunder; rocky, stony.

poke
nvt. To slice, cut crosswise into pieces, as fish or wood; to press out, as the core of a boil (Kam. 64:105) or the meat of an ʻopihi shell; section, slice, piece.

pono
nvs. Goodness, uprightness, morality, moral qualities, correct or proper procedure, excellence, well-being, prosperity, welfare, benefit, behalf, equity, sake, true condition or nature, duty; moral, fitting, proper, righteous, right, upright, just, virtuous, fair, beneficial, successful, in perfect order, accurate, correct, eased, relieved; should, ought, must, necessary.

pōpō ʻauhuhu
Term used in the traditional fishing method of hola. Same as `auhuhu. **pō.pō** 1. nvt. Ball, round mass, wad; cluster, bunch, as of flowers; to shape or wad up into a ball or bundle; baskets of ʻieʻie vine as used by nehu fishermen to collect nehu (For. 6:481). Cf. *kinipōpō*, *Pōpō-kapa*, *Pōpōua*. hoʻo.pō.pō To shape or wad into a ball. (PCP poopoo.)

pule
nvt. Prayer, magic spell, incantation, blessing, grace, church service, church; to pray, worship, say grace, ask a blessing, cast a spell.

puna
1. n. Spring (of water). Cf. *pūnāwai*. 2. n. Coral, lime, plaster, mortar, whitewash, calcium; coral container, as for dye, coral rubber. 3. n. Section between joints or nodes, as of bamboo or sugar cane. 4. n. Cuttlebone, as of octopus. 5. Short for kupuna as a term of address. 6. Short for punalua. hoʻo.puna Same as hoʻopunalua. 7. vi. To paddle with the hands, as to start a surfboard on its way to catch a wave. *Rare*. 8. n. Spoon (preceded by ke).

Puna is also land term given to a large district generally located on the eastern side of various Hawaiian Islands. Oftentimes, the district is abundant with fresh water springs and resources including vast rivers, streams and tributaries. On Kaua`i, the Puna district formerly included lands from the northside of Hā`upu Mountain all the way to the south border of the ahupua`a of Anahola.

ʻuala, ʻuwala
n. The sweet potato (Ipomoea batatas), a perennial, wide-spreading vine, with heart-shaped, angled, or lobed leaves and pinkish-lavender flowers. The tuberous roots are a valuable food, and they vary greatly in many ways, as in color and shape.

waʻa
1.n. Canoe, rough-hewn canoe, canoemen, paddlers; a chant in praise of a chief's canoe.
2.n. Trench, furrow, receptacle. *Fig.*, a woman. (PCP waka-.)
3. Moving masses of liquid lava, so called because of similarity to a moving canoe. *Rare*.

waʻa
4. Same as more common waʻawaʻa.

wahi
n. Place, location, position, site, setting.

wahine
nvs. Woman, lady, wife; sister-in-law, female cousin-in-law of a man; queen in a deck of cards; womanliness, female, femininity; feminine; Mrs.; to have or obtain a wahine; to become a woman, as an adolescent. In some chants, as those about Pele, the word wahine has a connotation of goddess.

Wākea or ā.kea
1. nvs. Broad, wide, spacious, open, unobstructed, public, at large; full, as a skirt; breadth, width. *Fig.*, liberal. Piliwaiwai ākea, open gambling. Ākea ka noʻonoʻo, broad-minded. Hōʻike ākea, a public report; to lay before the public. Ke hoʻolaha ʻia aku nei ma ke ākea, there is being widely advertised hereby. hoʻā.kea To widen, broaden, extend, enlarge, make public; broadening, expansion; extension; to escape *(rare)*.
2. *(Cap.)* n. Var. of Wākea

wahi pana
n. Legendary place.

wai
1. nvs. Water, liquid or liquor of any kind other than sea water (see ex., *koni*), juice, sap, honey; liquids discharged from the body, as blood, semen; color, dye, pattern; to flow, like water, fluid.
2. **(Cap.)** n. Place names beginning with Wai-, river, stream. Ka Wai Hālau O Wailua, a poetic name for Wailua, Kaua`i. Wai-lua, Wai-`ale`ale, Wai-koko, Wai-pā, Wai-mea, etc.
3. (Also spelled ai.) interr. pronoun; Who, whom, whose, what (animate antecedents).(Gram. 8.5.) ʻO wai! Who? ʻO wai kou inoa? What is your name? ʻO wai ia? Who is he? (angrily) Who does he think he is? Kō wai, kā wai? Whose? No wai? For or in honor of whom? Na wai? By whom?

wai.ū n. Milk; a wet nurse; breast. *Lit.*, breast liquid. Kau ka waiū, breasts filled with milk. Keiki waiū, nursing child. Hoʻokau i ka waiū, to perform ceremonies to make the breasts fill with milk. Lele ka waiū, breast milk has ceased to flow. Hoʻolele i ka waiū, to perform ceremonies to make the breast cease flowing. Kawaiūmakua is a pu`u that is part of the Kalalea mountain range that measures 1,670 feet high.

wauke
n. The paper mulberry (Broussonetia papyrifera), a small tree or shrub, from eastern Asia, known throughout the Pacific for its usefulness. It belongs to the fig or mulberry family. The bark was made into tough tapa used for clothing, bed clothes; it lasted longer than māmaki tapa.

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G. NOISE REPORT

ACOUSTIC STUDY FOR THE ANAHOLA SOLAR PROJECT ANAHOLA, KAUAI

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CHAPTER I. SUMMARY

The future noise levels associated with the proposed Anahola Solar Project on Kauai were evaluated for their potential impacts on noise sensitive receptors in the project environs. Future noise levels and potential impacts associated with the activities at the project site were evaluated.

Along Kuhio Highway, which is expected to service the project traffic, traffic noise levels at the closest noise sensitive receptors to the north are not expected to change significantly. Due to the relatively low volumes of project traffic (20 vehicles per hour or less) when compared to the high volumes of non-project traffic (879 to 1,067 vehicles per hour) on Kuhio Highway, traffic noise level increases should be less then 0.1 dB and will be difficult to measure. Traffic noise level increases associated with the Anahola Solar Project should not result in adverse traffic noise impacts.

Noise from on site activities at the Anahola Solar facility should not result in adverse noise impacts at the closest noise sensitive receptors located approximately 770 feet north of the project site. During the daytime hours, the background noise levels at the closest noise sensitive receptor will be higher than the noise levels from the normal daily activities at the proposed facility. Visits to the facility by noisier vehicles delivering and removing electrical equipment and poles may be audible, but are not expected to be characteristic of the normal daily activities at the proposed facility. Therefore, adverse noise impacts are not expected during daytime operations.

During the quieter nighttime hours, beeper type back-up alarms will probably be audible at the closest noise sensitive receptors. This is due to the lower background noise levels, more favorable atmospheric propagation conditions during darkness, and the concentration of beeper type back-up alarm signal energy within a narrow band of high frequencies. Because nighttime deployment of work crews from the new facility may be required during emergency repairs, the replacement of the beeper type back-up alarms with broadband noise, self-adjusting, back-up alarms is recommended. These broadband back-up alarms should be inaudible at the closest noise sensitive receptors.

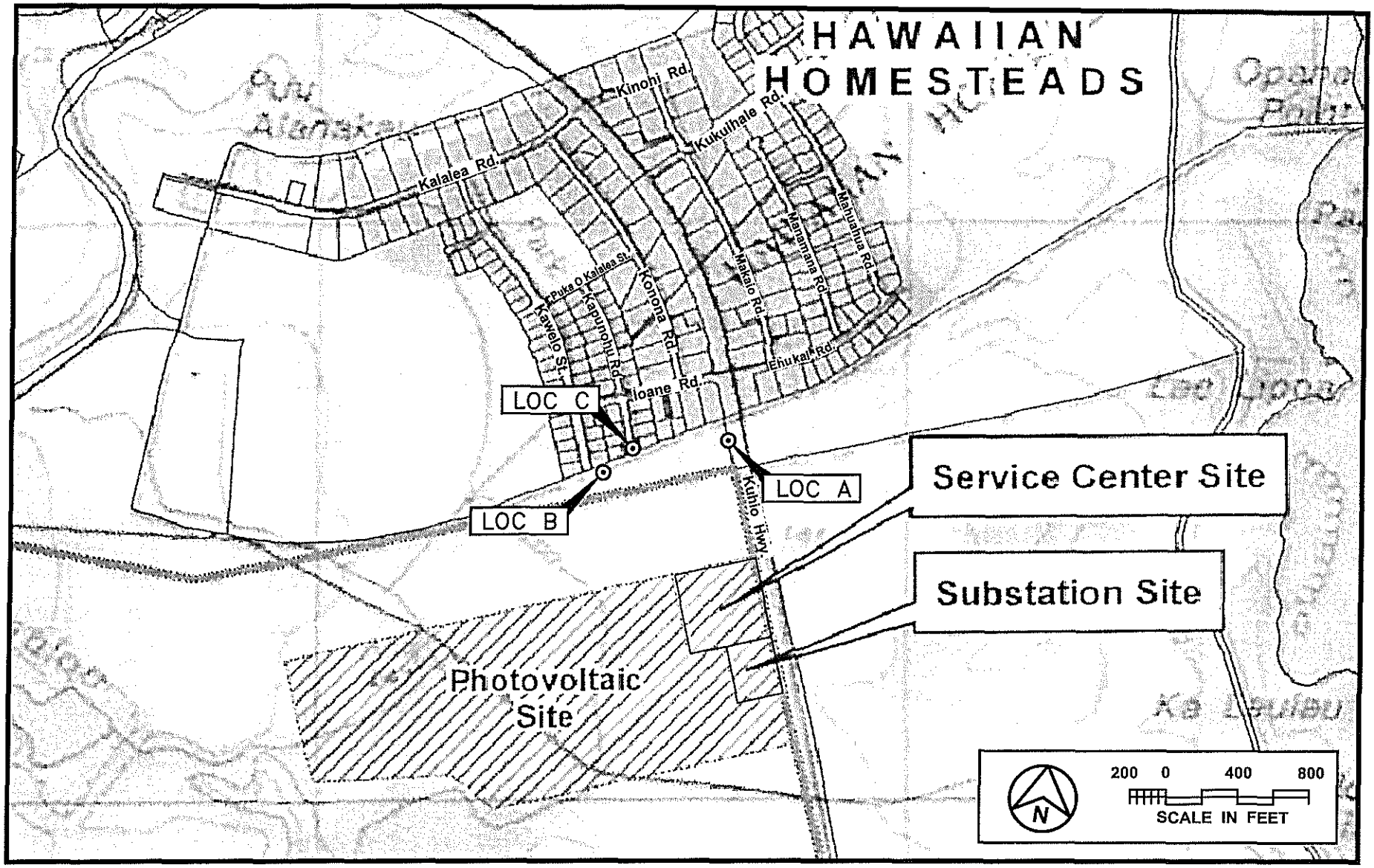
Construction activities on the project site will probably be audible at residences north of the project site. Construction noise levels are expected to be in the "Moderate Exposure, Acceptable" category due to the relatively large buffer distances (at least 770 feet) from the project site to the closest residences. The implementation of State DOH (Department of Health) construction noise permit procedures is recommended and will require that noisy construction activities do not occur during the nighttime, Sundays, and holidays. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category due to the temporary nature of the work and due to the administrative controls available for its regulation. Instead, these impacts will probably be limited to the temporary degradation of the quality of the acoustic environment in the immediate vicinity of the construction work sites.

CHAPTER II. PURPOSE

The primary objective of this study was to describe the future noise levels and potential noise impacts associated with the proposed Anahola Solar Project on Kauai. The location of the proposed Anahola Solar Project facility is shown in Figure 1. The facility will consist of a photovoltaic (PV) panel array, substation, and Service Center.

Roadway traffic noise levels and impacts associated with the Anahola Solar Project were to be determined along the primary access roadway (Kuhio Highway) which is expected to service the project's traffic. A specific objective was to determine future traffic noise levels associated with the project traffic, and the potential noise impacts associated with project traffic. Recommendations for minimizing traffic noise impacts were to be provided as required.

Assessments of possible noise impacts from on-site activities and as well as from short term construction noise at the proposed location for the Anahola Solar Project were also included in the noise study objectives. Recommendations for minimizing these noise impacts were to be provided as required.



PROJECT LOCATION MAP AND NOISE MEASUREMENT LOCATIONS

FIGURE 1

CHAPTER III. NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY

The noise descriptor currently used by federal agencies to assess environmental noise is the Day-Night Average Sound Level (DNL or Ldn). This descriptor incorporates a 24-hour average of instantaneous A-Weighted sound levels as read on a standard Sound Level Meter. The maximum A-Weighted sound level occurring while a noise source such as a heavy truck or aircraft is moving past a listener (i.e., the maximum sound level from a "single event") is referred to as the "Lmax value". The mathematical product (or integral) of the instantaneous sound level times the duration of the event is known as the "Sound Exposure Level", or Lse, which is analogous to the energy of the time-varying sound levels associated with a single event.

The DNL values represent the average noise during a typical day of the year. DNL exposure levels of 55 or less are typical of quiet rural or suburban areas. DNL exposure levels of 55 to 65 are typical of urbanized areas with medium to high levels of activity and street traffic. DNL exposure levels above 65 are representative of densely developed urban areas and areas fronting high volume roadways.

By definition, the minimum averaging period for the DNL descriptor is 24 hours. Additionally, sound levels which occur during the nighttime hours of 10:00 PM to 7:00 AM are increased by 10 decibels (dB) prior to computing the 24-hour average by the DNL descriptor. Because of the averaging used, DNL values in urbanized areas typically range between 50 and 75 DNL. In comparison, the typical range of intermittent noise events may have maximum Sound Level Meter readings between 75 and 105 dBA. A more complete list of noise descriptors is provided in Appendix B to this report. In Appendix B, the Ldn descriptor symbol is used in place of the DNL descriptor symbol.

Table 1, extracted from Reference 1, categorizes the various DNL levels of outdoor noise exposure with severity classifications. Table 2, also extracted from Reference 1, presents the general effects of noise on people in residential use situations. Figure 2, extracted from Reference 2, presents suggested land use compatibility guidelines for residential and nonresidential land uses. A general consensus among federal agencies has developed whereby residential housing development is considered acceptable in areas where exterior noise does not exceed 65 DNL. This value of 65 DNL is used as a federal regulatory threshold for determining the necessity for special noise abatement measures when applications for federal funding assistance are made.

As a general rule, noise levels of 55 DNL or less occur in rural areas, or in areas which are removed from high volume roadways. In urbanized areas which are shielded from high volume streets, DNL levels generally range from 55 to 65 DNL, and are

TABLE 1

EXTERIOR NOISE EXPOSURE CLASSIFICATION (RESIDENTIAL LAND USE)

NOISE EXPOSURE CLASS	DAY–NIGHT SOUND LEVEL	EQUIVALENT SOUND LEVEL	FEDERAL (1) STANDARD
Minimal Exposure	Not Exceeding 55 DNL	Not Exceeding 55 Leq	Unconditionally Acceptable
Moderate Exposure	Above 55 DNL But Not Above 65 DNL	Above 55 Leq But Not Above 65 Leq	Acceptable(2)
Significant Exposure	Above 65 DNL But Not Above 75 DNL	Above 65 Leq But Not Above 75 Leq	Normally Unacceptable
Severe Exposure	Above 75 DNL	Above 75 Leq	Unacceptable

Notes: (1) Federal Housing Administration, Veterans Administration, Department of Defense, and Department of Transportation.

(2) FHWA uses the Leq instead of the Ldn descriptor. For planning purposes, both are equivalent if: (a) heavy trucks do not exceed 10 percent of total traffic flow in vehicles per 24 hours, and (b) traffic between 10:00 PM and 7:00 AM does not exceed 15 percent of average daily traffic flow in vehicles per 24 hours. The noise mitigation threshold used by FHWA for residences is 67 Leq.

TABLE 2

EFFECTS OF NOISE ON PEOPLE
(Residential Land Uses Only)

EFFECTS[1] / DAY-NIGHT AVERAGE SOUND LEVEL IN DECIBELS	Hearing Loss	Speech Interference		Annoyance[2]	Average Community Reaction[4]	General Community Attitude Towards Area
		Indoor	Outdoor			
	Qualitative Description	%Sentence Intelligibility	Distance in Meters for 95% Sentence Intelligibility	% of Population Highly Annoyed[3]		
75 and above	May Begin to Occur	98%	0.5	37%	Very Severe	Noise is likely to be the most important of all adverse aspects of the community environment.
70	Will Not Likely Occur	99%	0.9	25%	Severe	Noise is one of the most important adverse aspects of the community environment.
65	Will Not Occur	100%	1.5	15%	Significant	Noise is one of the important adverse aspects of the community environment.
60	Will Not Occur	100%	2.0	9%	Moderate to Slight	Noise may be considered an adverse aspect of the community environment.
55 and below	Will Not Occur	100%	3.5	4%		Noise considered no more important than various other environmental factors.

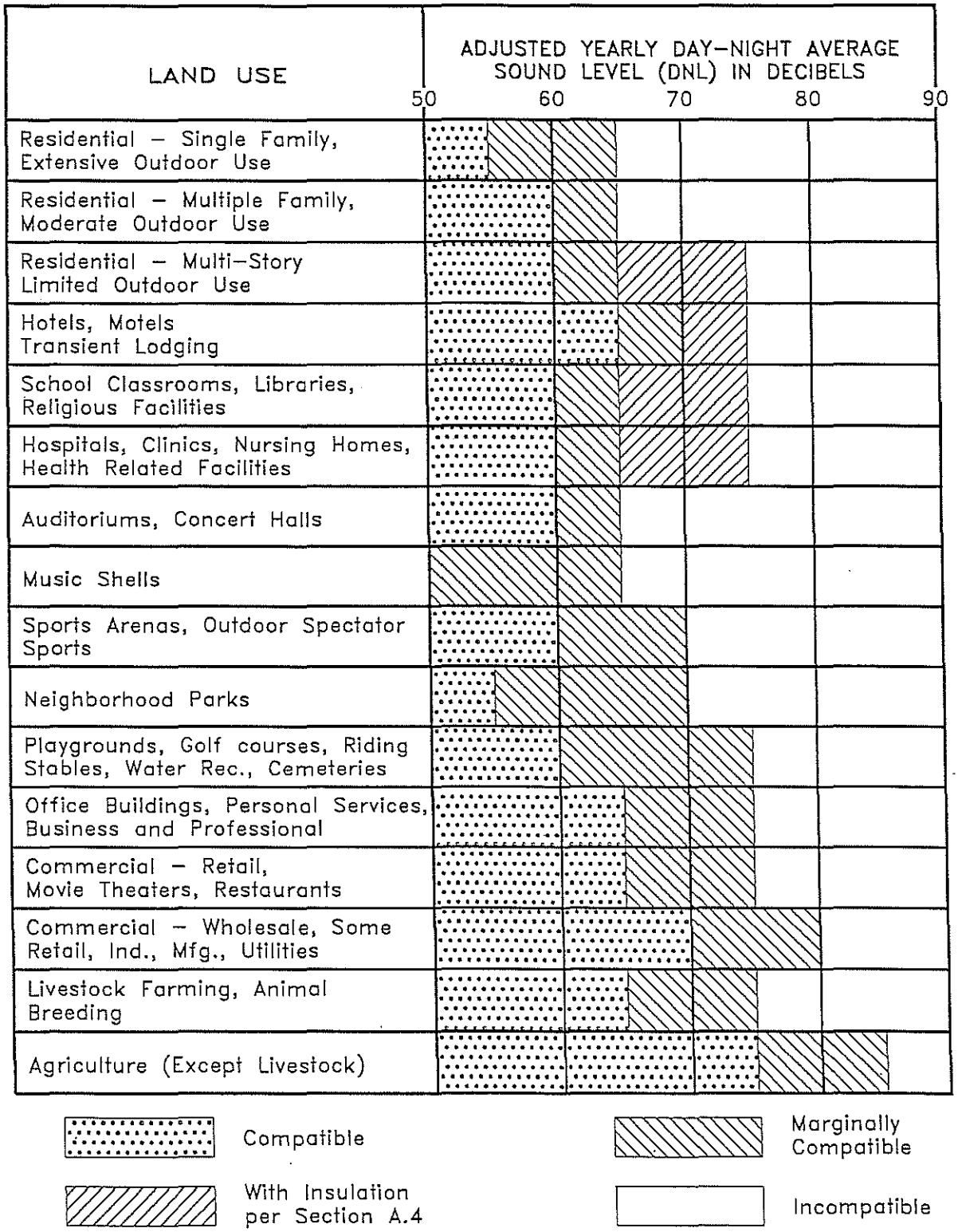
1. "Speech Interference" data are drawn from the following tables in EPA's "Levels Document": Table 3, Fig. D-1, Fig. D-2, Fig. D-3. All other data from National Academy of Science 1977 report "Guidelines for Preparing Environmental Impact Statements on Noise, Report of Working Group 69 on Evaluation of Environmental Impact of Noise."

2. Depends on attitudes and other factors.

3. The percentages of people reporting annoyance to lesser extents are higher in each case. An unknown small percentage of people will report being "highly annoyed" even in the quietest surroundings. One reason is the difficulty all people have in integrating annoyance over a very long time.

4. Attitudes or other non-acoustic factors can modify this. Noise at low levels can still be an important problem, particularly when it intrudes into a quiet environment.

NOTE: Research implicates noise as a factor producing stress-related health effects such as heart disease, high-blood pressure and stroke, ulcers and other digestive disorders. The relationships between noise and these effects, however, have not as yet been quantified.



LAND USE COMPATIBILITY WITH YEARLY AVERAGE DAY–NIGHT AVERAGE SOUND LEVEL (DNL) AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED.
(Source: American National Standards Institute S12.9–1998/Part 5)

FIGURE 2

usually controlled by motor vehicle traffic noise. Residences which front major roadways can be exposed to levels of 65 DNL. Due to noise shielding effects from intervening structures, interior lots are usually exposed to 3 to 10 DNL lower noise levels than the front lots which are not shielded from the traffic noise.

For the purposes of determining an acceptable level of exterior noise for residences, federal agencies have determined that an exterior noise level of 65 DNL or lower is considered acceptable. These federal agencies include the Federal Aviation Administration (FAA), Department of Defense (DOD); Federal Housing Administration, Housing and Urban Development (FHA/HUD), and Veterans Administration (VA). This standard is applied nationally (see Reference 3).

For office, commercial, industrial, and other non-noise sensitive land uses, exterior noise levels as high as 70 to 75 DNL are generally considered acceptable. Exceptions to this occur when naturally ventilated office and other commercial establishments are exposed to exterior levels which exceed 65 DNL. The State Department of Health (DOH) regulates the noise levels from fixed machinery by imposing maximum allowable sound levels at the property boundaries for various zoning categories (see Reference 4). Because of the Agricultural Zoning of the project site, the allowable noise levels from fixed machinery at or beyond the project site boundaries is 70 dBA during the daytime and nighttime periods. The noise levels of portable or movable equipment (such as trucks, front end loaders, fork lifts, etc.) are not subject to the 70 dBA limit under DOH noise regulations.

Due to the relatively large (770+ feet) buffer distances between the proposed Anahola Solar Project site and the closest noise sensitive receptors to the north, regulation of the noise levels during construction of the Anahola Solar facility is not as critical as it would be within an urban area. Construction noise levels are regulated by the State DOH using a curfew system (Reference 4) whereby noisy construction activities are not normally permitted during the nighttime periods, on Sundays, and on holidays. Construction activities (which could typically exceed the limits established for fixed machinery) are normally allowed during the normal daytime work hours on weekdays and on Saturdays using a system involving the issuance of construction noise permits.

CHAPTER IV. GENERAL STUDY METHODOLOGY

General. Computer noise modeling was used to describe the noise levels associated with Anahola Solar Project activities at the closest noise sensitive receptors to the north. The noisiest activities are expected to occur during sitework and construction activities prior to commissioning of the facility. The existing Kapaa Baseyard operations of the Kauai Island Utility Cooperative (KIUC) are planned to be relocated to the Service Center Site where shown in Figure 1. These operations are expected to be the noisiest activities on the Anahola Solar Project site following commissioning of the facility. The noise levels of a KIUC Line Truck (with boom and bucket) were measured at the KIUC Kapaa Baseyard facility, and were used to form a basis for modeling the noise levels of the noisy equipment expected to be most frequently used at the Service Center Site. The noise from these equipment and operations at the proposed facility and from motor vehicles traveling along the primary access road to the proposed facility were evaluated. Risks of adverse noise impacts from future baseyard operations at the Service Center Site, traffic, and short term construction noise were determined, and possible noise mitigation measures were provided as applicable.

Traffic Noise Measurements. Traffic noise measurements were obtained at Location A along Kuhio Highway (see Figure 1) on November 23, 2012 to validate the traffic noise model, and to describe background ambient noise levels during low and high volume traffic conditions. The U.S. Federal Highway Administration Traffic Noise Model (TNM) Version 2.5 (Reference 5) was used to calculate existing and future traffic noise levels, with the traffic noise measurements used to validate the reasonableness of the traffic noise predictions provided by the TNM. The results of these traffic noise measurements and their comparison with TNM predictions are shown in Table 3.

Because background noise levels at the noise sensitive receptor locations closest to the project site are controlled by traffic along Kuhio Highway, the average background noise levels at these receptor locations tend to be lowest during the nighttime and early morning hours. Background ambient noise measurements were obtained at Locations B and C (see Figure 1) between 9:50 and 11:59 am on November 23, 2012 and between 6:16 and 9:00 pm on November 23, 2012. These background noise measurements are summarized in Table 4, and were used to compare against the predicted noise levels from on-site activities at the project site.

Noise During On-Site Activities. Measurements of sound levels associated with Line Truck operations were performed on November 23, 2012. Line Trucks would typically be deployed from the proposed Service Center Site in conjunction with service calls associated with maintenance and repair of off-site KIUC facilities. The proper operation of the Line Trucks will typically be verified prior to leaving the Service Center. The sound levels recorded of a Line Truck at 50 feet distance are shown in Figure 3. The various operating modes of the Line Truck are also shown in the figure. Based on the measurements of the Line Truck at the KIUC Kapaa Baseyard, noise level

TABLE 3

TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
A. 50 FT from the center-line of Kuhio Hwy. (11/23/12)	0753 TO 0853	52	706	13	11	68.7	68.7
A. 50 FT from the center-line of Kuhio Hwy. (11/23/12)	1601 TO 1701	55	1,080	7	2	70.8	70.8
B. At South End of Kawelo St. (11/23/12)	0951 TO 1051	N/A	N/A	N/A	N/A	43.0	N/A
C. At South End of Kapunohu Rd. (11/23/12)	1059 TO 1159	N/A	N/A	N/A	N/A	46.5	N/A
C. At South End of Kapunohu Rd. (11/23/12)	1816 TO 1916	N/A	N/A	N/A	N/A	47.1	N/A
B. At South End of Kawelo St. (11/23/12)	1924 TO 2024	N/A	N/A	N/A	N/A	41.7	N/A
C. At South End of Kapunohu Rd. (11/23/12)	2028 TO 2100	N/A	N/A	N/A	N/A	45.8	N/A

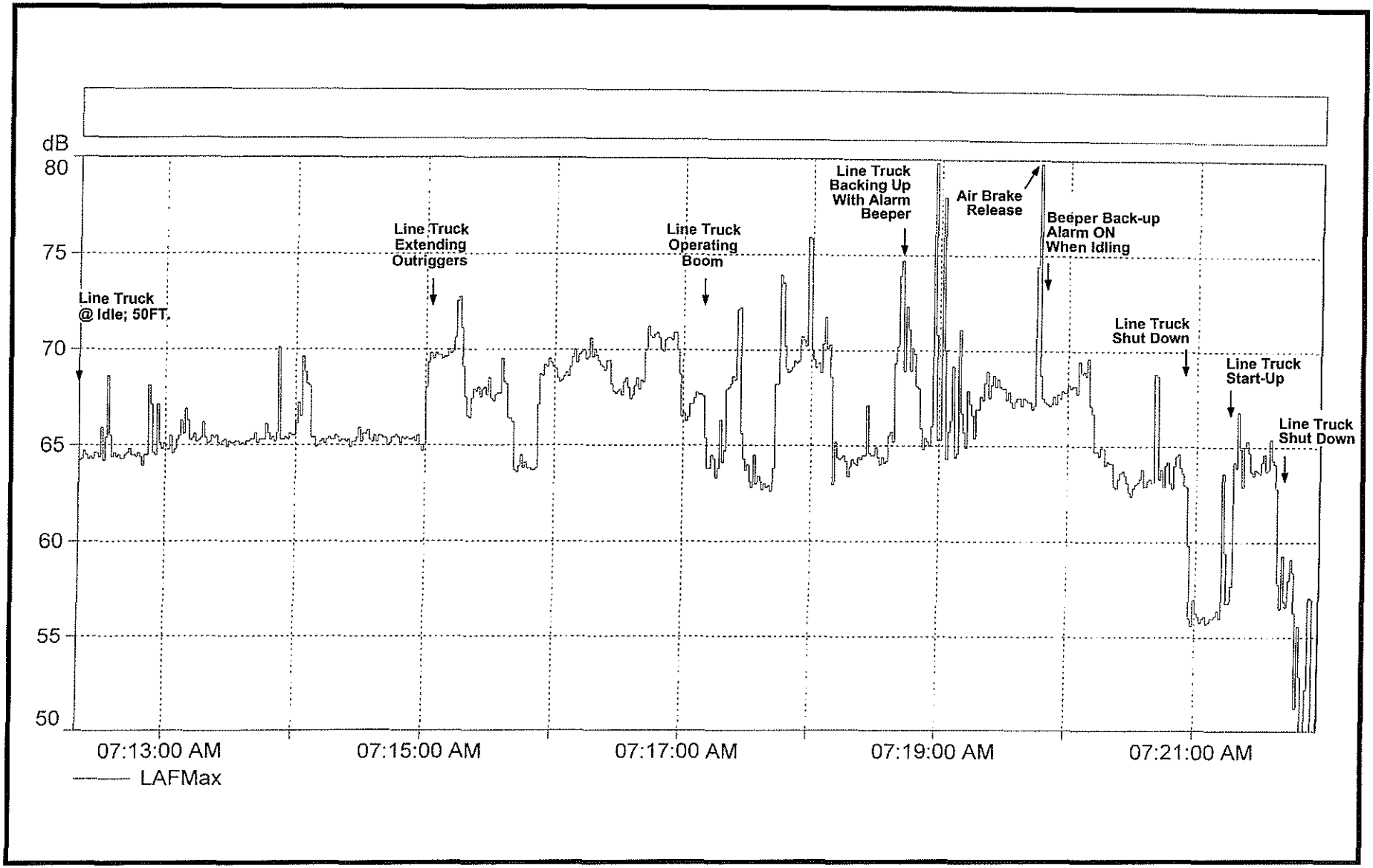
TABLE 4. MEASURED BACKGROUND NOISE LEVELS AT LOCATIONS B AND C

LOCATION: ANAHOLA RESIDENTIAL SUBDIVISION
DATE: November 23, 2012

Start Time	End Time	MAXL	LEQ	MINL	L99	L95	L90	L50	L10	L5	L1	Event Description
09:51 AM	10:51 AM	55.3	43.0	32.7	34.9	37.1	38.2	41.7	45.9	47.1	49.4	At Location B
10:59 AM	11:59 AM	62.6	46.5	31.8	35.9	39.4	40.6	45.4	49.4	50.6	53.0	At Location C
6:16 PM	7:16 PM	63.1	47.1	39.3	41.2	42.1	42.6	46.0	49.8	50.9	53.4	At Location C
7:24 PM	8:24 PM	54.4	41.7	33.0	34.7	35.7	36.6	40.0	43.4	44.4	47.6	At Location B
8:28 PM	9:00 PM	56.3	45.8	37.5	39.0	40.0	40.5	42.3	44.9	48.0	56.0	At Location C

Notes:

a. Leq = Average A-Weighted Sound Level (in dBA)
b. Lmax = Maximum A-Weighted Sound Level (in dBA)
c. Lmin = Minimum A-Weighted Sound Level (in dBA)
d. L10 = A-Weighted Sound Level (in dBA) which was exceeded 10 percent of the time.
e. L90 = A-Weighted Sound Level (in dBA) which was exceeded 90 percent of the time.
f. Lxx = A-Weighted Sound Level (in dBA) which was exceeded xx percent of the time.



MEASURED SOUND LEVELS OF LINE AT 50 FEET DISTANCE AT KIUC KAPAA BASEYARD

FIGURE 3

predictions were made at the closest noise sensitive receptors to the proposed Service Center facility. The noise modeling was performed using inverse square law for hemispherical spreading of a sound from a source at or near the ground, with inclusion of molecular absorption and anomalous excess attenuation effects. The modeling equation used to predict sound levels at any given distance from an on-site noise source was:

$$L_p = L_w - 20 \times \text{Log}\,(d) - [d \times a(f)] / 100 - 8,$$

where:

L_p = Sound pressure level in decibels (re $2x10^{-5}$ Pa) at distance d (in meters),
L_w = Sound power level of noise source in decibels (re picowatt), and
a(f) = Molecular absorption plus anomalous excess attenuation in decibels per 100 meters. For the 9 standard Octave Bands from 31.5 Hz to 8,000 Hz, the a(f) values used were 0.1, 0.16, 0.27, 0.39, 0.66, 1.08, 1.9, 3.47, and 5.2.

Traffic Noise Level Predictions. Traffic on Kuhio HIghway is the primary background noise source in the vicinity of the Anahola Solar Project. KIUC estimates that once they are operational, the three components of the Anahola Solar Project (i.e., PV arrays, substation, and base yard/service center) will generate no more than 20 new vehicles-trips per hour at any location on Kuhio Highway, and in most instances, it will be considerably less. Using this information, the increase in traffic noise levels along Kuhio Highway associated with the addition of 20 vehicles per hour was estimated using the TNM Version 2.5. For existing and future traffic along Kuhio Highway in the vicinity of the project site, it was assumed that the average noise levels, or Leq(h), during the pm peak traffic hour were approximately equal to the 24-hour DNL along Kuhio Highway. This relationship between the peak hour Leq(h) and the 24-hour DNL is typical for rural areas with relatively low volumes of traffic during the nighttime period.

Construction Noise. Evaluations of potential construction noise impacts at noise sensitive properties closest to the proposed Anahola Solar Project site were also provided. Risks of adverse noise impacts from construction activities at the project site were evaluated, and mitigation measures were recommended as required.

CHAPTER V. EXISTING NOISE LEVELS

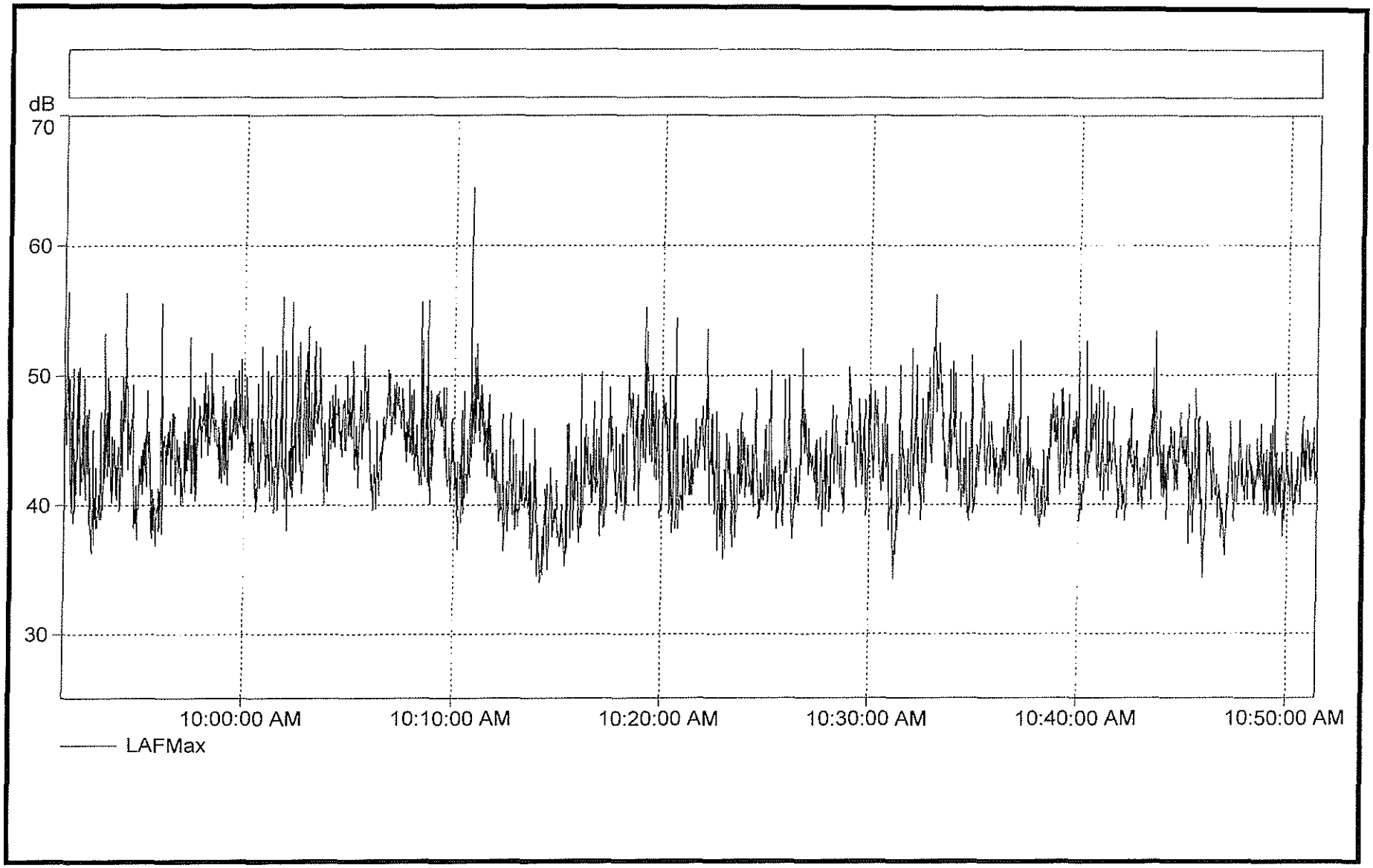
Traffic on Kuhio Highway controls the background noise levels at noise sensitive receptors closest to the proposed Anahola Solar facility. Existing peak hour traffic noise levels along Kuhio Highway are estimated to range from 69 to 71 Leq(h) at 50 foot distance from the centerline.

Existing background ambient noise levels at the makai (east) boundary of the proposed Anahola Solar site are relatively high at 69 to 71 Leq(h), or DNL, because the project site abuts the Kuhio Highway Right-of-Way. Kuhio Highway is also adjacent to the first row of existing residences within the Hawaiian Homes Anahola Subdivision north of the project. For this reason, and particularly during the normal working hours, background ambient noise levels at the closest noise sensitive receptors which front Kuhio Highway are relatively high, and will tend to mask the noise emissions from the proposed Anahola Solar facility.

Existing traffic (and background) noise levels decline with increasing distance from Kuhio Highway; from 65 Leq(h) at 90 feet from the highway centerline; to 58 Leq(h) at 200 feet from the highway centerline; to 49 Leq(h) at 500 feet from the highway centerline; and to 42 Leq(h) at 1,000 feet from the highway centerline. The measured background noise levels shown in Tables 3 and 4 are consistent with these estimates of existing background noise levels associated with traffic on Kuhio Highway.

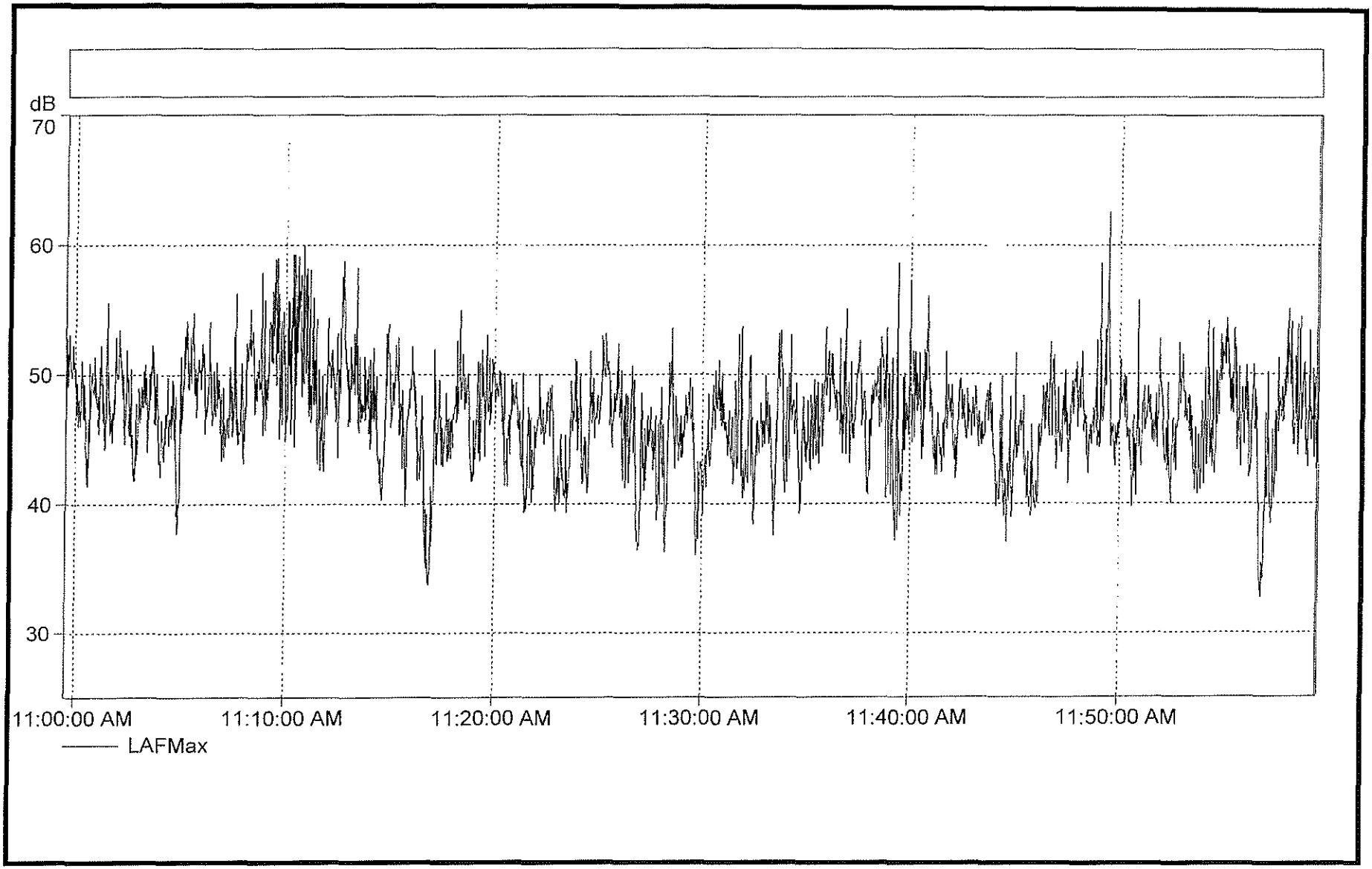
At the larger distances (in excess of 500 feet) from Kuhio Highway, other background noise sources (barking dogs, foliage moving in the wind, birds, distant surf, local motor vehicle traffic, and human activities) begin to control the background noise levels. At these locations, background noise levels are well below the 65 DNL FHA/HUD noise standard, and typically below the "Minimal Exposure, Unconditionally Acceptable" level shown in Table 1.

Figures 4 through 8 are strip charts of the measured background noise levels at Locations B and C. The large impulsive noise levels shown in Figures 7 and 8 were caused by distant barking dogs. The large triangular noise event recorded at Location C in Figure 8 at 8:57 PM was caused by a local motor vehicle. The quieter periods of these measured data were used to compare measured background noise levels at the Anahola Subdivision homes with predicted noise levels from on-site project noise sources located at the proposed Service Center Site.



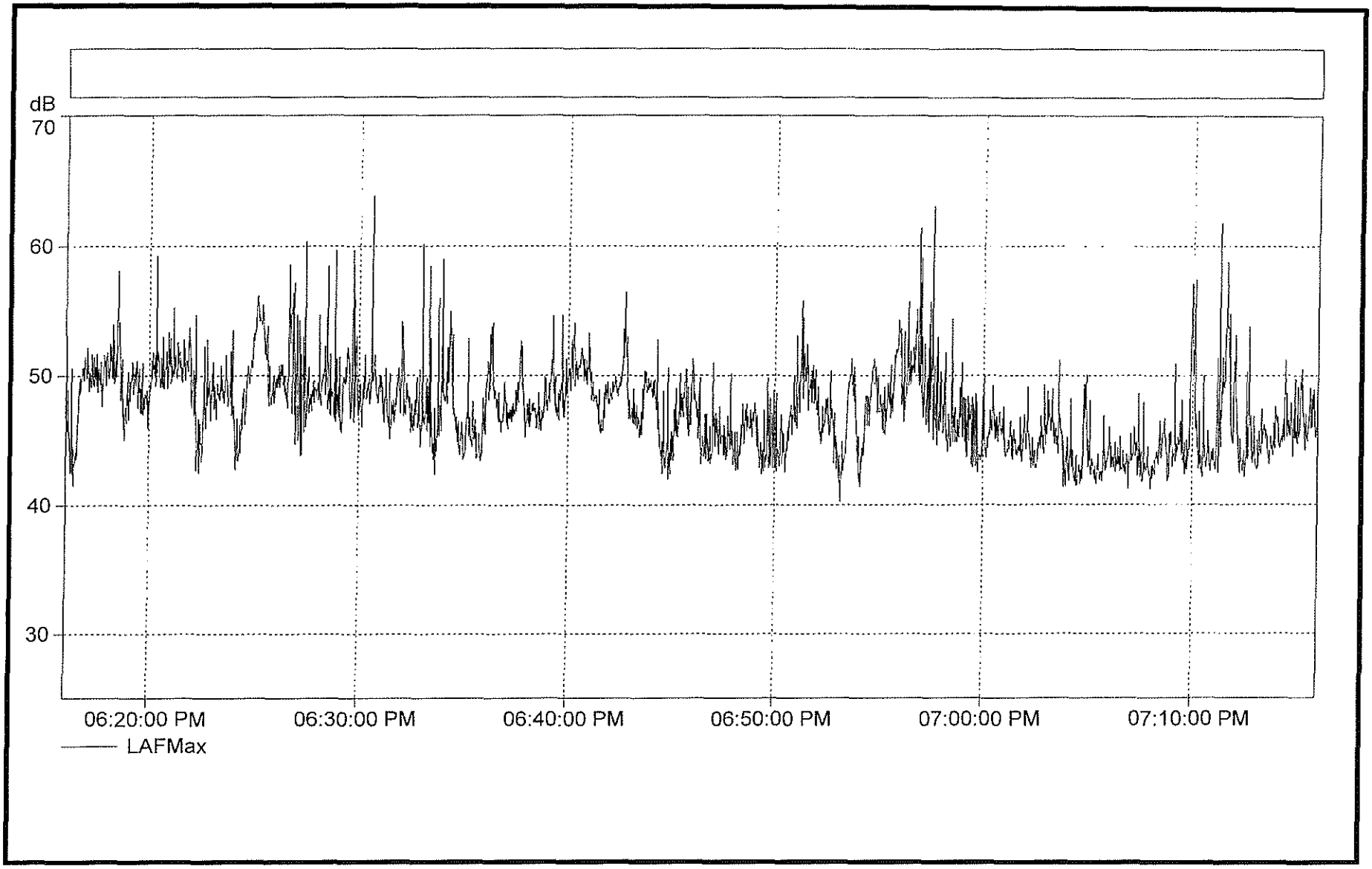
TIME HISTORY OF A-WEIGHTED SOUND LEVELS VS. TIME AT LOCATION B (9:51 AM TO 10:51 AM)

FIGURE 4



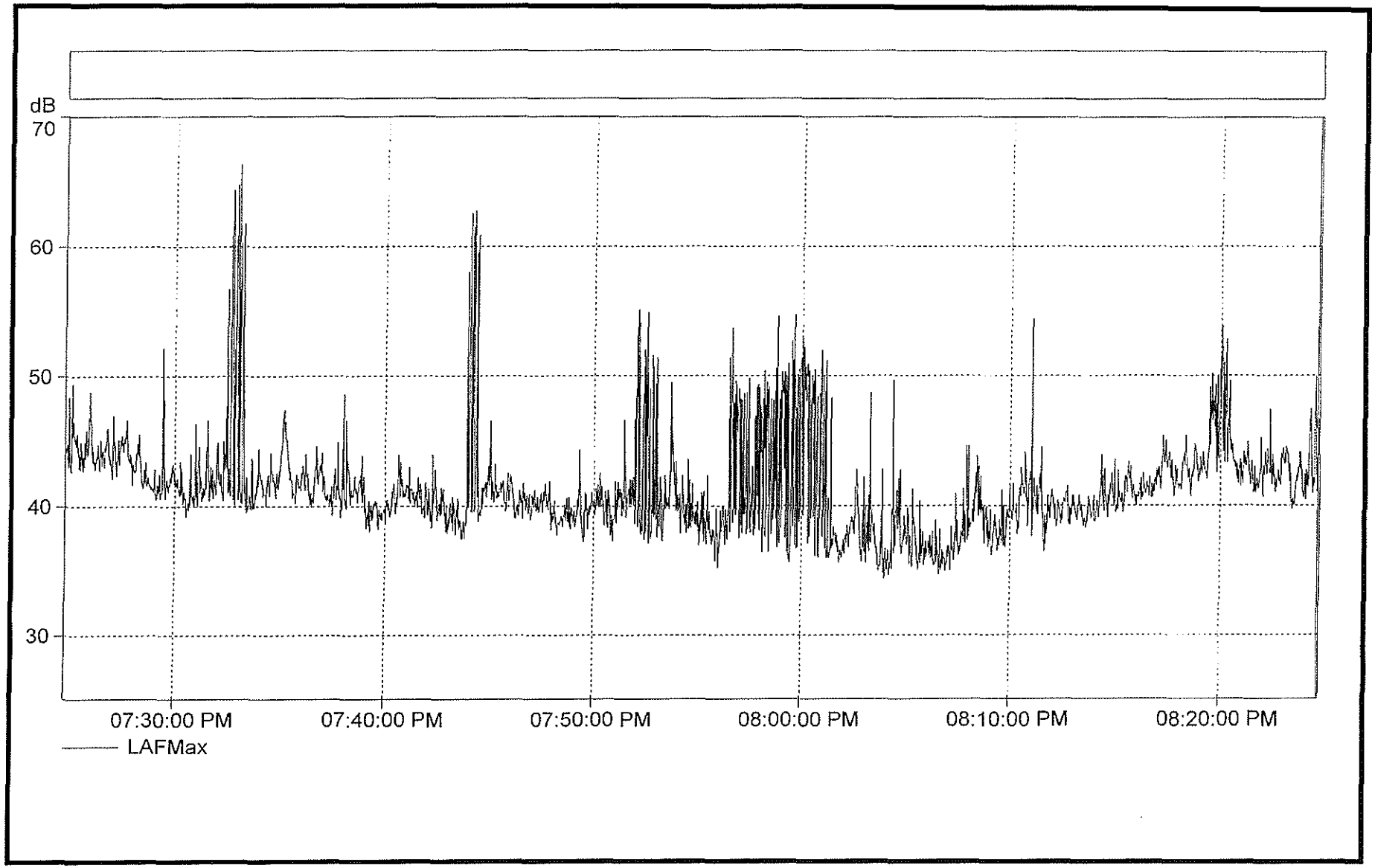
TIME HISTORY OF A-WEIGHTED SOUND LEVELS VS. TIME AT LOCATION C (10:59 AM TO 11:59 AM)

FIGURE 5



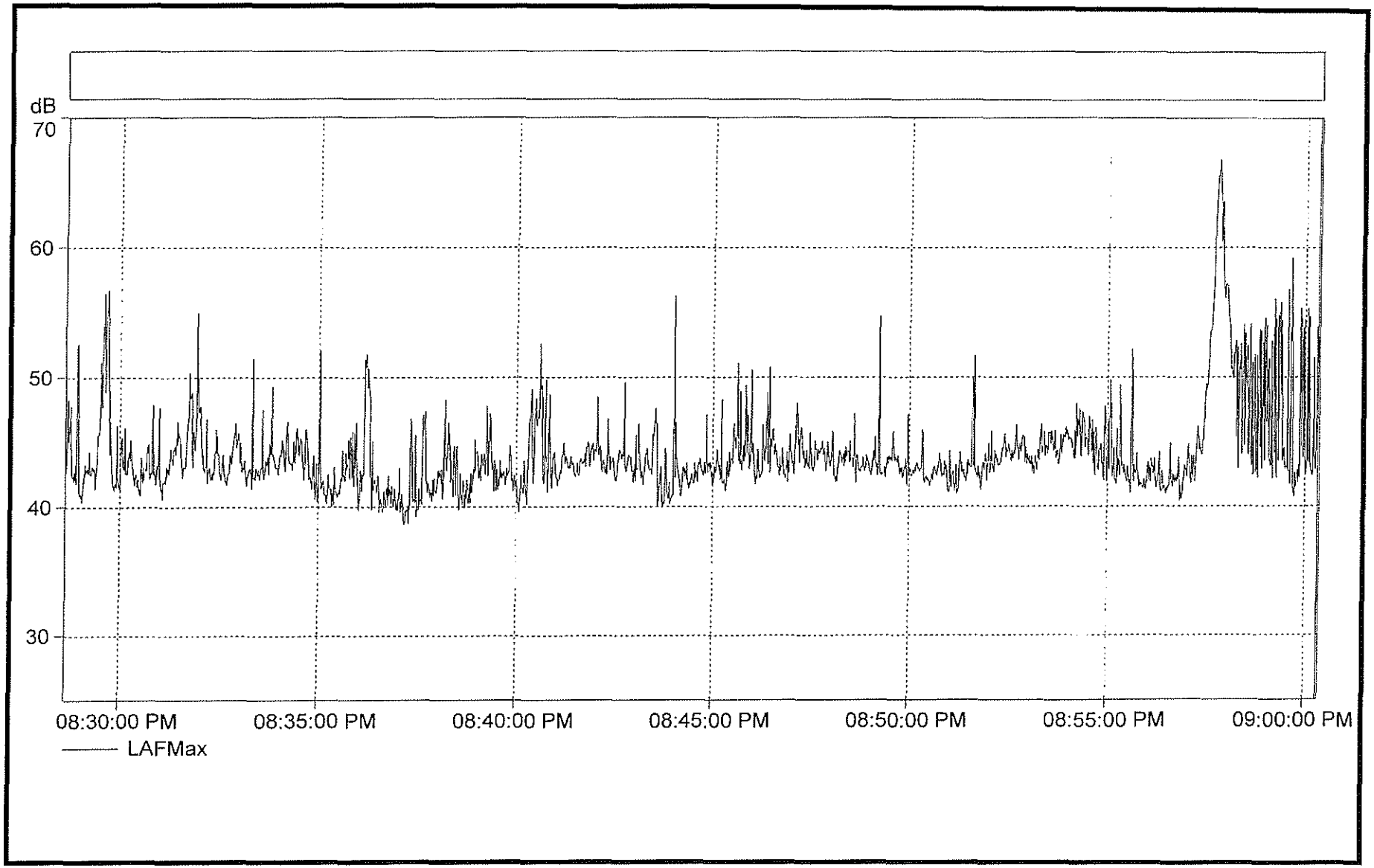
TIME HISTORY OF A-WEIGHTED SOUND LEVELS VS. TIME AT LOCATION C (6:16 PM TO 7:16 PM)

FIGURE 6



TIME HISTORY OF A-WEIGHTED SOUND LEVELS VS. TIME AT LOCATION B (7:24 PM TO 8:24 PM)

FIGURE 7



TIME HISTORY OF A-WEIGHTED SOUND LEVELS VS. TIME AT LOCATION C (8:28 PM TO 9:00 PM)

FIGURE 8

CHAPTER VI. FUTURE NOISE ENVIRONMENT

Motor Vehicle Traffic Noise. With or without the proposed Anahola Solar Project, future traffic noise levels along Kuhio Highway are expected to be similar to existing traffic noise levels. The non-project, peak hour traffic volumes on Kuhio Highway at the Hawaiian Homes Subdivision at Ioana Road will probably range from approximately 900 to 1,100 vehicles per hour based on information contained in Reference 6. The addition of 20 project vehicles per hour to these baseline traffic volumes will increase total traffic noise levels by less than 0.1 dB, which is not significant, and which will be very difficult to measure. Therefore, with or without the proposed Anahola Solar Project, future traffic noise levels along the Kuhio Highway (and at the closest noise sensitive receptors to the new Anahola Solar facility) should not increase significantly.

Baseyard Operations At Service Center. Predictions of the noise levels associated with KIUC Baseyard operations at the proposed Service Center were based on the measured noise levels at the KIUC Kapaa Baseyard, and other data collected during loading and unloading operations of tractor/trailer trucks. Spherical spreading plus molecular absorption and excess ground attenuation were used to calculate the sound levels at Locations B and C (see Figure 1), with the noise sources located mauka of the proposed Service Center Building.

Tables 5 and 6 present the predicted noise levels of the various baseyard operations at Locations B and C, respectively. Noise sources other than the KIUC Line Trucks, such as delivery tractor/trailer trucks with their noisier forklifts, were included in the tables, since these vehicles may intermittently visit the baseyard. The lower range of the predicted noise levels are more likely to occur during the daytime period (due to upward refraction of the sound rays from the sources and/or excess ground attenuation effects), while the higher noise levels are more likely to occur during the nighttime or overcast periods (due to the negligible excess ground attenuation effects). In addition to these sound propagation effects, the background ambient noise levels at the receptor locations are typically lower during the nighttime and early morning periods, so the risks of the baseyard noise sources being audible at the noise sensitive receptor locations are greater during the nighttime and early morning periods than during the normal daytime working periods.

Figures 9 through 12 depict the approximate relationships of the KIUC Line Truck noise levels measured on November 23. 2012 to the quieter measured background noise levels at Locations B and C. The actual time histories of the Line Truck noise levels may be lower than those shown in Figures 9 through 12 due to the frequency dependent sound attenuation effects and the high frequency characteristics of some of the LIne Truck noise sources (such as the back-up alarms and air brake release noise).

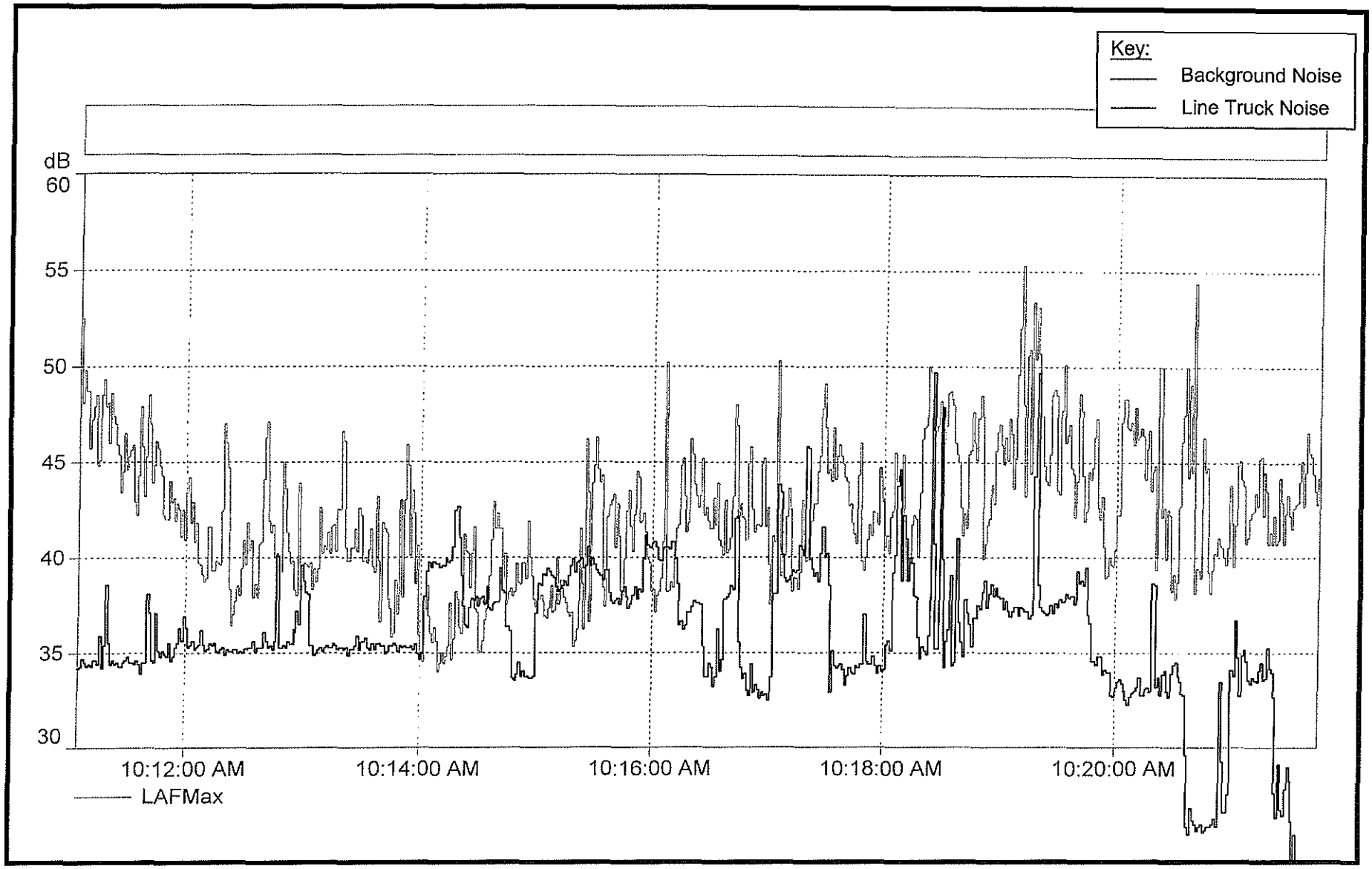
Background ambient noise levels at Locations B and C during the quieter periods were typically between 35 and 40 dBA. Based on the results shown in Tables 5 and 6,

TABLE 5
SUMMARY OF NOISE LEVELS FROM BASEYARD SOURCES AT LOCATION B

NOISE SOURCE	SOUND LEVEL AT 50 FEET (dBA)	DISTANCE (FEET) TO LOCATION B	PREDICTED NOISE LEVEL @ RECEPTOR	------- SOURCE AUDIBLE? ------- DAYTIME	NIGHTTIME
Steady Noise from Line Truck Idling	64.8	1,028	31 to 36 dBA	No	No
Average Noise from Operating Line Truck	67.8	1,028	36 to 40 dBA	No	No
Line Truck Beeper Type Back-Up Alarm	69.0	1,028	35 to 40 dBA	Yes	Yes
Line Truck Broadband Back-Up Alarm	68.6	1,028	34 to 39 dBA	No	No
Line Truck Air Brake Release	80.4	1,028	39 to 45 dBA	No	Possible
Banging Noise During Loading/Unloading	89.5	1,028	57 to 61 dBA	Yes	Yes
Noisy Tractor/Trailer Truck	85.2	1,028	53 to 57 dBA	Yes	Yes
Noisy Forklift	76.9	1,028	43 to 47 dBA	Possible	Yes
Tractor/Trailer Truck Back-Up Alarm	87.5	1,028	53 to 58 dBA	Yes	Yes

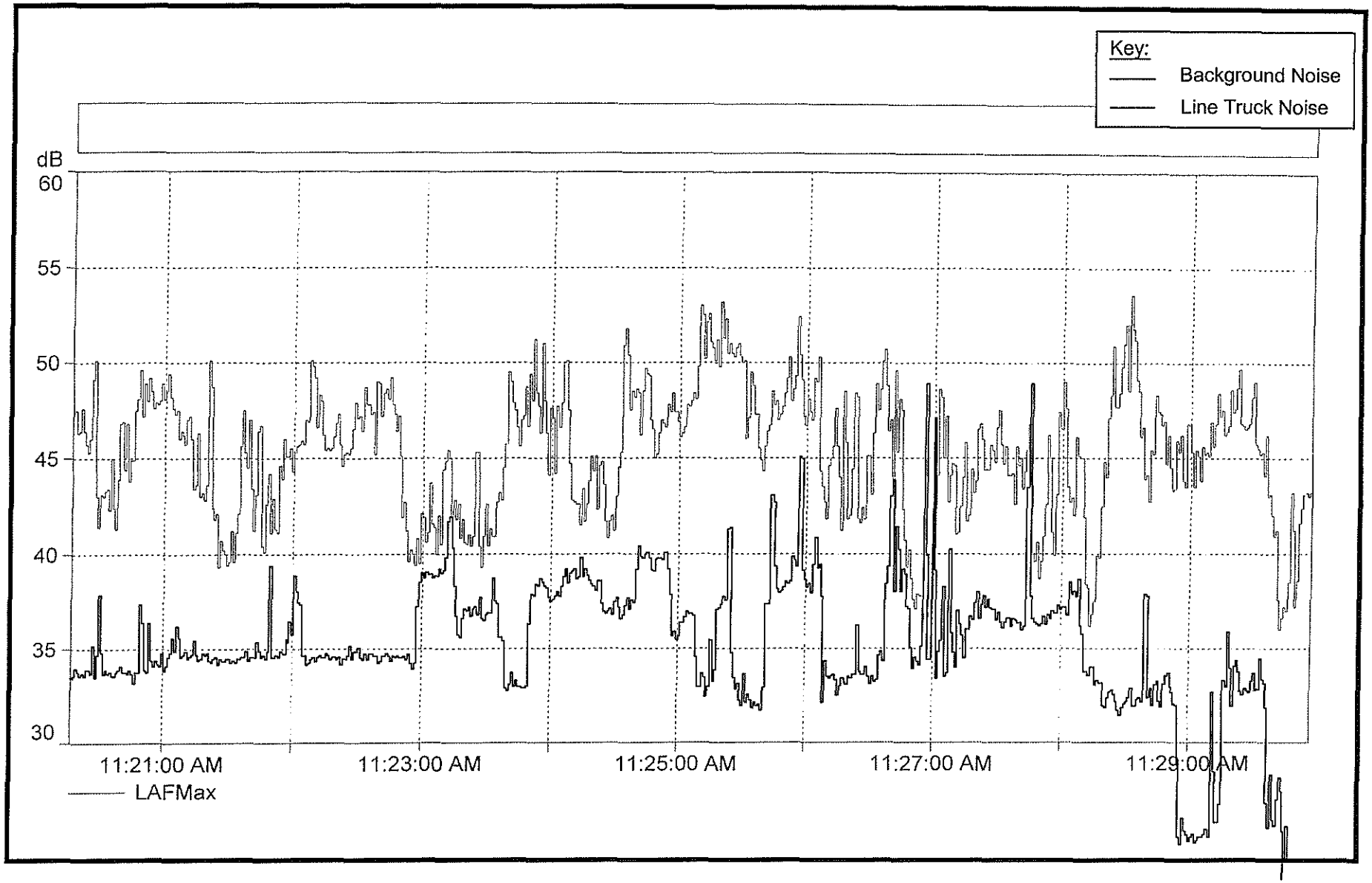
TABLE 6
SUMMARY OF NOISE LEVELS FROM BASEYARD SOURCES AT LOCATION C

NOISE SOURCE	SOUND LEVEL AT 50 FEET (dBA)	DISTANCE (FEET) TO LOCATION C	PREDICTED NOISE LEVEL @ RECEPTOR	SOURCE AUDIBLE? DAYTIME	SOURCE AUDIBLE? NIGHTTIME
Steady Noise from Line Truck Idling	64.8	1,052	31 to 35 dBA	No	No
Average Noise from Operating Line Truck	67.8	1,052	36 to 39 dBA	No	No
Line Truck Beeper Type Back-Up Alarm	69.0	1,052	34 to 39 dBA	Yes	Yes
Line Truck Broadband Back-Up Alarm	68.6	1,052	33 to 38 dBA	No	No
Line Truck Air Brake Release	80.4	1,052	39 to 45 dBA	No	Possible
Banging Noise During Loading/Unloading	89.5	1,052	56 to 60 dBA	Yes	Yes
Noisy Tractor/Trailer Truck	85.2	1,052	52 to 56 dBA	Yes	Yes
Noisy Forklift	76.9	1,052	43 to 47 dBA	Possible	Yes
Tractor/Trailer Truck Back-Up Alarm	87.5	1,052	52 to 58 dBA	Yes	Yes



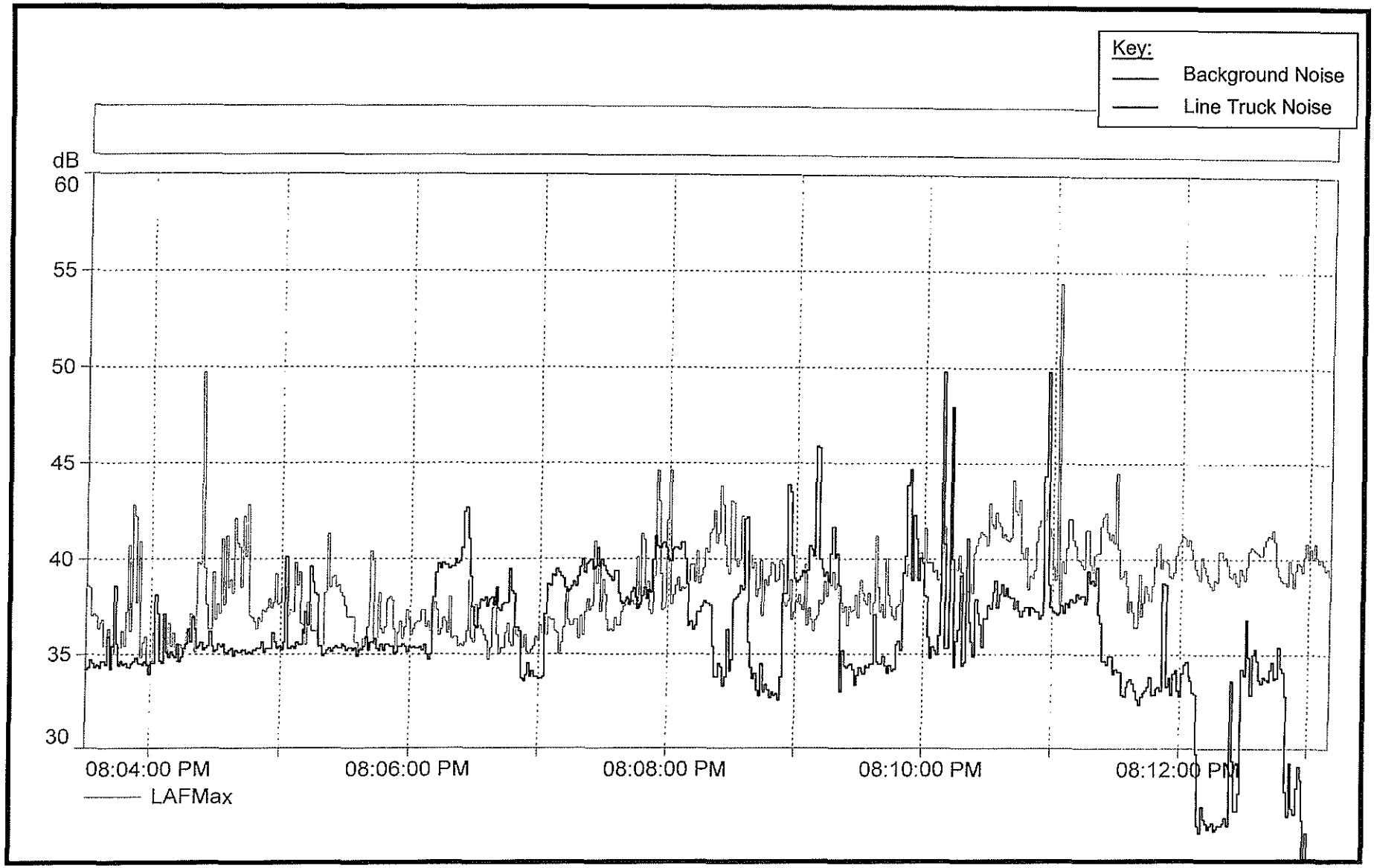
PREDICTED LINE TRUCK NOISE LEVELS SUPERIMPOSED ON MEASURED MORNING BACKGROUND NOISE LEVELS AT LOCATION B

FIGURE 9



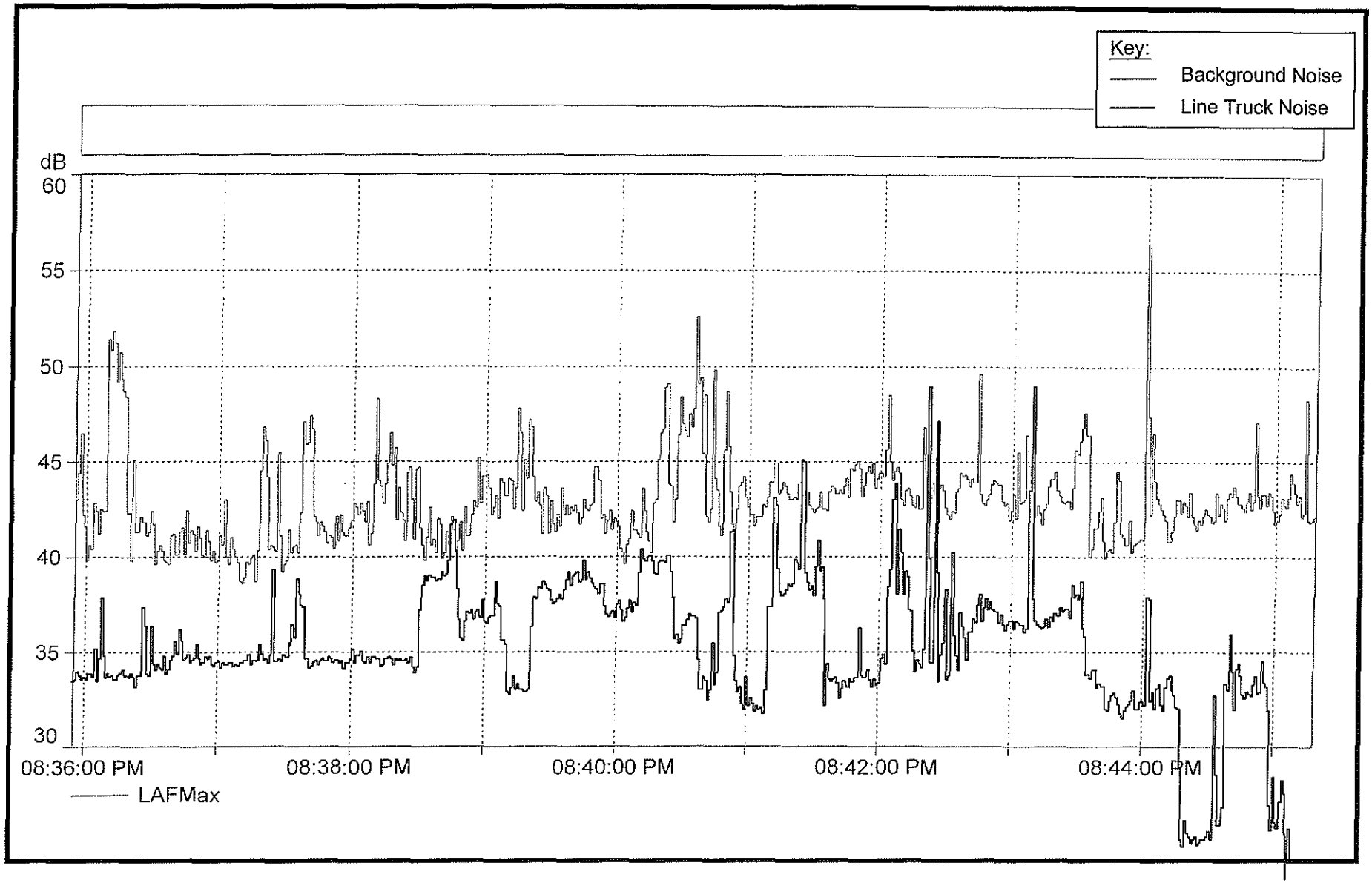
PREDICTED LINE TRUCK NOISE LEVELS SUPERIMPOSED ON MEASURED MORNING BACKGROUND NOISE LEVELS AT LOCATION C

FIGURE 10



PREDICTED LINE TRUCK NOISE LEVELS SUPERIMPOSED ON MEASURED EVENING BACKGROUND NOISE LEVELS AT LOCATION B

FIGURE 11



PREDICTED LINE TRUCK NOISE LEVELS SUPERIMPOSED ON MEASURED EVENING BACKGROUND NOISE LEVELS AT LOCATION C

FIGURE 12

and Figures 9 through 12, the relatively quiet KIUC Line Trucks should be able to operate on a regular basis during the daytime or nighttime periods with low risk of causing noise complaints at the closest Anahola residential subdivision, as long as their beeper type back-up alarms are replace with broadband noise back-up alarms. Visits to the KIUC Baseyard by the louder tractor trailer vehicles and loading/unloading equipment should not occur on frequent or regular basis, and should occur during normal business hours.

Exceedances of the 55 DNL or 65 DNL noise impact thresholds should not occur at the closest residences with or without the replacement of the Line Truck's back-up alarms. Risks of adverse noise impacts from the proposed KIUC Service Center and baseyard operations are considered to be very low.

CHAPTER VII. POTENTIAL NOISE IMPACTS ASSOCIATED WITH THE PROPOSED PROJECT AND POSSIBLE MITIGATION MEASURES

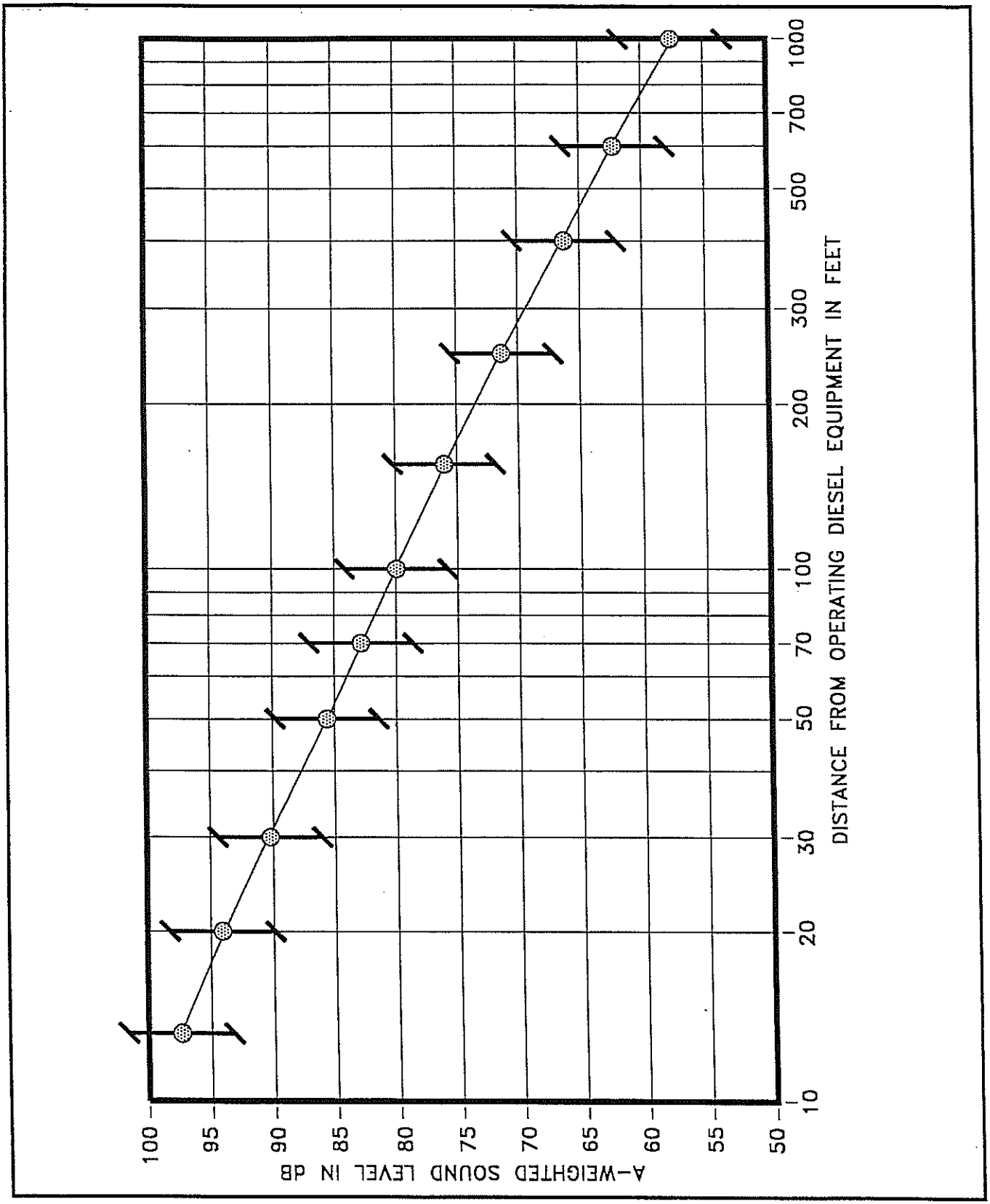
Traffic Noise Impacts. The increases in noise levels attributable to the Anahola Solar Project traffic are predicted to be difficult to perceive and should not be significant along Kuhio Highway, which would service the Anahola Solar facility. Because of the very small increases in traffic noise levels associated with this project, risks of potential noise impacts from project traffic are considered to be very low at existing noise sensitive receptors along Kuhio Highway. For these reasons, existing noise sensitive buildings in the project area should not require sound attenuation measures as a result of increased traffic noise associated with the proposed project.

Noise Impacts Associated with Baseyard Operations. The noise levels from baseyard operations at the proposed KIUC Service Center should be comparable or less than existing background noise levels at the closest noise sensitive receptors north of the project site. During the normal daytime working hours, the noise from routine baseyard operations (with the exception of back-up alarms) should not be audible at these noise sensitive receptors. The periods when audible back-up alarms occur, as well as the periods when noisier vehicles visit the baseyard, could result in higher than normal background noise levels at the closest noise sensitive receptors. However, their expected noise levels are not considered to be excessive for residences.

Nighttime activities at the proposed baseyard will probably occur due to the deployment of material and personnel during emergency trouble calls. For this reason, it is recommended that KIUC use the quietist possible equipment, and replace the beeper type back-up alarms with broadband noise back-up alarms. The broadband noise back-up alarms (with the same sound level as the beeper alarms of 69 dBA at 50 feet), should be inaudible at the closest noise sensitive receptors.

Construction Noise Impacts. Construction noise levels are anticipated to range between 32 to 65 dBA at the closest residences during the entire project construction period. Typical levels of noise from construction activity (excluding pile driving activity) are shown in Figure 13. The noise levels of the vibratory pile drivers (which are planned during installation of the metal posts for the PV panel supports) are expected to be approximately 5 dBA higher than the upper limits shown in Figure 13.

Tables 7 through 12 present the results of calculations of the predicted noise levels at Locations B and C resulting from construction activities at various locations on the project site. The assumed locations of the construction activities associated with each of the tables are shown in Figure 14. The construction activities are expected to be noisier and more continuous than those associated with post construction activities at the KIUC Service Center. The louder construction equipment (pile driver, earth moving equipment, and back-up alarms) are also expected to be audible at all locations on the project site.



ANTICIPATED RANGE OF CONSTRUCTION NOISE LEVELS VS. DISTANCE

FIGURE 13

TABLE 7
SUMMARY OF NOISE LEVELS AT LOCATIONS B AND C DURING CONSTRUCTION ACTIVITIES AT NORTHEAST SECTION OF PROJECT SITE

NOISE SOURCE	SOUND LEVEL AT 50 FEET (dBA)	DISTANCE (FEET) TO LOCATIONS B & C	PREDICTED NOISE LEVEL @ RECEPTOR
Vibratory Pile Driver	94.2	893 & 878	59 to 64 dBA
Grading / Earthwork	88.9	893 & 878	57 to 61 dBA
Front End Loader / Backhoe	84.9	893 & 878	53 to 57 dBA
Crane	79.5	893 & 878	49 to 52 dBA
Dump Truck	88.3	893 & 878	56 to 60 dBA
Noisy Forklift	76.9	893 & 878	45 to 49 dBA
Loud Beeper Back-Up Alarm	91.0	893 & 878	59 to 64 dBA

TABLE 8
SUMMARY OF NOISE LEVELS AT LOCATIONS B AND C DURING CONSTRUCTION ACTIVITIES AT CENTER OF NORTH BOUNDARY OF PROJECT SITE

NOISE SOURCE	SOUND LEVEL AT 50 FEET (dBA)	DISTANCE (FEET) TO LOCATIONS B & C	PREDICTED NOISE LEVEL @ RECEPTOR
Vibratory Pile Driver	94.2	794 & 988	57 to 65 dBA
Grading / Earthwork	88.9	794 & 988	55 to 62 dBA
Front End Loader / Backhoe	84.9	794 & 988	51 to 58 dBA
Crane	79.5	794 & 988	47 to 53 dBA
Dump Truck	88.3	794 & 988	54 to 61 dBA
Noisy Forklift	76.9	794 & 988	44 to 50 dBA
Loud Beeper Back-Up Alarm	91.0	794 & 988	57 to 65 dBA

TABLE 9
SUMMARY OF NOISE LEVELS AT LOCATIONS B AND C DURING CONSTRUCTION ACTIVITIES NEAR MAUKA SIDE OF PROJECT SITE

NOISE SOURCE	SOUND LEVEL AT 50 FEET (dBA)	DISTANCE (FEET) TO LOCATIONS B & C	PREDICTED NOISE LEVEL @ RECEPTOR
Vibratory Pile Driver	94.2	1,768 & 1,982	43 to 54 dBA
Grading / Earthwork	88.9	1,768 & 1,982	43 to 52 dBA
Front End Loader / Backhoe	84.9	1,768 & 1,982	40 to 48 dBA
Crane	79.5	1,768 & 1,982	36 to 44 dBA
Dump Truck	88.3	1,768 & 1,982	42 to 51 dBA
Noisy Forklift	76.9	1,768 & 1,982	32 to 41 dBA
Loud Beeper Back-Up Alarm	91.0	1,768 & 1,982	43 to 55 dBA

TABLE 10
SUMMARY OF NOISE LEVELS AT LOCATIONS B AND C DURING CONSTRUCTION ACTIVITIES NEAR CENTER OF PROJECT SITE

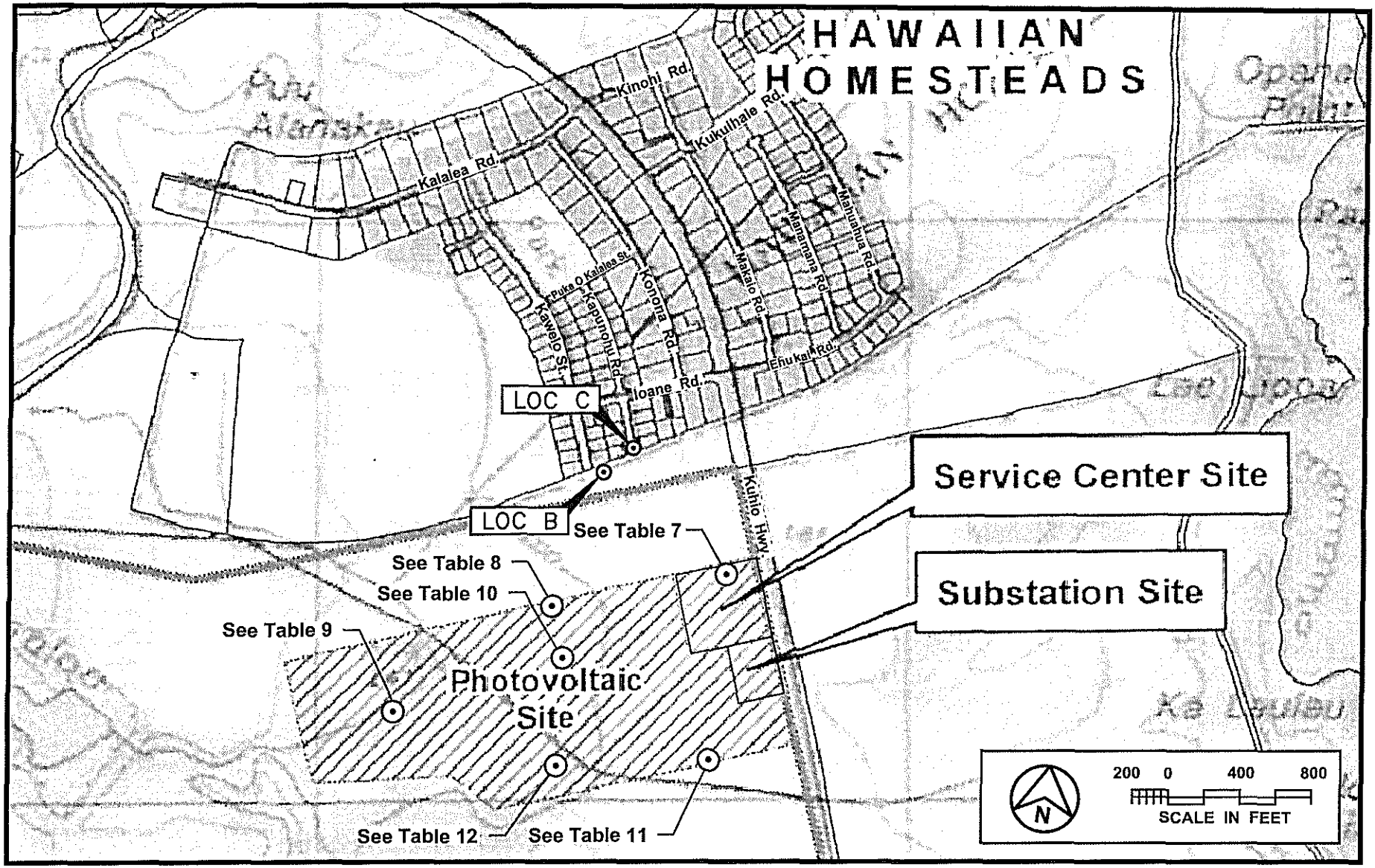
NOISE SOURCE	SOUND LEVEL AT 50 FEET (dBA)	DISTANCE (FEET) TO LOCATIONS B & C	PREDICTED NOISE LEVEL @ RECEPTOR
Vibratory Pile Driver	94.2	1,059 & 1,235	53 to 61 dBA
Grading / Earthwork	88.9	1,059 & 1,235	52 to 59 dBA
Front End Loader / Backhoe	84.9	1,059 & 1,235	48 to 55 dBA
Crane	79.5	1,059 & 1,235	44 to 50 dBA
Dump Truck	88.3	1,059 & 1,235	51 to 58 dBA
Noisy Forklift	76.9	1,059 & 1,235	40 to 47 dBA
Loud Beeper Back-Up Alarm	91.0	1,059 & 1,235	53 to 61 dBA

TABLE 11
SUMMARY OF NOISE LEVELS AT LOCATIONS B AND C DURING CONSTRUCTION ACTIVITIES NEAR SOUTHEAST SECTION OF PROJECT SITE

NOISE SOURCE	SOUND LEVEL AT 50 FEET (dBA)	DISTANCE (FEET) TO LOCATIONS B & C	PREDICTED NOISE LEVEL @ RECEPTOR
Vibratory Pile Driver	94.2	1,723 & 1,806	45 to 54 dBA
Grading / Earthwork	88.9	1,723 & 1,806	46 to 53 dBA
Front End Loader / Backhoe	84.9	1,723 & 1,806	41 to 49 dBA
Crane	79.5	1,723 & 1,806	38 to 45 dBA
Dump Truck	88.3	1,723 & 1,806	44 to 52 dBA
Noisy Forklift	76.9	1,723 & 1,806	33 to 41 dBA
Loud Beeper Back-Up Alarm	91.0	1,723 & 1,806	45 to 55 dBA

TABLE 12
SUMMARY OF NOISE LEVELS AT LOCATIONS B AND C DURING CONSTRUCTION ACTIVITIES NEAR CENTER OF SOUTH BOUNDARY OF PROJECT SITE

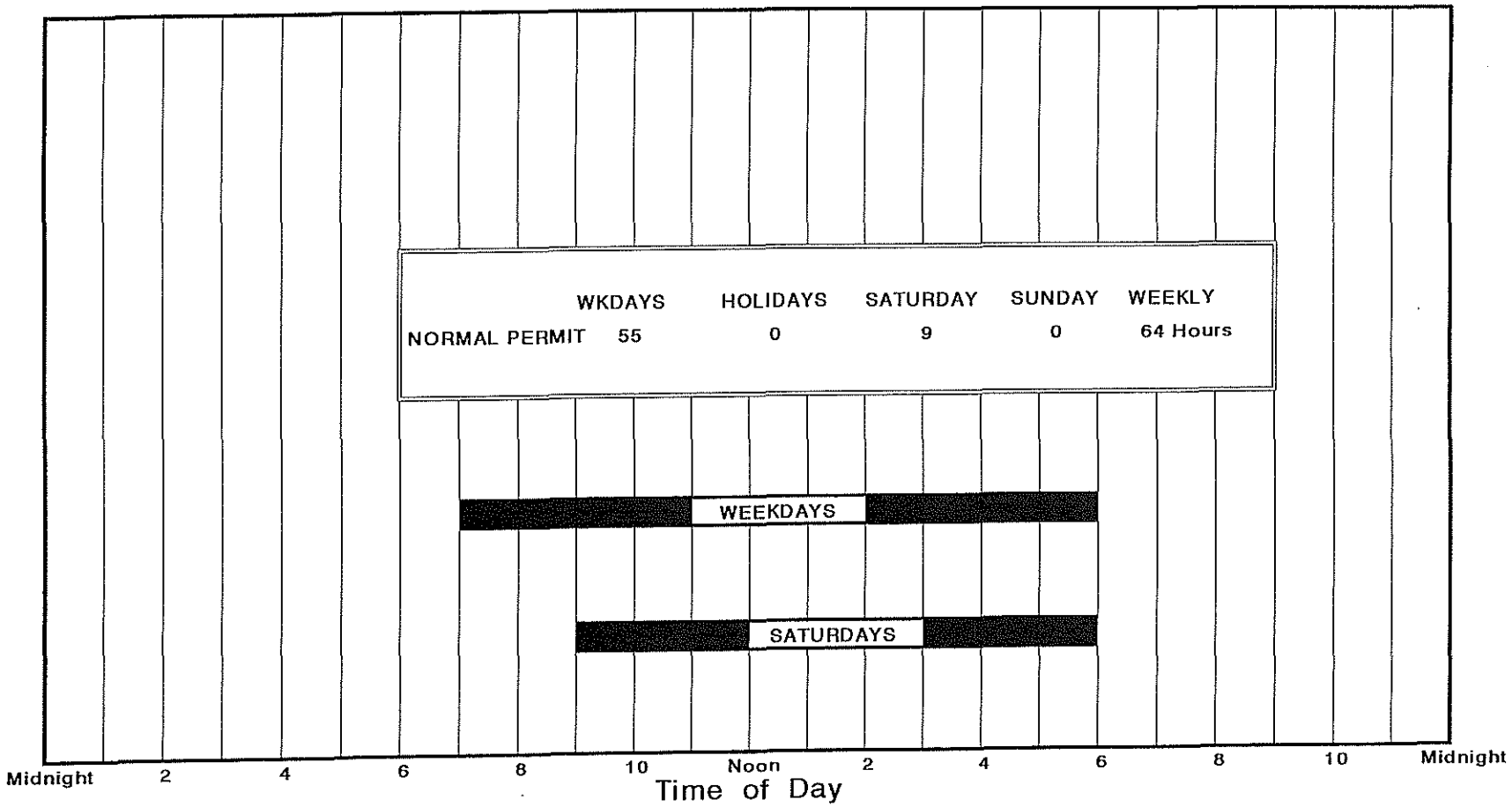
NOISE SOURCE	SOUND LEVEL AT 50 FEET (dBA)	DISTANCE (FEET) TO LOCATIONS B & C	PREDICTED NOISE LEVEL @ RECEPTOR
Vibratory Pile Driver	94.2	1,663 & 1,830	45 to 55 dBA
Grading / Earthwork	88.9	1,663 & 1,830	45 to 53 dBA
Front End Loader / Backhoe	84.9	1,663 & 1,830	41 to 49 dBA
Crane	79.5	1,663 & 1,830	38 to 45 dBA
Dump Truck	88.3	1,663 & 1,830	44 to 52 dBA
Noisy Forklift	76.9	1,663 & 1,830	33 to 41 dBA
Loud Beeper Back-Up Alarm	91.0	1,663 & 1,830	45 to 55 dBA



LOCATIONS ON THE PROJECT SITE WHERE CONSTRUCTION ACTIVITIES WERE ASSUMED WHEN DEVELOPING TABLES 7 THROUGH 12

FIGURE 14

The average noise level associated with construction activities at Locations B and C will probably exceed 55 DNL, but be less than 65 DNL during a work day. The implementation of State DOH construction noise permit procedures (see Reference 4) will require that noisy construction activities do not occur during the nighttime, Sundays, and holidays (see Figure 15). These permit procedures, which are routinely applied to noisy construction activities, are intended to minimize adverse noise impacts at residences. Because construction noise is expected to be audible at the closest residences, and may annoy some residences, the implementation of DOH permit procedures for construction noise is recommended for this project.



AVAILABLE WORK HOURS UNDER DOH PERMIT PROCEDURES FOR CONSTRUCTION NOISE

FIGURE 15

APPENDIX A. REFERENCES

(1) "Guidelines for Considering Noise in Land Use Planning and Control;" Federal Interagency Committee on Urban Noise; June 1980.

(2) American National Standard, "Sound Level Descriptors for Determination of Compatible Land Use," ANSI S12.9-1998/ Part 5; Acoustical Society of America.

(3) "Environmental Criteria and Standards, Noise Abatement and Control, 24 CFR, Part 51, Subpart B;" U.S. Department of Housing and Urban Development; July 12, 1979.

(4) "Title 11, Administrative Rules, Chapter 46, Community Noise Control;" Hawaii State Department of Health; September 23, 1996.

(5) "FHWA Highway Traffic Noise Model User's Guide;" FHWA-PD-96-009, Federal Highway Administration; Washington, D.C.; January 1998 and Version 2.5 Upgrade (April 14, 2004).

(6) Personal communication from Planning Solutions, Inc.; December 6, 2012.

APPENDIX B

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table I. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table I.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E.....). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A". For example, a report on blast noise might wish to contrast the LCdn with the LAdn.

Although not included in the tables, it is also recommended that "Lpn" and "LepN" be used as symbols for perceived noise levels and effective perceived noise levels, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

The A-weighted sound level (LA) was measured before and after the installation of acoustical treatment. The measured LA values were 85 and 75 dB respectively.

Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence, Leq, is designated the "equivalent sound level". For Ld, Ln, and Ldn, "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure. While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristics of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, DBA, PNdB, and EPNdB are not to be used. Examples of this preferred usage are: the Perceived Noise Level (Lpn was found to be 75 dB. Lpn = 75 dB). This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., deci).

Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighed Loss of Hearing" (PHL) shall be used consistent with CHABA Working Group 69 Report Guidelines for Preparing Environmental Impact Statements (1977).

TABLE I

A-WEIGHTED RECOMMENDED DESCRIPTOR LIST

	TERM	SYMBOL
1.	A-Weighted Sound Level	L_A
2.	A-Weighted Sound Power Level	L_{WA}
3.	Maximum A-Weighted Sound Level	L_{max}
4.	Peak A-Weighted Sound Level	L_{Apk}
5.	Level Exceeded x% of the Time	L_x
6.	Equivalent Sound Level	L_{eq}
7.	Equivalent Sound Level over Time (T) (1)	$L_{eq(T)}$
8.	Day Sound Level	L_d
9.	Night Sound Level	L_n
10.	Day-Night Sound Level	L_{dn}
11.	Yearly Day-Night Sound Level	$L_{dn(Y)}$
12.	Sound Exposure Level	L_{SE}

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is $L_{eq(1)}$). Time may be specified in non-quantitative terms (e.g., could be specified a $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine).

SOURCE: EPA ACOUSTIC TERMINOLOGY GUIDE, BNA 8-14-78,

TABLE II

RECOMMENDED DESCRIPTOR LIST

	TERM	A-WEIGHTING	ALTERNATIVE[1] A-WEIGHTING	OTHER[2] WEIGHTING	UNWEIGHTED
1.	Sound (Pressure)[3] Level	L_A	L_{pA}	L_B, L_{pB}	L_p
2.	Sound Power Level	L_{WA}		L_{WB}	L_W
3.	Max. Sound Level	L_{max}	L_{Amax}	L_{Bmax}	L_{pmax}
4.	Peak Sound (Pressure) Level	L_{Apk}		L_{Bpk}	L_{pk}
5.	Level Exceeded x% of the Time	L_x	L_{Ax}	L_{Bx}	L_{px}
6.	Equivalent Sound Level	L_{eq}	L_{Aeq}	L_{Beq}	L_{peq}
7.	Equivalent Sound Level Over Time(T) [4]	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8.	Day Sound Level	L_d	L_{Ad}	L_{Bd}	L_{pd}
9.	Night Sound Level	L_n	L_{An}	L_{Bn}	L_{pn}
10.	Day-Night Sound Level	L_{dn}	L_{Adn}	L_{Bdn}	L_{pdn}
11.	Yearly Day-Night Sound Level	$L_{dn(Y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12.	Sound Exposure Level	L_S	L_{SA}	L_{SB}	L_{Sp}
13.	Energy Average Value Over (Non-Time Domain) Set of Observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14.	Level Exceeded x% of the Total Set of (Non-Time Domain) Observations	$L_{x(e)}$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15.	Average L_x Value	L_x	L_{Ax}	L_{Bx}	L_{px}

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown. Applies also to C,D,E,.....weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is Leq(1). Time may be specified in non-quantitative terms (e.g., could be specified as Leq(WASH) to mean the washing cycle noise for a washing machine.

H. 2005 KIUC SERVICE CENTER STUDY

Kaua`i Island Utility Cooperative

Your Touchstone Energy® Cooperative

KIUC Service Centers Study

Current Service Center locations

West side
•Eleele

East side
•Kapaa

Divide Island geographically into Two districts for study

Objectives

- Determine appropriate number and location of service centers and staffing
- Use 15 year time horizon
- Consider customer growth patterns
- Determine geographical and load centers to best serve members
- Determine trouble call areas and response time

Geographical Centers of Both Districts

- Road mileage to determine center of both east and west side
- Dividing line in Lihue utilized to separate districts

Geographical center
West side

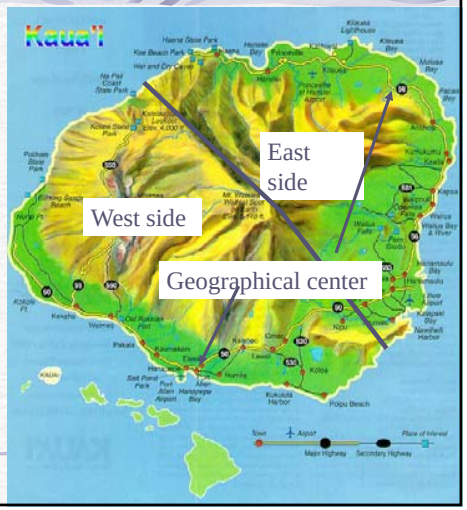
Port Allen	To	Miles
	Mana	17
	Kokee	24
	Kapaia	18
	Koloa	13.5
	Poipu	16.5
	Lihue	16

Geographical center of west side is aprox. Port Allen

Geographical centers

East side center
•Maloaa

West side center
•Eleele



Geographical center East side

Kapaa	to	Miles
	Lihue	8
	Kealia	2
	Anahola	5
	Kilauea	15
	Princeville	20
	Hanalei	22
	Wainiha Powerhouse	28
	End of road	29

Geographical center is apox. Moloaa

Geographical Center of Island

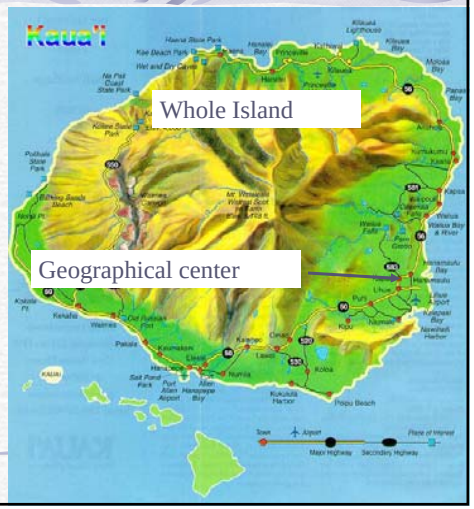
Kapaia is aprox. Geographical center of Island

Kapaia To	Miles	Kapaia To	Miles
Mana	35	End of rd north	38
Kokee	42	Wainiha	36
Koloa	13.5	Hanalei	30
Poipu	16.5	Princeville	28
Lihue	1	Kilauea	22
Kapaa	8	Moloaa	17
Kealia	10	Anahola	13

Load Center East and West Districts

- Determined load center of each district
- Considered Lihue as a dividing point between districts
- Used date peak as load model

Geographical center of Island
•Kapaia



Load Centers East Side
•Around Lydgate

Sub	Breaker #	MW			
East side				North of kapaa	9.98
Princeville	4121	0.81		Kapaa/ wailua	10
	4122	2.34			
	4123	0.88		Lihue	18.22
	4124	3.19			
				Load center east side	
Wainiha	4002	0.45		Lydgate	
Kapaa	3411	1.71			
	3412	2.21			
	3413	1.6			
	3414	1.03			
	3415	0.72			
Lydate	3211	1.11			
	3212	0.45			
	3213	2.17			
	3214	2.2			
Lihue	3123	2.75			
	3124	2.14			
	3125	2.57			
	3121	4.57			
	3122	2.95			
	3126	0.01			
Kapaia	3313	1.72			
	3314	0.4			

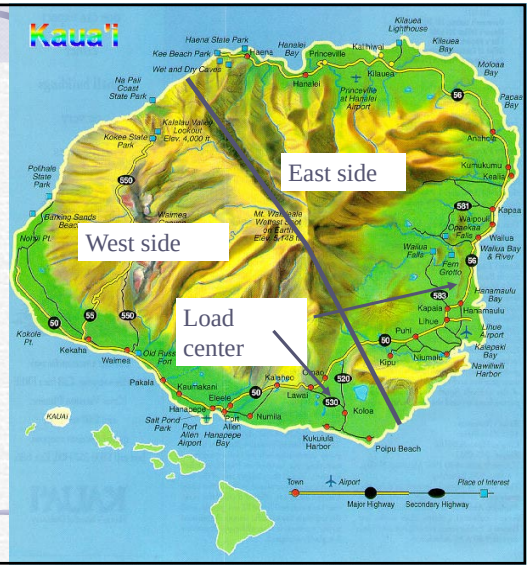
West side Load center

•Between Lawai and Koloa

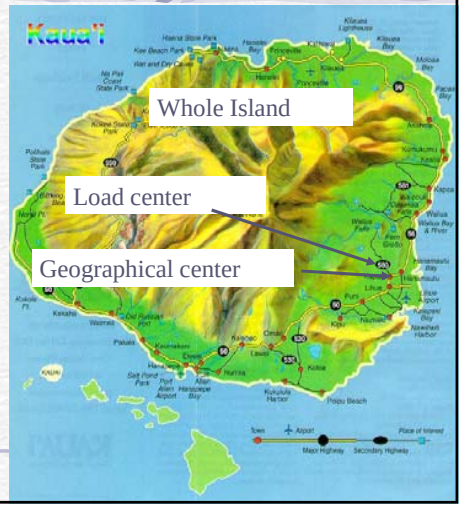
West side					
Koloa	2311	1.25		Koloa Poipu	9.86
	2312	2.26			
	2313	4.3		Lawai, Kalaheo	2.75
	2314	1.14			
				Pt allen, Hanapepe	1.71
Lawai	2131	0			
	2132	0.64		Hanapepe west	5.34
	2133	0.27			
	2134	1.29		west side	
				Load center between	
Kaumakani	1432	0.25		Lawai and Poipu	
Kekaha	1322	0.85			
	1323	1.99			
	1324	0.02			
	1325	0.68			
Port Allen	5001	1.46			
	5002	1.17			
Mana	1231	0.84			
	1232	0.22			
	1233	0.49			

Island load center is in Kapaia area

Sub	Breaker #	MW			
East side					
Princeville	4121	0.81		North of kapaa	9.98
	4122	2.34		Kapaa/ wailua	10
	4123	0.88		Lihue	18.22
	4124	3.19			
				Load center east side	
Wainiha	4002	0.45		Lydgate	
Kapaa	3411	1.71			
	3412	2.21			
	3413	1.6			
	3414	1.03			
	3415	0.72			
Lydate	3211	1.11		load center of whole island	
	3212	0.45		Lihue	
	3213	2.17			
	3214	2.2			
Lihue	3123	2.75			
	3124	2.14			
	3125	2.57			
	3121	4.57			
	3122	2.95			
	3126	0.01			
Kapaia	3313	1.72			
	3314	0.4			
West side					
Koloa	2311	1.25		Koloa Poipu	9.86
	2312	2.26			
	2313	4.3		Lawai, Kalaheo	2.75
	2314	1.14			
				Pt allen, Hanapepe	1.71
Lawai	2131	0			
	2132	0.64		Hanapepe west	5.34
	2133	0.27			
	2134	1.29		west side	
				Load center between	
Kaumakani	1432	0.25		Lawai and Poipu	
Kekaha	1322	0.85			
	1323	1.99			
	1324	0.02			



Kapaia is the approximate Load & geographical center for the island



Geographic and Load Study Conclusions

- Geographical centers for existing districts are Moloaa east and Eleele west and island center is Kapaia
- Load centers for east district is around Lydgate & west district is between Lawai and Koloa & island load center is around Kapaia

West side trouble call breakdown					West side percent of T/C's			39.10%
	Number					Number		
	Of TC's	% of Total	Town			Of TC's	% of Total	Town
	562	8.10%	Kalaheo			254	3.66%	Kekaha
	334	4.82%	Lawai			179	2.58%	Waimea
	156	2.25%	Omao			18	0.26%	Pakala
Total T/C	1052	15.17%				43	0.62%	Mana
						45	0.65%	Kaumakani
						15	0.22%	Makaweli
	Number					5	0.07%	PMRF
	Of TC's	% of Total	Town			156	2.25%	Kokee
	313	4.51%	Koloa		Total T/C	715	10.31%	
	281	4.05%	Poipu					
Total T/C	594	8.56%						
	Number							
	Of TC's	% of Total	Town					
	6	0.09%	Port Allen					
	207	2.98%	Hanapepe					
	121	1.75%	Eleele					
	10	0.14%	Numila					
	7	0.10%	Mt. Kahili					
Total T/C	351	5.06%						

Trouble Call Study

- Considered east and west districts
- Included trouble call reports from 1997 to 2005
- Used report to breakdown number of calls for a given area

East side trouble call breakdown					East side percent of T/C's			60.90%
	Anahola north					Wailua area		
	Number					Number		
	Of TC's	% of Total	Town			Of TC's	% of Total	Town
	248	3.58%	Anahola			645	9.30%	Wailua
	43	0.62%	Moloaa			63	0.91%	Waipouli
	303	4.37%	Kilauea			13	0.19%	Lydgate
	122	1.76%	Haena			6	0.09%	Nukolii
	74	1.07%	Wainiha		Total T/C	727	10.48%	
	49	0.71%	Anini					
	210	3.03%	Princeville					
	33	0.48%	Kalihiwai			Lihue Area		
	166	2.39%	Hanalei			Number		
Total T/C	1248	17.99%				Of TC's	% of Total	Town
						690	9.95%	Lihue
						190	2.74%	Hanamaulu
	Kapaa area					128	1.85%	Puhi
	Number					13	0.19%	Kapaia
	Of TC's	% of Total	Town			9	0.13%	Niumalu
	1043	15.04%	Kapaa			35	0.51%	Nawiliwili
	2	0.03%	Kawaihau			16	0.23%	Kipu
	81	1.17%	Kapahi		Total T/C	1081	15.59%	
	42	0.61%	Kealia					
Total T/C	1168	16.84%						

Trouble Call Study Conclusion

- East 61% of all trouble calls
- West 39% of all trouble calls
- A service center in Kapaia could handle trouble calls from from Wailua to Poipu/Koala area
- It would balance out the trouble calls between service centers. Eleele 31%, Kapaia 35%,and the North shore service center 34%

East side trouble call breakdown with Kapaia					East side percent of T/C's			34.83%
	Anahola north					Kapaa area		
	Number					Number		
	Of TC's	% of Total	Town			Of TC's	% of Total	Town
	248	3.58%	Anahola			1043	15.04%	Kapaa
	43	0.62%	Moloaa			2	0.03%	Kawaihau
	303	4.37%	Kilauea			81	1.17%	Kapahi
	122	1.76%	Haena			42	0.61%	Kealia
	74	1.07%	Wainiha		Total T/C	1168	16.84%	
	49	0.71%	Anini					
	210	3.03%	Princeville					
	33	0.48%	Kalihiwai					
	166	2.39%	Hanalei					
Total T/C	1248	17.99%						

Proposed Kapaia service center trouble call breakdown						Kapaia % of T/C's		34.63%
	Wailua area					Number		
	Number					Of TC's	% of Total	Town
	Of TC's	% of Total	Town			313	4.51%	Koloa
	645	9.30%	Wailua			281	4.05%	Poipu
	63	0.91%	Waipouli		Total T/C	594	8.56%	
	13	0.19%	Lydgate					
	6	0.09%	Nukolii					
Total T/C	727	10.48%						
	Lihue Area							
	Number							
	Of TC's	% of Total	Town					
	690	9.95%	Lihue					
	190	2.74%	Hanamaulu					
	128	1.85%	Puhi					
	13	0.19%	Kapaia					
	9	0.13%	Niumalu					
	35	0.51%	Nawiliwili					
	16	0.23%	Kipu					

West side trouble call breakdown with Kapaia					West side percent of T/C's			30.54%
	Number					Number		
	Of TC's	% of Total	Town			Of TC's	% of Total	Town
	562	8.10%	Kalaheo			254	3.66%	Kekaha
	334	4.82%	Lawai			179	2.58%	Waimea
	156	2.25%	Omao			18	0.26%	Pakala
Total T/C	1052	15.17%				43	0.62%	Mana
						45	0.65%	Kaumakani
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	Number					5	0.07%	PMRF
	Of TC's	% of Total	Town			156	2.25%	Kokee
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	207	2.98%	Hanapepe					
	121	1.75%	Eleele					
	10	0.14%	Numila					
	7	0.10%	Mt. Kahili					
Total T/C	351	5.06%						

KIUC Service center Options exploring top 3

Option 2 Move Kapaa to Kapaia

Pros

- Already own the land
- Located at center of island
- Allows for some growth in the future

Option 1 Do nothing

Pros

1. Least expensive option

Cons

1. Kapaa traffic results in long response times to Lihue our largest loads
2. Getting in and out of Kapaa is getting harder because of traffic
3. Plans to rebuild Kapaa Substation into GIS sub
4. Eventually we will outgrow Kapaa
5. Bike path is going to be built around the substation

Option 2 Move Kapaa to Kapaia

Cons

- Make response time to our north shore customers longer
- Less productive time for our crews when working north because of afternoon Kapaa traffic
- 2nd most expensive option

Option 3 Build Kapaia yard

Move Kapaa service center further north

Pros

- Reduces response time for our members
- Reduces the amount of wasted time sitting in traffic
- Improves services for our north shore and Lihue customers
- Increases the ability to share equipment between service centers
- Able to respond better to island growth
- Will be able to perform more of our own work without out sourcing to contractors
- Resources more evenly distributed and better able to respond during natural disaster

Land Study of Available Commercial Property

- There are no Commercial Properties at or greater than 2 acres located in the Kapaa – Lihue districts listed at this time.
- Grove farm will rent out 2 acres or more located at the old Lihue Plantation Hanamaulu repair shop on a long term lease for approx. $6000.00 per month.
- Mike Lauretta DNLR land agent states that there is no Commercial State land available at this time.
- Noel Akamu of Hawaiian Home Lands, lands division. Noel states that HHL is willing to negotiate a long term lease on Hawaiian Home Lands located in Anahola next to Kuhio Hwy. At the old Iniki temporary dump site for 2 plus acres pending approval of KIUC's application. Lease would be below market value and be approved for Commercial use.
- There is another parcel located at the old Meadow Gold Dairy, which is now owned by Jeff Lindler and is zoned Ag.

Option 3 Build Kapaia Service Center Move Kapaa Service Center Further North

Cons

- Most expensive option
- Need to outfit another yard
- Need to hire more personnel

Recommendations for optimization of service centers

- Complete build out of Kapaia service center as originally planned
- Build new service center at Anahola on Hawaiian homes land
- Relocate Kapaa to Anahola

Kapaia Service Center

- Relocate system shop to center of island for better substation coverage
- Add 2 planners in Kapaia for Lihue engineering
- Relocate vehicle maintenance to Kapaia for a more centralized dept.
- Move warehouse for E&O to Kapaia to better serve both sides of the island

Kapaia Construction Costs

- Administrative building
  10,500 sq. ft *$150 sq. ft = $1,575,000
- Production equipment building
  4750 sq ft * $100 sq ft = $475,000
- Vehicle mantenance bulding
  3250 sq ft * $100 sq ft = $325,000
- Shop building
  11,000 sq ft * $100 sq ft = $1,100,000

Kapaia Service Center

- Purchase large bucket, line truck, service truck and crew pickup for Kapaia
- Staff service center with 1 lineman from Kapaa, 1 lineman from Eleele, vacant troubleshooter slot from Kapaa, 2 apprentices spots, and 2 new lineman
-

Kapaia Construction Costs

- Warehouse
  15,000 sq ft * 60 sq ft = $ 1,100,000
- Vehicle refueling area
  $240,000 per Senter petroleum
- Vehicle/ parts wash area
  $7,400 for 50' x 60' slab
- Covered parking
  13,500sq ft x $30 sq ft = $405,000
- Paved driveway
  57,580 sq ft = $100,000 per Hawaiian Paving

Kapaia Construction Costs Totals

$1,575,000+$800,000+$1,100,000+$900,000+$240,000+$7407+$405,000+$100,000= $5,127,407 total cost estimate pending final designs and using 1999 monies

Anahola Service Center Construction Cost Totals

$1,000,000 + $600,000+ $240,000+ $405,000+$60,000=$2,305,000 est. Pending final designs and using 1999 monies

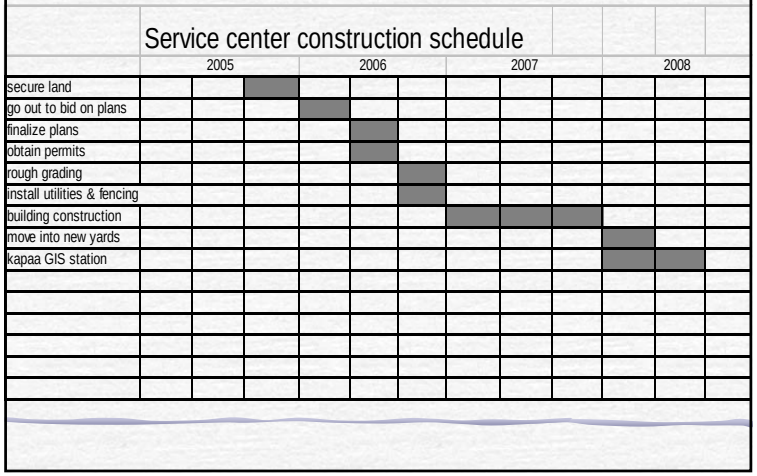
Anahola Service Center Construction Costs

- Office building
  4000 sq ft x $150 sq ft = $600,000
- Shop building/ warehouse
  10,000 sq ft x $100 sq ft = $1,000,000
- Vehicle refeuling area
  $240,000
- Covered Parking and storage
  13,500 sq ft x 30 sq ft = $405,000
- Paved parking area
  $60,000

Totals Both Service Centers

- Kapaia estimated build cost $5,127,407
- Anahola estimated build costs $2,305,000
- Total both yard build out $7,432,407

Service center construction schedule



2005 E&O Vacancy & Staffing

- Assigned to look at current staffing and look at future needs
- Used possibility of third service center
- Used results of current coop survey

Kaua`i Island Utility Cooperative

Your Touchstone Energy® Cooperative

2005 E&O Vacancy & Staffing

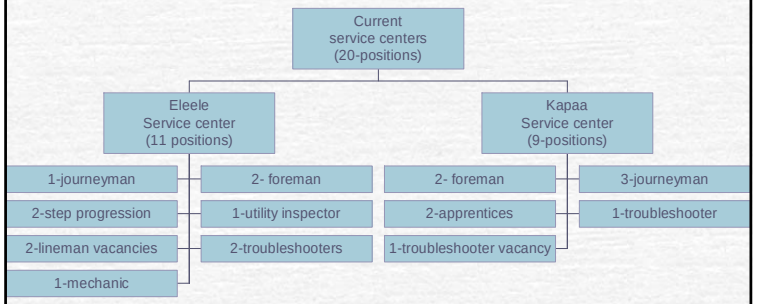
Current Staffing

- Eastside
  - 2-foreman
  - 3-journeymen
  - 2-apprentice
  - 1-troubleshooter
  - 1-vacant troubleshooter

  9 positions total
- West side
  - 2- foreman
  - 1-journeyman
  - 2-lineman in step progression
  - 2- lineman vacancies
  - 2 –troubleshooters
  - 1-utility inspector

  10 positions total

Current Staffing



Current Employees in Apprentice Or Step Progression Program

a.Curran Chang: Hours completed, (4) lessons to complete
b.Tim Medeiros: Step (7), (2) exams to re-take,
(18) lessons to complete
c.Fred Laborte: Step (3), (70) lessons to complete
d. Tim Brantner Apprentice

Current vacancies as of 6/30/05:

a. Primary Trouble man – Kapaa Service Center
b. Journeyman Linemen – Eleele Service Center
c. Helper AQ – Eleele Service Center

Retirement Eligibility:

2005:
1. Eric Kajiwara
2. Jerry Tittle
3. Cliff Sato

2006:
1. Ralph Villabrille

2007:
1. Clyde Chang

2008:
1. Hippo Princena

2009:
1. Bernard Naea NBU
2. Bill Workman

2011:
1. Chris Acoba

2012:
1. Tim Medeiros

2013:
1. Pat Malama
2. Soni Tupou NBU

Coop Survey

- Sent a survey to other coops to get a feeling of where we stand in comparison
- Received 16 responses

Coop Survey

- Do you pay a premium for a person to take a truck home or standby for a trouble calls?
- How many weeks is a person on call to take trouble calls?
- How do you handle the hours of service rules when your guys work long hours?
- Coop size
- Number of people in construction dept

Coop Survey

2005 trouble call and hours of service survey

- What are your normal business hours?
- Do you have any of your line crews on shift work?
- How do you handle after hour trouble calls? (Ex: does trouble shooter take a truck home or line man standby or just call out whoever answers phone)

Coop Survey Results

Coop Survey

Company	Utility Name	Trouble calls	Pay for Standby	Construction size
11500	Big Country Elec.	Two linemen on call some take	4 hrs of 1.5 per week	33 employees
12,400	Empire Electric	1 man standby	yes	12 lineman
16,500	Kosciusko REMC	1 man on call take truck home	Yes $120 per week	22 employees
160,000	Middle Tennessee	3 districts 5 men per district	Yes	n/a
17500	Central Rural Elec	2 men a night rotated daily	Yes 1 hour reg pay for no callouts	18
18,00	Buckeye REC	4 men on standby 2 buckets 2	yes $125 per weekend and $45 per holiday	20 lineman
18000	Indian Elec. Coop	1 standby crew	2 hrs per week standby	21 lineman
20,000	Linn County Rec	3 lineman on standby	2 hrs of pay at 1.5 rate	25 lineman
26000	Southeastern Indiana	no truck taken home	yes	32
29,600	Boone Elec. Coop	Standby crew	yes 12 hrs reg pay for sat and Sunday	28
32,000	N/A	4 lineman on call each week	yes $200 per week standby	20 lineman
34,000 ,	Adams Columbia	troubleshooter takes home	Yes 14 hrs per week	30 lineman
4000	Prairie Energy Coop	1 man per week Tues - Tues	Yes 2% of base pay no truck home	13 lineman
42,300	Appalachian Elec	2 lineman on call no truck at	16 hrs of pay Fri. to Fri.	25 lineman
76000	Carroll Elec. Coop	2 people rotate	1.5 hrs reg pay on weekdays and 3 hrs on	62 total
92,000	Rappahannock Elec.	Two linemen on call takes	Yes 2 hrs reg weekdays 4 hrs pay weekend	60 lineman

Coop's With Comparable Size

Coop	Size	Linecrew	
Linn County Rec	20,000 members	25.00	
N/A	32,000 members	20.00	
Indiana REMC	26000 members	32.00	
Boone Elec. Coop	29,600 members	28.00	
Adams Columbia Elec coop	34,000 , members	30.00	average linecrew size
		135.00	27

Workforce Development

Number needed to hire to achieve 29 positions in dept by 2008 = 8 lineman 1 mechanic

Number realistically expected to retire by 2008

2 lineman, 1 mechanic

Average age of current workforce= 45.24

New hires/replacements

2006

4 Linemen,

1Auto Mechanic Assistant

2007:

4 linemen

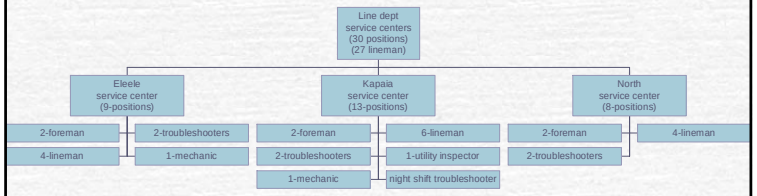
1 Mechanic

2008:

2 linemen

1 Utility Inspector

Proposed Staffing



Lineman College Option

Due to staffing shortages and the minimum amount of candidates needed, it is not feasible to open a lineman college on Kauai at this time. Instead, it would be feasible to interview, select and send candidates to a Mainland Lineman College, and after successfully completing program, hire them as Apprentice Linemen here on Kauai.

Staffing Conclusions

- Identified need to add to line dept whether we open Kapaia service center or not
- Need to address problems with getting and maintaining new lineman
- Need to maintain a balance between hiring apprentices and journeyman

Trouble Call Study

- Done to improve on the way we handle trouble calls
- Try to reduce # of calls
- Find alternatives to the way we are doing it now
- Provide better service for our customers

Trouble Call Study

2005

Trouble Call Response

• Westside – (1) Trouble shooters (6) Line personnel (7) weeks primary
b. Eastside – (1) Troubleshooter (6) Line personnel (7) weeks primary
c. With expanding to (3) service centers in mind, (2) more troubleshooters will be added to further enhance coverage of districts

Options

Do Away With Troubleshooter Position

- Leave existing men in positions and have all lineman rotate in when needed
- When existing position become vacant abandon position and hire lineman
- Each lineman would have 6 weeks troubleshooting a year with current staffing

Do Nothing

- Continue operating with troubleshooters
- Problem retaining existing trouble shooters
- 2 positions open right now no applicants to fill the jobs
- Have lost 4 troubleshooters in the last 2 years

Do Away With Troubleshooter Position

- Have lineman only take truck home when primary troubleshooter
- Convert vacant troubleshooter spots to lineman vacancies
- Redo lineman job description to include all lineman are responsible for after hours trouble calls
- Implement standby pay for taking truck home and standby

Coop Survey Standby Costs

Standby costs per week
4 hrs of 1.5 per week = $191 per week
$120 dollars per week
1 hour reg pay for no callouts= up to $223.51 per week
$125 per weekend and $45 per holiday
2 hrs per week standby =$ 63.86 per week
2 hrs of pay at 1.5 rate=$95.79 per week
12 hrs reg pay for sat and Sunday =$383 per week
$200 per week standby
14 hrs per week=$447.02 per week
2% of base pay no truck home=$26 per week per man
16 hrs of pay Fri. To Fri = $510.88 per week
1.5 hrs reg pay on weekdays and 3 hrs on=$431.47 per week
2 hrs reg weekdays 4 hrs pay weekend=$574.54 per week

- $260.85 average cost per week

Time of Trouble Calls

- Majority of calls come in from 7:00 am to 9:00 pm
- Shift until 11:30 pm would give lineman time to handle most of the calls before shift is over
- Lineman would be available for streetlight surveys and after hours reconnects and trouble calls
- Would work with 3 service center option

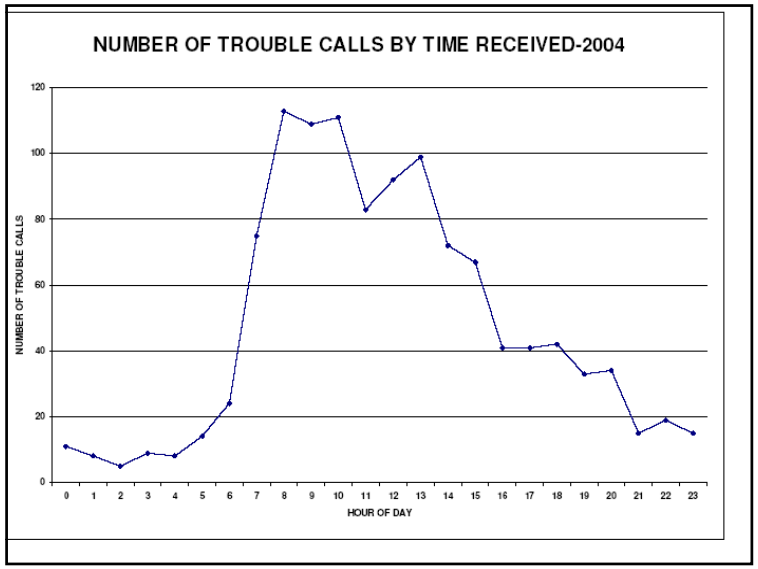
Options for Standby Pay

- Pay a flat fee per night (ex:40 per day = $280 a week)
- Pay 1 hr of pay per day at prevailing rate($33.84 for 1 hr or $372 per week using trouble shooter pay) problem is that different classifications get different rates.

KIUC TC BY HOUR RECEIVED

HOUR OF DAY # CALLS RECIEVED
Data from 1997 to 2004

0 -53	9:00a.m.- 632	6:00p.m. - 254
1:00a.m.- 53	10:00a.m.- 667	7:00p.m. - 208
2:00a.m. -45	11:00a.m.- 496	8:00p.m. - 197
3:00a.m.- 59	12:00a.m.- 493	9:00p.m. - 137
4:00a.m.- 47	1:00p.m. -429	10:00p.m. - 91
5:00a.m.- 74	2:00p.m.- 426	11:00p.m.-66
6:00a.m.- 164	3:00p.m.-385	
7:00a.m. -371	4:00p.m.-289	
8:00a.m. -681	5:00p.m.- 229	



Suggestions to Relieve After Hours Calls

- Implement lineman on shift work from 3:00pm to 11:30pm reporting to Kapaia
- Shift would cover most of the calls received after normal hours
- Calls on weekends and between midnight and 7:00 am would be handled by lineman on standby

Time Of Calls

- In 2004 we received 79 calls from midnight to 7:am
- Averages out to be about 7 calls per month island wide
- Should expect to see about 4 calls per month east side and 3 calls per month west side
- Trouble shooters can expect 1 to 2 calls per week from 11:30pm to 7:00 am