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DATE: 11/9/2007

TO: LAURENCE K. LAU, ACTING DIRECTOR  
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

FROM: IAN COSTA, DIRECTOR  
COUNTY OF KAUA'I  
DEPARTMENT OF PLANNING

*I.D.D. FOR*

**SUBJECT: FINDING OF NO SIGNIFICANT IMPACT (FONSI) FOR AGRICULTURE  
BIOMASS-TO-ENERGY FACILITY, KŌLOA, KAUA'I, HAWAII  
TAX MAP KEY (4) 2-7-001-001**

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OFFICE OF ENVIRONMENTAL QUALITY CONTROL

The County of Kaua'i Department of Planning has reviewed the comments received during the 30-day public comment period which began on August 8, 2007 and the Final Environmental Assessment prepared by Green Energy Team LLC.

According to OEQC guidelines a "Significant effect" or "significant impact" means the sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of the environment, are contrary to the state's environmental policies or long-term environmental goals and guidelines as established by law, or adversely affect the socioeconomic or social welfare, or are otherwise set forth in section 11-200-12 of this chapter.

The criteria for significant effect and discussion are as follows.

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

No archaeological site's identified, land has been in agricultural use and majority would continue as such.

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

Most of existing land uses would remain with the exception of the plant site itself.

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

Project safeguards State's unique environmental characteristics by recognizing our isolation and dependency on fossil fuels and moves us to a local energy source. In addition, the project: Protects

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Green Energy Hawai'i  
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air resources by using a less polluting form of power generation; Encourages a practice which fully utilizes natural resources rather than importing outside resources; Has the potential to eliminate a weed tree; Encourages industry which protects the environment; Encourages efficient use of energy resources.

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

An alternative on island source of energy would make this a likely gain for the economic and social welfare of the community

**(5) Substantially affects public health;**

Applicant has disclosed pollutants and would institute mitigation measures, in compliance with Hawaii Administrative Rules standards. Plant would emit fewer pollutants than current power production at Port Allen.

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

Effects on public highways would be managed through accel and decel lanes and turn management.

**(7) Involves a substantial degradation of environmental quality;**

EPA and DOH standards must be met on site. Environmental effects of energy consumption are already present. The plant would not increase energy consumption but provide a different way to meet it. Therefore, as long as emissions are better than current generation means there is no large scale degradation but an improvement.

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

Project would involve a commitment of agricultural land base to the fuel production for the plant; however lands committed would still be in agriculture use.

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

Standard mitigation measures would be in place to minimize bird take.

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

Chemical discharge would meet DOH and EPA levels. Noise mitigation would be in place for chipping activities.

**(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;**

Project does not affect a natural watercourse and ecosystem nor is located in a hazard zone.

**(12) Substantially affects scenic vistas and viewplanes identified in county or state plans or studies; or,**

Project is in a scenic corridor however applicant has planned for effective screening.

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**(13) Requires substantial energy consumption.**

Project generates energy.

The proposed agriculture biomass-to-energy project does not, with regards to these criteria for determination, have significant impacts to the environment nor is it contrary to any state environmental policies or guideline as established by law. In fact, it directly supports the mandated legislature for renewable energy projects as established under Hawai'i Revised Statutes Chapter 269 renewable portfolio standard (RPS) that mandates that each electrical utility company shall provide 20 percent of its net electricity through renewable energy by the end of the year 2020.

The County of Kaua'i Department of Planning has determined that this project will not have significant environmental effects with regard to the standards of HRS 343 and has issued a FONSI. Please publish this notice in the next available Office of Environmental Quality Control (OEQC) *Environmental Notice*.

The project will still be subject to the standards and procedures of the Comprehensive Zoning Ordinance.

Earth Tech, Inc. (Earth Tech), the authorized agent for Green Energy Team LLC, will deliver the four hard copies of the Final EA to your office. If you have any questions, please call Ms. Michelle Mason of Earth Tech at 356-5322.

Enclosures: (1) OEQC Publication Form  
(2) Four copies of the Final EA (to be delivered by Earth Tech)

cc: Imai Aiu, County of Kaua'i, Department of Planning  
Bryan Mamacay, County of Kaua'i, Department of Planning  
Eric Knutzen, Green Energy  
Michelle Mason, Earth Tech



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## Final Environmental Assessment

# Agriculture Biomass-to-Energy Facility Kōloa, Kaua`i, Hawai`i

### Proponent:

Green Energy Team LLC  
4313 Kapuna Road  
Kilauea, Hawai`i 96754



### Prepared by:

Earth Tech, Inc.  
841 Bishop Street, Suite 500  
Honolulu, Hawai`i 96813

November 2007



## EXECUTIVE SUMMARY

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Green Energy Team LLC is proposing an agriculture biomass-to-energy facility on Kaua`i, Hawai`i<sup>1</sup>. The proposed project site is located on the Island of Kaua`i in the Kōloa District approximately 9 miles southwest of Līhu`e, 2.5 miles northeast of Oma`o Town, 3 miles north of Kōloa Town, and northeast of Kaumuali`i Highway and identified by Tax Map Key (4) 2-7-001:001. The proposed project area is currently undeveloped agricultural land comprised of a single parcel approximately 64 acres in size. The proposed site for the actual agriculture biomass-to-energy facility is located on a 6 acre parcel within the 64 acres that is cultivated with Eucalyptus and Albizia trees; approximately 1,200 feet north of Kaumuali`i Highway and approximately 6 miles from the shoreline of the Pacific Ocean.

The need for the project arises because of HRS Title 15, Chapter 269, Part V renewable portfolio standard (RPS) that mandates that each electrical utility company shall provide 20 percent of its net electricity through renewable energy by the end of the year 2020.

This environmental assessment (EA) analyzes the potential environmental consequences of the proposed action and alternatives to determine if there would be significant short-term, long-term, and/or cumulative impacts on the human, natural, or historic environments.

All activities conducted in support of this EA, including reports, field investigations, technical studies, and public involvement are conducted in accordance with Hawai`i Revised Statutes (HRS) Chapter 343, environmental impact statements; the Hawai`i Administrative Rules (HAR), Title 11, Chapter 200, State of Hawai`i Department of Health Implementing Rules for the Environmental Review Process; and Act 50, HRS Chapter 343, requiring impacts to Hawai`i's culture, traditional cultural properties and practices, and customary rights be addressed in the environmental review process.

### PROPOSED ACTION AND ALTERNATIVE

The proposed action and alternative are described as follows:

- **Proposed Action.** The proposed action is to construct, operate, and maintain an agriculture biomass-to-energy facility to provide renewable energy to the Island of Kaua`i through cooperation with the Kaua`i Island Utilities Cooperative. The proposed facility would utilize agriculture biomass and process it into energy as an integral part of an existing agriculture operation. The facility would be an environmentally sound method of handling the waste stream from the agriculture operation, generating clean sustainable energy to the community of Kaua`i while stimulating further agriculture activity. The facility would utilize approximately 195 tons of agriculture biomass per day for a gross of 7,100 kilowatts (kW) and a net of 6,400 kW of electrical energy, one-tenth of Kaua`i's current peak load. The proposed action would assist with the reduction of dependence on fossil fuels for the generation of electricity and assist with meeting the mandated RPS.
- **No-Action Alternative.** Under the no-action alternative, the agriculture biomass-to-energy facility would not be developed. Kaua`i would continue its complete dependence on imported fossil fuels and would not assist with meeting the mandated RPS.

### SUMMARY OF ENVIRONMENTAL IMPACTS

The environmental impacts from the proposed action and alternative are summarized below:

**Proposed Action.** The proposed action involves the construction, operation, and maintenance of an agriculture biomass-to-energy facility. No adverse impacts are expected. Long-term positive impacts

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<sup>1</sup> This project was previously referred to as "agriculture waste-to-energy"; however, biomass is a more accurate depiction of the proposed action and therefore the title has been changed.

are expected for socioeconomics, utilities, and infrastructure. Short-term adverse construction-related impacts to air quality, noise, and safety and health are expected during the construction phase of the facility. However, appropriate mitigation measures during construction activities would reduce these impacts. Operational-related impacts to air quality, water, biological, and visual resources would be minimized through mitigation measures to a level of non-significance. Additionally, all applicable federal and state regulations would be followed.

**No-Action Alternative.** The no-action alternative would not implement the agriculture biomass-to-energy facility and would, therefore, have a direct negative impact to socioeconomics and utilities and infrastructure. The Island of Kaua`i would also continue its reliance on fossil fuels.

#### **DETERMINATION**

To determine whether the proposed action would have a significant impact on the human, natural, or historic environments, the project, its anticipated direct and indirect effects, and the short-term, long-term, and cumulative impacts have been evaluated in accordance with HAR §11-200-12. In making this determination, the proposed action has been evaluated with respect to the significance criteria established in HAR Section 11-200-12. Based on the studies performed, discussion of impacts and mitigation measures contained in Section 4.0 of this document, and the evaluation of the significance criteria in Section 5.1, it is anticipated that the proposed project would not have a significant adverse impact on the environment and that the proposed action does warrant an anticipated negative declaration and therefore the preparation of an environmental impact statement is not required. Therefore, a Finding of No Significant Impact has been determined.

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## ACRONYMS AND ABBREVIATIONS

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%	percent
§	Section
°F	degree Fahrenheit
µg/m <sup>3</sup>	micrograms per cubic meter
AAQS	ambient air quality standard
BACT	Best Available Control Technology
BMP	Best Management Practices
CAA	Clean Air Act
CAB	Clean Air Branch
CDP	Census Designated Place
CFR	Code of Federal Regulations
CO	carbon monoxide
Commission	Kaua`i Historic Preservation Review Commission
CSP	Covered Source Permit
CWB	Clean Water Branch, Hawai`i Department of Health
dB	decibel
dBA	decibel (A-weighted scale)
DLNR	Department of Land and Natural Resources, State of Hawai`i
DOH	Department of Health, State of Hawai`i
DOFAW	Division of Forestry and Wildlife, State of Hawai`i
DOT	Department of Transportation, State of Hawai`i
EA	environmental assessment
EPA	Environmental Protection Agency, United States
ESA	environmental site assessment
ESP	Electrostatic Precipitator
FIRM	flood insurance rate map
ft <sup>2</sup>	square foot
HAP	hazardous air pollutant
HAR	Hawai`i Administrative Rules
HEER	Hazard Evaluation and Emergency Response Office
HRS	Hawai`i Revised Statutes
gpm	gallons per minute
KIUC	Kaua`i Island Utilities Cooperative
kV	kilovolts
kW	kilowatts
mg/L	milligrams per liter
mph	miles per hour
NAAQS	National Ambient Air Quality Standards
NEMA	National Electrical Manufacturer's Association
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	nitrogen oxide
NPDES	National Pollutant Discharge Elimination Systems
NSPS	new source performance standard
NSR	new source review
OHA	Office of Hawaiian Affairs
OSHA	Occupational Safety and Health Administration
PM <sub>10</sub>	Particulate Matter less than 10 microns
PM <sub>2.5</sub>	Particulate Matter less than 2.5 microns
PSD	Prevention of Significant Deterioration
ROI	Region of Influence
ROW	right of way
RPS	renewable portfolio standard
SCAP	Stream Channel Alteration Permit
SHPD	State Historic Preservation Division
SHWB	Solid and Hazardous Waste Branch
SO <sub>2</sub>	Sulfur Dioxide

SPCC	Spill Prevention, Control, and Countermeasures
SPL	sound pressure level
TDS	total dissolved solids
TMK	Tax Map Key
tpy	tons per year
U.S.	United States
U.S.C.	United States Code
UIC	underground injection control
USGS	United States Geological Survey
VOC	volatile organic compound
Water Commission	Commission on Water Resources Management
yd <sup>3</sup>	cubic yards

## 1.0 INTRODUCTION

Green Energy Team LLC (herein referred to as “Green Energy”) is proposing an agriculture biomass-to-energy facility on Kaua'i, Hawai'i. The proposed project site is located on the Island of Kaua'i in the Kōloa District approximately 9 miles southwest of Līhu'e, 2.5 miles northeast of Oma'ō Town, 3 miles north of Kōloa Town, and northeast of Kaumuali'i Highway (Figure 1-1). The parcel is identified by Tax Map Key (TMK) (4) 2-7-001:001 (Figure 1-2). The proposed project area is currently undeveloped agricultural land comprised of a single parcel approximately 64 acres in size (Figure 1-1). The proposed site for the actual agriculture biomass-to-energy facility is located approximately 1,200 feet north of Kaumuali'i Highway, approximately 6 miles from the shoreline of the Pacific Ocean, and situated on a 6 acre plot of agriculture land cultivated with Eucalyptus and Albizia trees (Figure 1-3).

This environmental assessment (EA) analyzes the potential environmental consequences of the proposed action and alternatives to determine if there would be significant short-term, long-term, and/or cumulative impacts on the human, natural, or historic environments.

All activities conducted in support of this EA, including reports, field investigations, technical studies, and public involvement are conducted in accordance with Hawai'i Revised Statutes (HRS) Chapter 343, environmental impact statements; the Hawai'i Administrative Rules (HAR) Title 11, Chapter 200, State of Hawai'i Department of Health (DOH) Implementing Rules for the Environmental Review Process; and Act 50, HRS Chapter 343, requiring impacts to Hawai'i's culture, traditional cultural properties and practices, and customary rights be addressed in the environmental review process.

### 1.1 PURPOSE OF AND NEED FOR ACTION

The purpose of the proposed action is to provide renewable energy to the Island of Kaua'i through an innovative agriculture biomass-to-energy technology. The need arises because of HRS Title 15, Chapter 269, Part V renewable portfolio standard (RPS) that mandates that each electrical utility company shall provide 20 percent (%) of its net electricity through renewable energy by the end of the year 2020. Appendix A contains the Senate Bills and RPS Chapter 269 enacted by legislature.

### 1.2 ENVIRONMENTAL PERMITS, CONSULTATIONS, AND APPROVALS

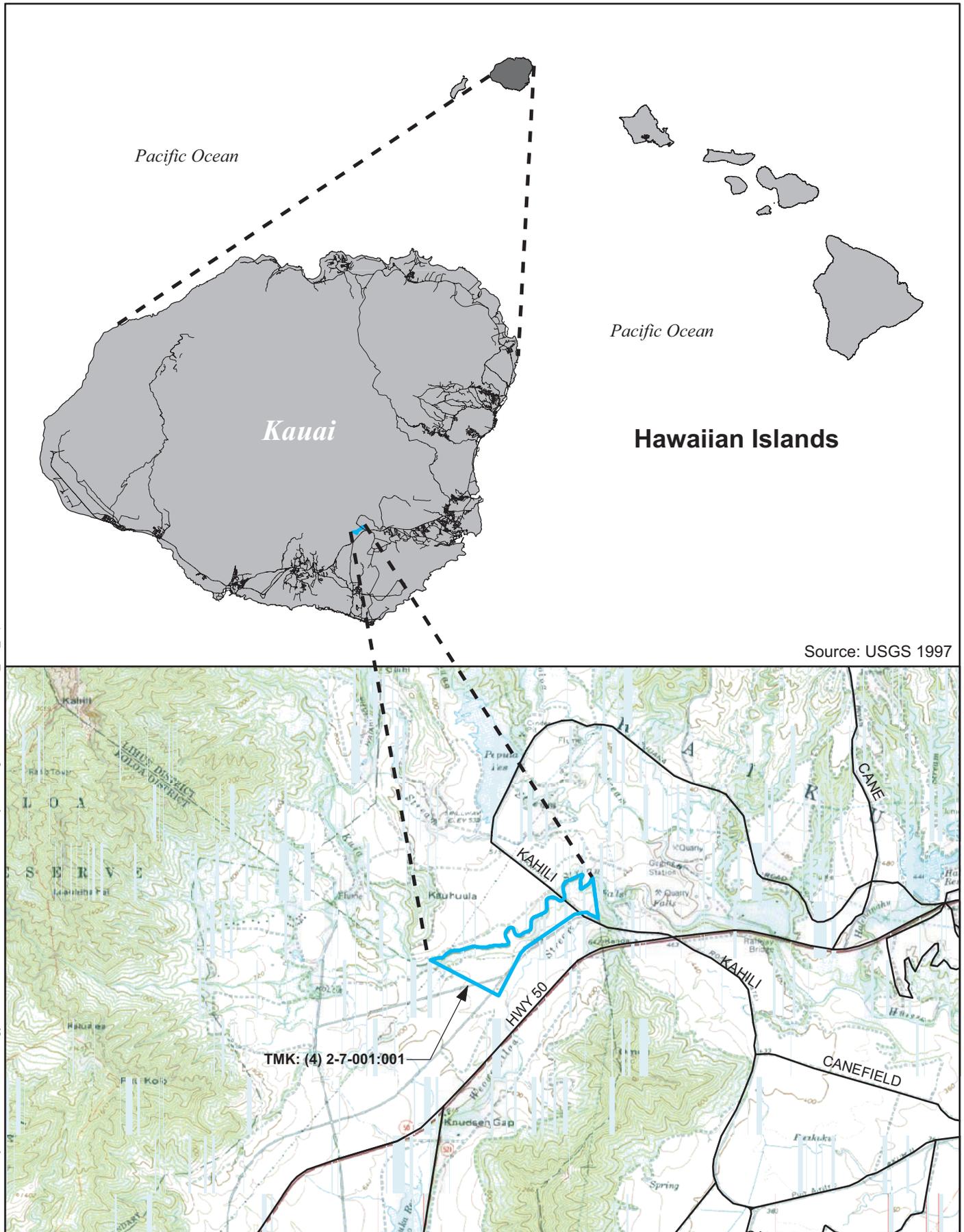
In addition to the environmental disclosure requirements of HRS Chapter 343, implementation of the proposed action would require coordination and consultation with the following state and local agencies for permits, clearances, or approvals (see Appendix B for agency correspondence):

- **State Historic Preservation Division (SHPD).** Historic preservation review was initiated pursuant to HRS Chapter 6E-42 and a determination of “no effect” has been received from the SHPD.
- **Act 50.** Statements or information related to traditional cultural uses in the project vicinity were requested from the Office of Hawaiian Affairs (OHA) and other knowledgeable informants including; traditional cultural practitioners, historians, community organizations, and government agencies, per Act 50. The results of this consultation are presented in Section 4.3.
- **State of Hawai'i Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW).** A review of threatened and/or endangered species which may be impacted by the proposed action was conducted. Communication has been received from both the Oahu and Kaua'i DOFAW and the main concerns are with the type of outdoor lighting and exterior building paint that the facility would have. The recommendations for the types of outdoor lighting and exterior paint would be strictly followed, as outlined in Section 4.2.

- **DLNR, Commission on Water Resource Management (Water Commission).** A request for determination was submitted to the Water Commission on whether or not a Stream Channel Alteration Permit (SCAP) would be required to access the water source from the nearby Kōloa Ditch System. The Water Commission responded that a SCAP would not be required for the proposed action.
- **DOH Clean Water Branch (CWB).** Since the total area of land disturbance during construction activities would be over 1 acre, a National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Associated with Construction Activities pursuant to HAR Chapter 11-55 Appendix C would be required for storm water associated with the construction activities. The NPDES Permit would be obtained prior to the commencement of construction activities.
- **DOH Clean Air Branch (CAB).** DOH CAB was consulted regarding requirements for a Covered Source Permit (CSP) pursuant to HAR Chapter 11-60.1 Subchapter 5. A CSP Application was submitted in May 2007 in support of the proposed action. The CSP Application is provided in Appendix C. Also provided in Appendix B are the comments received from the DOH CAB on the CSP Application with responses.
- **DOH Solid and Hazardous Waste Branch (SHWB) and DOH Hazard Evaluation Emergency Response Office (HEER).** DOH SHWB and DOH HEER were consulted regarding any known records of hazardous waste associated with the property. No records were identified. A meeting was also held with the SHWB to determine the need for a Solid Waste Management Permit. The determination is pending.
- **Kaua'i Historic Preservation Review Commission (Commission).** In order to inform local residents of the proposed action and solicit comments, a copy of the Draft EA was sent to the Commission. The Commission placed the Draft EA on their agenda for their October 4, 2007 meeting. Comments were received (see Appendix B) and are discussed in Section 3.3 and Section 4.3.

Green Energy would comply with all applicable permits, laws, and regulations and would continue to work closely with all state and local agencies. Letters of Support have been received from various state and local agencies, State of Hawai'i House of Representatives, and individuals which indicate the importance and support for sustainable and renewable energy projects in order to prepare for Hawai'i's future on the Island of Kaua'i (See Appendix C).

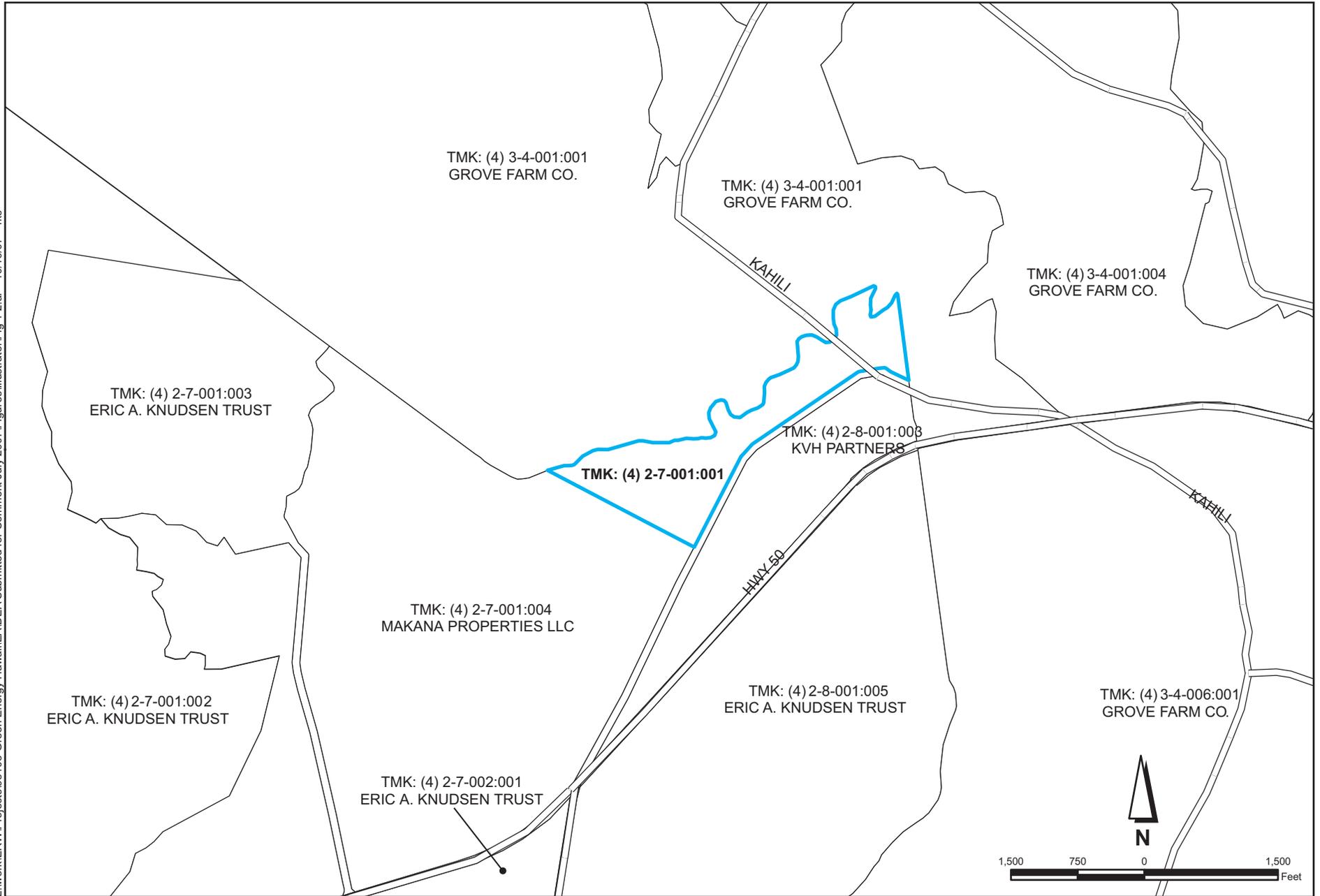
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Source: USGS 1997

**Figure 1-1**  
**Site Location and Topographic Map**  
**Agriculture Biomass-to-Energy Facility, Kōloa, Kauaʻi**  
**Environmental Assessment**





**Figure 1-2**  
**Tax Map Key**  
**TMK (4) 2-7-001:001**  
**Agriculture Biomass-to-Energy Facility, Kōloa, Kaua'i**  
**Environmental Assessment**



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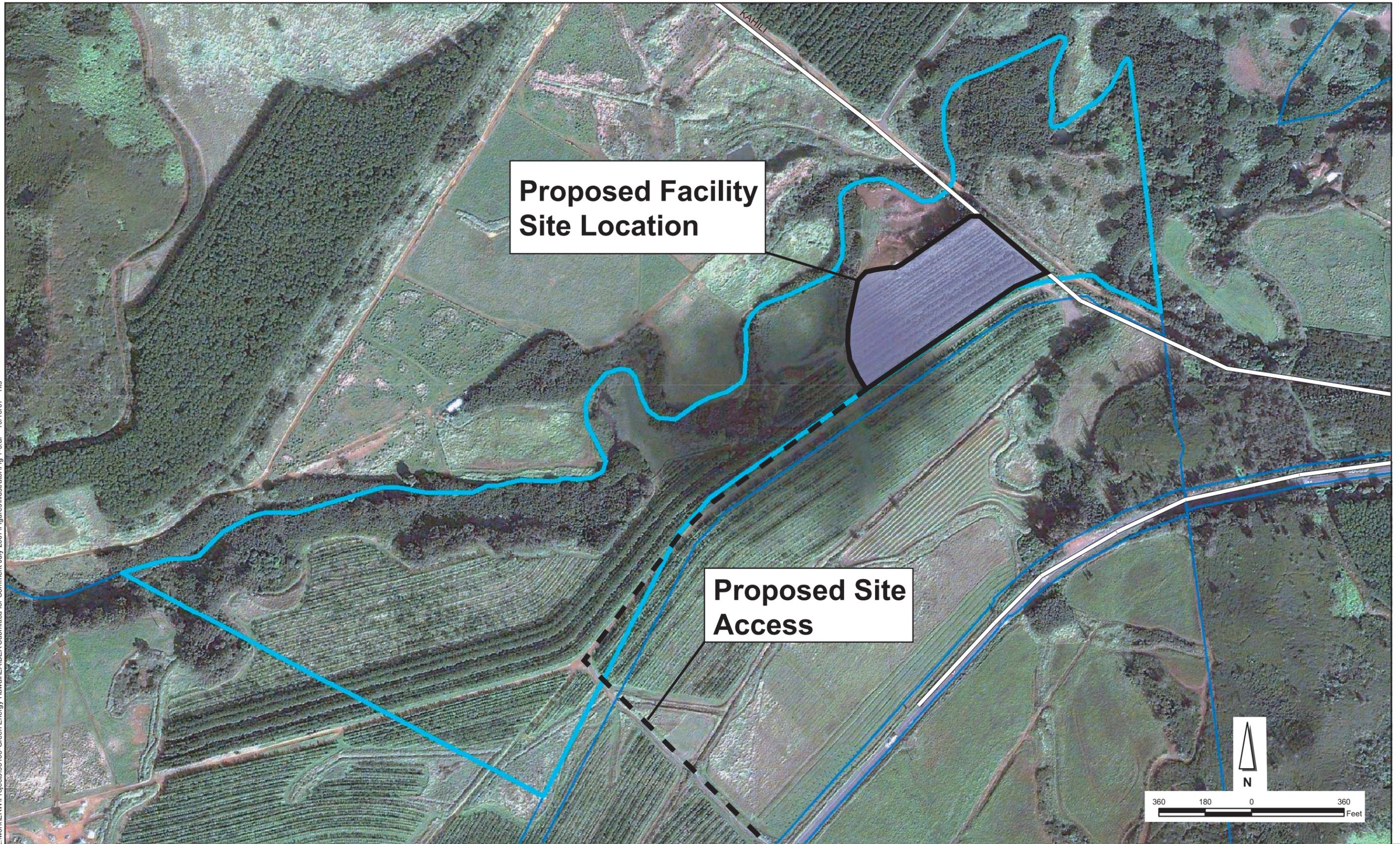


Figure 1-3  
Aerial Photo of Proposed Property  
Agriculture Biomass-to-Energy Facility, Kōloa, Kaua'i  
Environmental Assessment



## 2.0 PROJECT DESCRIPTION

This section provides background information on the proposed project, and a description of the proposed action and the no-action alternative.

### 2.1 PROPOSED ACTION

The proposed action is to construct, operate, and maintain an agriculture biomass-to-energy facility to provide renewable energy to the Island of Kaua'i through cooperation with the Kaua'i Island Utilities Cooperative (KIUC). The proposed facility would utilize agriculture biomass and process it into energy as an integral part of an existing agriculture operation. The facility would be an environmentally sound method of handling the waste stream of the agriculture operation, generating clean sustainable energy for the community of Kaua'i while stimulating further agriculture activity. It is anticipated that a total of 9 employees with rotating shifts would be required to operate and maintain the facility on a 24 hour per day, 7 day per week basis, with approximately 30 agricultural jobs created to grow and harvest the Eucalyptus and Albizia trees.

The proposed agriculture biomass-to-energy facility is proposed to be constructed on an approximate 6 acre parcel of land. The proposed facility site layout includes an energy plant building, feedstock storage and chipping area, a power sub-station, a gravel log laydown area, and paved access areas (Figure 2-1 and Figure 2-2).

The elevation of the subject property is approximately 440 feet above mean sea level. The overall gradient of the subject property is north, northeast. A United States Geological Survey (USGS) topographic map of the subject property and surrounding area is presented in Figure 1-1.

Minor grading would be done with some fill brought in. KIUC overhead transmission lines cross directly over the proposed facility site, which is ideal for connection of the proposed electrical sub-station to these lines. Furthermore, the proposed site is generally in between the KIUC Port Allen and Kapaia fossil fuel energy production units, which contributes to stabilizing the KIUC electrical grid and is favored as such by KIUC. Local cane haul roads with an estimated 8 to 10 large 20 cubic yard (yd<sup>3</sup>) dump trucks per day would be primarily used to transport the wood chips to the facility site for processing. Tractors hauling flatbed trailers would be utilized to haul the actual wood.

Water necessary for cooling and creating steam which is requisite to the production of energy exists approximately 4,600 feet west of the site at the Kōloa Ditch. This water from the Kōloa Ditch would be transported to the facility filtration and water preparation system using gravity fed 10-inch diameter high-density polyethylene raw water supply pipe. Under the proposed action, there would be some minor excavation at the facility site as well as an approximate 4 foot wide by 2 foot deep excavation corridor for the pipeline. The two general proposed pipeline alignments to the facility are presented in Figure 2-3. However, the actual alignments will be based on consultation with the appropriate agencies, such as the State of Hawaii Department of Transportation (DOT). The process associated with the proposed action is explained in detail in the following sections.

#### 2.1.1 Agriculture Biomass Flow

Approximately 95% of the targeted biomass would be derived from Albizia and Eucalyptus wood chips. The Eucalyptus trees are in majority sourced from plantations whereas the Albizia trees are planted as a natural nitrogen giver in rows interspaced between rows of saw wood trees such as Eucalyptus. This natural fertilization method is an economical and more environmentally friendly alternative to chemical fertilization.

The Albizia trees grow faster than the saw wood trees (i.e., Eucalyptus) for which they provide nutrients, and must be periodically culled from the tree plantations to allow the saw wood trees room for growth. The Albizia trees are a significant forestry waste product, which would present a formidable waste stream burden for Kaua'i. The Green Energy project would utilize the Albizia waste

stream as a source of energy. Green Energy has a contract with a local tree farmer to provide 195 tons of feedstock per day for 20 years, matching the term of the Power Purchase Agreement with KIUC. Sources of the wood fuel includes currently leased lands to the contracted local tree farmer of approximately 3,700 acres, an additional 2,000 acres targeted to be leased by Green Energy in the very near future, and 1,500 acres that have been identified where the land owner has requested assistance in Albizia clearing from their properties (i.e., volunteer stands); for a total of 7,200 acres. Each of these sources would generate varying amounts of biomass fuel per acre. Based on reasonable annual growth estimates, it is anticipated that the overall average biomass fuel per acre from each of these sources will be approximately 165 tons per acre for the first 7 years. Thus it is anticipated 1.18 acres per day would have to be harvested during the first 7 years. It should be noted that this is an average and depending upon which tree stands are being harvested, the acreage could range from 1.64 acres in the established plantations to 0.98 acres in the land clearing operations. During the first 7 years prior to the Green Energy leased land reaching rotation age, it is anticipated that approximately 430 acres per year would need to be harvested or approximately 3,010 acres in total. After the initial 7 year period, it is anticipated that 285 acres of the 2,000 leased acres would be ready for harvest resulting in approximately 20,000 tons per year (tpy) or 55 tons per day. The remaining 140 tons per day would come from a combination of established plantations and volunteer stands. It is estimated that these two sources would generate an average of 160 tons per acre thus it would require approximately 0.88 acres per day or 319 acres per year. Therefore, in years 7 through 20 it is estimated that approximately 600 acres per year would be required to supply 195 tons per day to the project. This would require a total land base of 4,200 acres of plantations and volunteer stands to sustain the fuel supply.<sup>2</sup>

Albizia chip testing by Hazen Research in Colorado has resulted in confirmation that the wood is of exceptionally high calorific content, and generates outstanding British Thermal Units when introduced into the gasification/thermal oxidation process. Albizia trees are planted close together and cut back on a regular basis; the remaining Albizia stumps generate equal or stronger re-growth when compared to newly planted Albizia saplings, and are capable of this re-growth approximately 4 to 6 times before new plantings are required. Albizia is considered one of the fastest growing trees in the world.

Approximately 70% of the culled Albizia waste would be transported on flatbed trailers hauled by a tractor across cane haul roads to the proposed facility site for chipping, which is identical to the agricultural process with which sugar cane was once moved across the same lands decades ago. The remaining 30% of the Albizia would be chipped directly at the respective plantation locations to reduce bulkiness and the wood chips would subsequently be placed in 20 yd<sup>3</sup> dump trucks and hauled to the proposed facility site over the cane haul roads. All feedstock would be brought in on a just-in-time basis; minimal feedstock would be stockpiled in the field or outside of the two day covered storage area. The chips in the storage area would be turned as required to prevent gas build-up and potential spontaneous combustion.

### 2.1.2 Gasification/Thermal Oxidation

Once at the facility, the biomass would be stored and naturally air dried for up to two days before being pushed by a front end loader into a pit housing an underfeed conveyer system which transports the chips to surge bins. The wood chips would then be metered into an oxygen-deprived gasification chamber where they would be slowly gasified at a low temperature of approximately 1,100 degrees Fahrenheit (°F), creating a wood gas. The wood gas would then be channeled into sealed gasification chambers (gasifiers), which are coupled to industrial water-tube steam boilers. The wood gas generated in each gasifier would travel through the boiler burner nozzle where it would be superheated and mixed with air for complete combustion. The steam generated in each boiler would be used in a multi-stage condensing turbine generator to produce electricity.

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<sup>2</sup> As per internationally recognized forestry expert, Mr. Jim Burk, JEB Consulting, Gustine, CA.

Gasification is considered by many experts to be one of the most efficient technologies/processes available for converting solid biomass fuel (wood chips) into usable energy. Several key benefits of the gasification process include low particulate emissions due to a precisely controlled air flow via computer controls and a high flame temperature (2,100°F +) in the boiler. The flame has a sufficient residence time in the boiler to destroy a greater amount of volatile organic emissions compared to other types of combustion systems. Other types of combustion systems (i.e., stokers or straight combustion) cannot generate nor maintain very high flame temperature. This is primarily due to the design of those systems and the large amounts of excess air used in them.

Since the gasification process produces lower particulate emissions compared to other traditional types of biomass combustion units, a simple mechanical (multi-cyclone) can be utilized to capture a majority of the particulates leaving the plant. However, to further reduce the particulate emissions from the plant, Green Energy has selected an ESP, or Electrostatic Precipitator, to be designed into the system. The ESP is considered to be one of the most efficient processes for removing particulates from the exhaust stream. The ESP is capable of collecting 95% or better of the particulates in the exhaust stream. The estimated emissions from operation of each of the plant systems and the total maximum emission of regulated air pollutants for the facility are shown in Table 4-1.

Beyond the air emissions noted above, solid waste by-products in the form of toxic ash would not be found. In fact, the non-toxic wood ash resulting from the process represents about 1.5% of the original feedstock tonnage introduced into the system, and would be used as a fertilizer for its tree plantations. This outstanding "closed loop" application demonstrates Green Energy's ambition to be an outstanding sustainable energy provider in an environmentally friendly way.

### 2.1.3 Plant Components

The components for the proposed waste-to-energy facility are proven technologies that have been successfully used for decades in similar applications resulting in significantly reduced net greenhouse emissions and ash when compared to more conventional methods. The technology used to produce power would be a multi-stage condensing steam turbine generator. The plant components, presented in Figure 2-1 through Figure 2-3, are outlined below.

#### Buildings

A main **Energy Plant** building, approximately 15,000 square feet (ft<sup>2</sup>) in size, would house the gasifiers, the boilers, the steam turbine, and the other required steam auxiliary equipment. This building would have a dedicated climate and dust controlled operator's room where the operation of the energy plant would occur. The Energy Plant building would also contain administrative areas, a locker room, bathrooms, a storage room, mechanical rooms, and electrical rooms. This building would be a pre-engineered steel structure capable of withstanding 150 mile per hour (mph) lateral winds. All buildings, structures, and equipment would be designed to meet seismic specifications.

The **Feedstock Storage** building would be a pre-engineered fabric-covered structure of approximately 21,000 ft<sup>2</sup> used for the two-day storage and drying of chipped material. The wood chipping operation would also occur under this roofed structure. The biomass would be moved to the gasifiers using a conveyor system.

#### Electrical Sub-station

A new 57.1 kilovolt (kV) sub-station would be constructed at the west end of the proposed facility site. The turbine generator would produce approximately 7,100 kilowatts (kW) gross electrical output with a net output of approximately 6,400 kW at 13.8 kV. The power for the Energy Plant would be derived from the generator via a transformer. The KIUC Kōloa to Līhu'e transmission line would be interrupted with a breaker and service disconnected to each line. The sub-station would have the ability to feed towards the Kōloa Switchyard or Līhu'e Switchyard. A protective fence would surround

the sub-station. All breakers would be designed to eliminate arc flashing personnel hazards in accordance with National Fire Protection Association standards.

### **Steam Cycle Description**

Raw feedwater from the Kōloa Ditch would be treated using appropriate reverse osmosis or demineralizer treatment for use as boiler or cooling tower makeup water. The boiler makeup water would be used to maintain the level of the surge tank, which would absorb swings in plant return water quantity and provide a place to accept low pressure condensate return. From the surge tank, feedwater would be transferred via pumps to the deaerator, which would reduce dissolved oxygen and carbon dioxide to very low levels by heating the feedwater using steam to approximately 225°F. The heated and deaerated feedwater would then be pumped to the boilers at high pressure where the water would then be heated into steam. The superheated steam would be collected in a header and then piped to the multi-stage condensing turbine. The steam would turn the turbine to produce electricity and be exhausted after the last turbine stage to the condenser.

### **General Plant Design and Operating Strategy**

The proposed Energy Plant would be fully automated and designed to be operated with no more than the specified number of employees required for safety and operational needs. It is anticipated that a total of 9 employees with rotating shifts would be required to operate and maintain the facility on a 24 hour per day, 7 day a week basis. All valves and valve actuators would be accessible for operation and maintenance. All plant equipment and facilities materials would be produced in the United States (U.S.) or designed and built to U.S. standards. The project construction contractor would be accepted and approved by KIUC. The plant interior and exterior noise levels along the property line would be within permit specifications under all operating conditions. Emergency lighting would be provided in all areas of operation. Site elevation would be graded in excess of the 100 year flood level.

### **Demineralization Water**

All water treatment and regeneration equipment will be fully enclosed and climate controlled. The system will be able to produce a minimum of 110% of the plant's maximum daily consumptive water use. The proposed Energy Plant would be adequately sized and designed for ease of removal of large equipment (roll up doors, overhead crane). All piping, storage tanks, equipment, and materials will be designed to minimize corrosion and to meet specifications associated with water production and delivery. The piping arrangement shall be plumbed to allow for use of portable demineralizers. The demineralization system will be a fully automated system with critical controls, instrumentation and alarms available both locally and into the control room (able to start, operate, and stop unmanned). Full redundancy will be used on all chemical pumps and for raw water supply and final product outlet. Chemical storage will be adequate and capable of supporting 10 days of full capacity water production. All chemical equipment, instrumentation, and piping will be properly shielded in accordance with Occupational Safety and Health Administration (OSHA) requirements. All pumps will have suction/discharge flange and bolt connections.

All valves and piping runs will be properly labeled and accessible for maintenance and operation.

### **Cooling Water Return System**

The water system will be designed to collect and pump back to Kōloa Ditch the return water from the plant in accordance with DOH-approved discharge permit requirements. Hot blowdown water from the boilers will be cooled with factory grade water for subsequent discharge back into the Kōloa Ditch with an estimate temperature differential from intake from the ditch to effluent return of approximately +0.5°F.

### 2.1.4 Transportation Plan

There are two separate transportation flows for the proposed action: 1) plant personnel transportation, and 2) feedstock transportation, as described below.

#### Plant Personnel Transportation

The plant is proposed to be operated and maintained by nine individuals during a 24 hour time period. Operational hours would be 24 hours a day, seven days a week, with one operator per shift, as well as a plant manager and clerical and maintenance staff during the day shift. Each employee is expected to access the plant site once per shift utilizing a car or pickup truck. Approximate shift times would be as follows:

- Evening Shift – 7:00 pm to 7:00 am (One Operator)
- Day Shift – 7:00 am to 7:00 pm (One Operator)
- Day Shift – 8:00 am to 4:30 pm (Plant Manager, Maintenance Staff, and Clerical Staff)

The ingress route to the plant would be from a southbound Līhu`e direction only, with a right hand turn onto the gravel road known locally as the “Old Government Road” or the “the American flag road”. Left hand lane turns from a northbound Kekaha direction would be strictly prohibited. The egress route from the plant would be from either direction. Grass and other vegetation would be routinely cut back and maintained to allow maximum visibility approaching the entrance to the access road and at the entrance to the access road itself.

Each employee is expected to access the plant once per shift in either a car or pick-up truck. Estimated personnel shift access would be as follows:

- Evening Shift – 1 vehicle between 6:30 and 6:45 pm and again at 7:15 to 7:30 am
- Day Shift – 1 vehicle between 7:15 and 7:30 am and again at 6:30 to 6:45 pm
- Day Shift – 4 vehicles between 7:30 and 7:45 am and again at 4:45 to 5:00 pm

This constitutes a total minimum of 12 personnel making right hand turns from a north bound direction on any given day. There may be times where an employee leaves the site during their shift for personnel reasons, meal breaks, etc. Safety issues are being discussed with the DOT, such as signage, acceleration/deceleration lanes, etc.

#### Feedstock Transportation

The feedstock transportation network is set up to be as convenient as possible to the feedstock provider while having the least potential for adverse impacts. The plant site itself is located approximately in the center of the tree plantations currently maintained by the feedstock provider. Nearly all of the transportation of the feedstock would be made using existing cane haul roads directly from the tree plantations. Approximately 8 to 10 large 20 yd<sup>3</sup> dump trucks would transport the feedstock to the plant.

A tractor hauling a flatbed trailer would be utilized to move feedstock from the plantations located on the opposite side of Kaumuali`i Highway, to the plant. The crossing of the highway would be at the main cane haul gravel road found immediately west of Huleia (“Halfway”) bridge. Of the 8 to 10 trailer loads per day, 2 to 3 per day on average would have to cross the highway at the Huleia “Halfway” Bridge. It might be four in one day, and one the next. The crossings would take place during non-peak travel time hours, 10:00 pm to 5:00 am, to have minimal impact on traffic. Safety issues are being discussed with the DOT, such as signage, timing, lighting, etc.

Additional information on transportation is presented in Sections 3.11 and 4.11. Mitigation measures to eliminate or minimize potential transportation impacts are presented in Section 4.11.

## **2.2 PROJECT SCHEDULE, COST, AND SOURCE OF FUNDING**

Construction activities related to the proposed action are anticipated to be completed as early as December 2008 or as late as December 2010. The proposed action has a preliminary construction cost estimate of approximately \$30 million or less. This project would be funded fully through private funds.

## **2.3 ALTERNATIVE TO THE PROPOSED ACTION**

In addition to the proposed action, the no-action alternative will be analyzed in this EA. Two other alternative plant locations were considered in the conceptual design phase but they were determined to be not feasible and were eliminated from further consideration. The alternatives considered but not carried forward are presented below in Section 2.3.2.

### **2.3.1 No-Action Alternative**

Under the no-action alternative, the agriculture biomass-to-energy facility would not be constructed. Kaua'i would continue its complete dependence on imported fossil fuels and would not assist with meeting the mandated RPS.

### **2.3.2 Alternative Considered But Not Carried Forward**

**Alternative Plant Location #1.** One alternative plant location, also zoned agriculture, that was considered was located in close proximity to the existing proposed facility location; however, it was deemed to be not as feasible for several reasons: 1) a much greater distance to a suitable water source; 2) a much greater distance to the existing KIUC overhead transmission lines; 3) located closer to residential areas; and 4) possibly most important, was not the neighboring parcel owners preferred location for the plant (see Letters of Support in Appendix D).

**Alternative Plant Location #2.** A second alternative plant location that was considered was located in the Hanama`ulu area, approximately 3 miles northeast of Līhu`e. The main reasons why this alternative was not carried forward was because the location did not satisfy the benefits of "distributed generation", whereas utilities such as KIUC prefer to have production geographically placed in between production units. The area of Hanama`ulu is in close proximity to the Kapa`ia substation and would have simply increased production in that area, rather than producing in areas where KIUC substations are not close by. The selected location is between the Port Allen and Kapa`ia substations, filling in a "weak zone". Another reason why this location was eliminated was the distance the feedstock would have to be hauled was much greater and would result in adverse impacts to traffic and transportation infrastructure.



Figure 2-1  
Proposed Action - Plane View  
Agriculture Biomass-to-Energy Facility, Kōloa, Kaua'i  
Environmental Assessment





Figure 2-2  
Proposed Action - Bird's Eye View  
Agriculture Biomass-to-Energy Facility, Kōloa, Kaua'i  
Environmental Assessment



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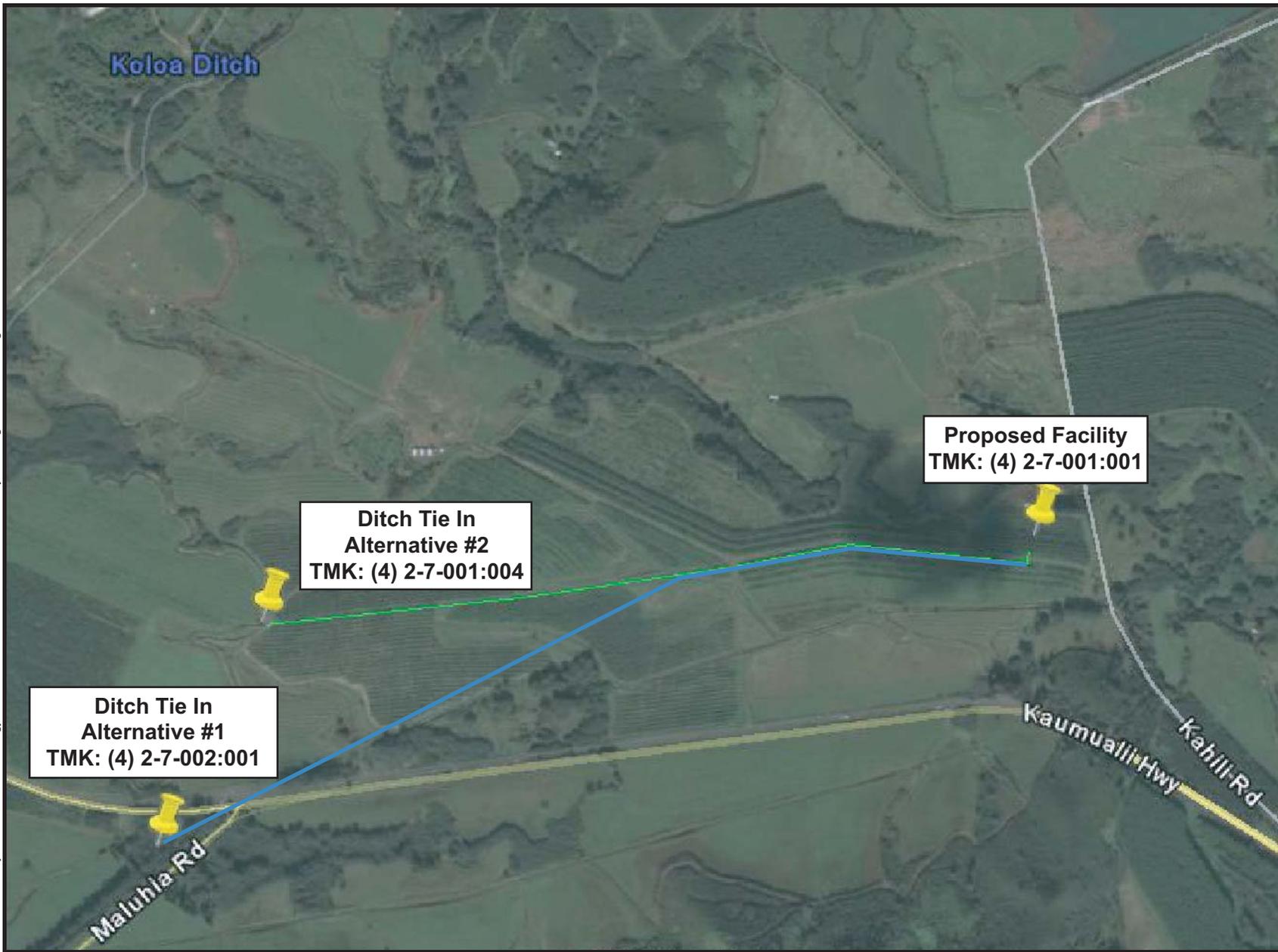


Figure 2-3  
Proposed Pipeline Alignment  
Agriculture Biomass-to-Energy Facility, Kōloa, Kauaʻi  
Environmental Assessment



### 3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

This chapter describes the affected environment associated with the proposed action and the no-action alternative. The information provided serves as a baseline from which to identify and evaluate environmental changes resulting from implementation of the proposed action or the no-action alternative.

The affected environment describes the natural and man-made environments, which includes air quality, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste, land use, natural hazards, noise, safety and health, socioeconomics, transportation, utilities and infrastructure, visual resources, and water resources. The Region of Influence (ROI) is defined for each resource area affected by the proposed action and the no-action alternative. The ROI determines the geographical area to be addressed as the affected environment.

#### 3.1 AIR QUALITY

The ROI for air quality is the proposed project site and downwind areas on Kaua'i. Downwind areas vary during the year and air quality is affected by the climate. The climate is characterized by two distinct seasons, primarily defined by the annual variation in persistence of the northeast trade winds. The summer months from May to September are typically drier and warmer, while the winter months from October to April are usually wetter and cooler.

Air quality in a given location is defined by the concentration of various pollutants in the atmosphere, generally expressed in units of parts per million or microgram per cubic meter ( $\mu\text{g}/\text{m}^3$ ). Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The significance of a pollutant concentration is determined by comparing it to federal and/or state ambient air quality standards. The Clean Air Act (CAA) 42 United States Code (U.S.C.) 7401-7671(q), amended in November 1990, stipulates that emissions sources must comply with the air quality standards and regulations that have been established by federal, state, and county regulatory agencies. These standards and regulations focus on 1) the maximum allowable ambient pollutant concentrations; and 2) the maximum allowable emissions from individual sources.

The U.S. Environmental Protection Agency (EPA) has established the federal standards for the permissible levels of certain pollutants in the atmosphere. These National Ambient Air Quality Standards (NAAQS) have been established for seven criteria pollutants: ozone, nitrogen dioxide ( $\text{NO}_2$ ), particulate matter equal to or less than 10 microns in diameter ( $\text{PM}_{10}$ ), particulate matter equal to or less than 2.5 microns in diameter ( $\text{PM}_{2.5}$ ), carbon monoxide (CO), sulfur dioxide ( $\text{SO}_2$ ), and lead. Ozone is a secondary pollutant formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors. The ozone precursors are nitrogen oxide ( $\text{NO}_x$ ) and volatile organic compounds (VOCs). The State of Hawai'i has established its own ambient air quality standards (HAR Title 11 Chapter 59-4) that are as strict or, in some cases, stricter than the NAAQS. The State of Hawai'i has also established standards for fugitive dust emissions emanating from construction activities (HAR Title 11 Chapter 60.1-33). These standards prohibit any visible release of fugitive dust from construction sources without taking reasonable precautions. The State standards are administered by the DOH.

The EPA designates all areas of the U.S. as having air quality better than (attainment) or worse than (non-attainment) the NAAQS. Pollutants in an area may be designated as unclassified when there are insufficient ambient air quality data for the EPA to form a basis for an attainment status. The non-attainment classifications for CO and  $\text{PM}_{10}$  are further divided into moderate and serious categories. Ozone non-attainment is divided into marginal, moderate, serious, severe, and extreme categories. In 2005, the State of Hawaii met all federal ambient air quality standards (DOH 2005) and is considered an attainment area for all criteria pollutants.

Title 40 Code of Federal Regulations (CFR) 51 Part 93, General Conformity, requires federal actions to conform to any State Implementation Plan approved or promulgated under Section (§) 110 of the CAA. An air conformity applicability analysis and possibly a formal air conformity determination are required for federal actions in nonattainment or maintenance areas. The general conformity rule does not apply because the project site is within an area classified as an attainment area for the NAAQS.

As an attainment area, Kaua'i County is regulated under the Prevention of Significant Deterioration (PSD) program authorized by the CAA Part C §§ 160 through 169. PSD areas require that owners and/or operators of new or modified stationary sources obtain a PSD permit prior to construction of a major source situated in attainment or unclassified areas. A major source is defined by PSD regulations as being a specific type of stationary source listed by the EPA that has a potential of emitting 100 tpy or more of a regulated pollutant. A source not listed by the EPA may also be considered major if it has the potential to emit 250 tpy or more of a regulated pollutant. PSD permitting criteria would be applicable if the potential emissions of a regulated pollutant from the biomass gasifiers (as listed types) exceed 100 tpy or total facility emissions exceed 250 tpy.

The DOH requires permits for covered sources as defined in HAR Chapter 11-60.1. Covered source permitting would be applicable if the proposed plant would be any of the following:

- A "major source," which HAR Chapter 11-60.1 further defines as a stationary source emitting at least 100 tpy of criteria pollutant, 10 tpy of any single hazardous air pollutant (HAP), or 25 tpy of all HAPs;
- A source subject to a new source performance standard (NSPS) or other requirement under § 111 of the CAA;
- A source subject to a national emissions standard for hazardous air pollutants or other requirement pursuant to § 112 of the CAA, with the exception of those sources solely subject to regulations or requirements pursuant to § 112(r) of the Act; and
- A source subject to the rules for PSD of air quality.

Some national parks and wilderness areas are designated as Class 1 areas where appreciable deterioration of air quality is considered significant. The nearest Class 1 area is Haleakalā National Park, Maui, approximately 200 miles southeast of the project site. The maximum allowable pollutant concentration increase under PSD regulations for a Class 1 area is defined by 40 CFR Parts 51 and 52.

The project area is located on agricultural land. The primary source of air pollutants in the project vicinity are emissions from motor vehicles traveling on the nearby road and highway, and fugitive dust from agricultural activities. Criteria pollutant levels within the ROI are expected to be less than or comparable to levels reported at air monitoring stations, as air monitoring stations are generally placed near city centers where there are mixed commercial, industrial, and residential land uses. Therefore, existing air quality within the ROI is assumed to be in compliance with federal and state air quality standards.

### 3.2 BIOLOGICAL RESOURCES

The ROI for biological resources, including flora and fauna, is the proposed project area. The footprint of the proposed facility is entirely within heavily disturbed land that has been historically and currently used as agricultural lands. The planting locations are also on agricultural lands.

The majority of the vegetation present within the proposed project area can be classified into two major groupings: 1) agricultural lands supporting cultivated Eucalyptus and Albizia trees; and 2) undeveloped non-agricultural lands, consisting mostly of native overgrown grasses and shrubs.

An avifauna and mammal survey was not conducted for this proposed action; however, a records review and several site visits were conducted. Per consultation with the Oahu and Kaua'i DOFAW, two protected seabird species, the Newell's shearwater and the Hawaiian petrel, may occur in the vicinity of the proposed project site.

Consultation with the DOFAW has been initiated and a request for concurrence that the proposed project would not adversely affect any threatened and/or endangered plants or wildlife in the project vicinity has been made (see Appendix B).

### 3.3 CULTURAL RESOURCES

The ROI for cultural resources is the proposed project area and adjacent areas. This resource encompasses prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reason. For the purpose of this EA, archaeological/cultural resources are defined to include prehistoric and historic archaeological sites, historic buildings and structures, and traditional (i.e., native Hawaiian) sites.

In accordance with Act 50, a request for statements or information relating to current cultural practices in the project vicinity from knowledgeable informants, including traditional cultural practitioners, historians, community organizations, and government agencies was made (see Appendix E). Per the *Guidelines for Assessing Cultural Impacts* (DOH 1997), the types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs. The cultural resources that support such cultural practices and beliefs are also subject to assessment.

A site map encompassing the geographic extent or area of potential effect was included with a brief correspondence soliciting information regarding current cultural practices near the proposed project site. The solicitation for information was distributed to the OHA, SHPD, Kaua'i Historic Preservation Review Commission (Commission), KAHEA, Department of Hawaiian Homelands, University of Hawai'i Center for Hawaiian Studies, and a local resident Mr. Teddy Blake who was identified by the OHA Kaua'i Branch. Letters sent and documentation for follow-up are included in Appendix E. Based on comments received from the Commission, the mele data bank at Bishop Museum was researched. Based on a record review and several site visits, no significant archeological, cultural, or historic sites have been identified as being present at the proposed project location. The only identified cultural site within the *ahupua`a*, but outside of the project area, was Kanehaule heiau, at Kaunuieie, Kōloa, which was documented as being a destroyed heiau where rites of circumcision were performed (Bernice P. Bishop Museum Bulletin 80-83). It was also documented that in 1927 the mauka lands of the Kōloa Plantation planted by the Knudsen Brothers proved unsuitable for the growing of sugar cane with profit and their venture definitively abandoned (Alexander 1985).

Historic preservation review was initiated pursuant to HRS Chapter 6E-42 and a determination of "no effect" has been received from the SHPD (see Appendix B).

### 3.4 GEOLOGY AND SOILS

The Island of Kaua'i consists of a single shield volcano that is deeply eroded and partly veneered with much later volcanics. The shield volcano was built by the extrusion of lava of the Waimea Canyon Volcanic Series during the late Pliocene Epoch (about 2.25 million years ago). These lava flows are exposed near the Knudsen Gap. Due to their age, these olivine basalts are usually mantled with residual and saprolite soils grading into weather rock with increasing depth.

Following the cessation of the main shield volcano, there was renewed volcanic activity with the extrusion of the post-erosional Kōloa Volcanic Series. Rocks of the Kōloa Volcanic Series are generally characterized as thick flows of dense basalt extruded from groups of vents and are associated with pyroclastic materials that form low cinder cones at the vent. Rocks of the Kōloa

Volcanic Series cover the majority of the eastern half of the Island of Kaua'i. In general, the rocks have a mantle of residual and saprolitic soils grading to weathered basalt with depth.

The proposed project site is situated on six soil classifications, with the Kappa Series being the most prominent. Soil found at the proposed project location consists of Kapa`a silty clay (KkB, KkC, KkD, and KkE), Hanamā`ulu silty clay (Hsb), and Rough broken land (rRR) (USDA SCS 1973).

Soils found in the Kappa Series consist of well-drained soils on uplands on the Islands of Kaua'i and Oahu. These soils developed in material weathered from basic igneous rock. They are gently sloping to extremely steep. Elevations range from 200 to 800 feet.

- **KkB (Kapa`a silty clay, 3 to 8% slopes).** KkB is found on broad ridges in the uplands, were about 300 acres on Kaua'i, south of Pu`u Kolo peak and southwest of the Knudsen Gap. This soil formed in volcanic ejecta. The surface layer and the upper part of the subsoil contain less gibbsite than typical. In a representative profile, the surface layer is dark yellowish-brown silty clay about 14 inches thick. The subsoil, about 46 inches thick, is yellowish-red and reddish-brown silty clay that has subangular blocky structure. The surface layer is strongly acidic. The subsoil is medium acidic to very strongly acidic. Permeability for this soil is moderately rapid. Runoff is slow and the erosion hazard is slight. Kapa`a silty clay is considered suitable for growth of sugarcane, pasture, pineapple, orchards, truck crops, wildlife habitat, and woodland.
- **KkC (Kapa`a silty clay, 8 to 15% slopes).** With this soil, runoff is slow to medium and the erosion hazard is slight to moderate. Included in mapping were 202 acres on Kaua'i, south of Puu Kolo peak and southwest of the Knudsen Gap. This soil formed in volcanic ejecta. The surface layer and the upper part of the subsoil contain less gibbsite than is typical. This soil is suitable for sugarcane, pasture, pineapple, orchards, wildlife habitat, and woodland.
- **KkD (Kapa`a silty clay, 15 to 25% slopes).** With this soil, runoff is medium and the erosion hazard is moderate. This soil formed in volcanic ejecta. The surface layer and the upper part of the subsoil contain less gibbsite than is typical. This soil is suitable for sugarcane, pineapple, pasture, orchards, wildlife habitat, and woodland.
- **KkE (Kapa`a silty clay, 25 to 40% slopes).** Runoff is rapid and the erosion hazard is moderate to severe. Part of the surface layer has been removed by erosion. This soil is used for pasture, wildlife habitat, and woodland.

Soils found in the Hanamā`ulu Series consist of well-drained soils on stream terraces and steep terrace breaks on the island of Kaua'i. These soils developed in alluvium washed from upland soils. They are nearly level to strongly sloping. Elevations range from 200 to 700 feet. The annual rainfall amounts to 60 to 100 inches. Hanamā`ulu soils are geographically associated with Kapa`a and Hīhīmanu soils.

- **HsB (Hanamā`ulu silty clay, 3 to 8% slopes).** This soil is found on terraces. Included in the mapping were two areas of stony soil adjacent to streams. In a representative profile, the surface layer is brown and very dark grayish-brown silty clay about 11 inches thick. The subsoil, about 60 inches thick, is dark brown and dark reddish-brown subangular blocky silty clay over silty clay loam. The substratum consists of slightly to strongly weathered pebbles, stones, and boulders. The soil is extremely acid in the surface layer and very strongly acid in the subsoil. Permeability is moderately rapid. Runoff is slow, and the erosion hazard is no more than slight. This soil is used for sugarcane, pasture, water supply, and wildlife habitat.

Rough broken land (rRR) consists of very steep land broken by numerous intermittent drainage channels. In most places it is not stony. It occurs in gulches and on mountain sides on all the islands except Oahu. The slope is 40 to 70%. Elevations range from nearly sea level to about 8,000 feet. The local relief is generally between 25 and 500 feet. Runoff is rapid, and geologic erosion is active. The annual rainfall amounts to 25 to more than 200 inches. These soils are variable and 20 to more

than 60 inches deep over soft weathered rock. Included in the mapping were areas of colluvium and alluvium along gulch bottoms. This land type is used primarily for watershed and wildlife habitat. In places it is also used for pasture and woodland. The dominant natural vegetation in the drier areas consists of guava, lantana, Natal retop, Bermuda grass, koa haole, and molasses grass. Ohia, kukui, koa, and ferns are dominant in water areas. Pua keawe, `a`ali`i, and sweet vernalgrass are common at the higher elevations. A soil classification map reflecting the proposed project area and the soils described above is provided in Figure 3-1.

### 3.5 HAZARDOUS MATERIALS AND HAZARDOUS WASTE

The ROI for hazardous materials and hazardous wastes is the proposed project area. For the purpose of the following analysis, the term hazardous materials or hazardous wastes will mean those substances defined by the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. Sections (§§) 9601 et seq., and Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901–6992. In general, these include substances that, because of their quantity, concentration, or physical, chemical, or toxic characteristics, may present an unreasonable risk to health, safety, and the environment when released.

A Phase I Environmental Site Assessment (ESA) was conducted for the proposed parcel of land to identify any recognized environmental conditions (specifically, evidence as to the presence or likely presence of any hazardous substance or petroleum product under conditions that indicate an existing release, a past release or a material threat of a release into property structures or to ground, groundwater or surface water) (Earth Tech 2007). As part of the ESA, DOH SHWB, and DOH HEER were contacted regarding any known records of hazardous waste associated with the property. No records were identified. Upon completion of the Phase I ESA assessment of the proposed project area, no evidence of the use or storage of hazardous and/or regulated materials or wastes was identified on the subject property or adjacent properties.

### 3.6 LAND USE AND OWNERSHIP

The land use and ownership ROI is the proposed project and adjacent areas. The project area identified as TMK (4) 2-7-001: 001 is agricultural land. The State Land Use Commission, regulates land use through classification of State lands into four districts; Urban, Agriculture, Conservation, and Rural (HRS Chapter 205). The proposed project area is located within the State land use district designated as Agriculture, specifically cropland and pasture. Additionally, the proposed site is not within a special management area, or listed on the historic site register.

### 3.7 NATURAL HAZARDS

Natural hazards that may occur in and affect the proposed project area include floods, tsunamis, hurricanes, earthquakes, and other natural events. The ROI for natural hazards is the proposed project area.

**Floods.** The Federal Emergency Management Agency Flood Insurance Rate Map (FIRM) flood zone designations are:

- A – Areas of 100-year flood, base flood elevations not determined
- AE – Areas of 100-year flood, base flood elevation determined
- XS – Areas of 500 year flood; areas of 100-year flood with average depths of less than one foot or within the drainage area less than one square mile, and areas protected by levees from 100-year flood
- X – Areas determined to be outside the 100-year flood plain
- D – Areas in which flood hazard is undetermined

- VE – Areas of 100-year coastal flood with velocity (wave action), base flood elevations determined (Coastal High Hazard District)

The proposed facilities' structures would be located on a relatively flat area located above the confluence of Kula Stream and Weoweopilau Stream which is outside the Special Flood Hazard Area according to the FIRM panel 305E. Due to the topography of the land, flooding is not expected within the proposed project area.

**Tsunamis.** Tsunamis are a series of destructive ocean waves generated by seismic activity that could potentially affect shorelines of Hawai'i. Tsunamis affecting Hawai'i are typically generated in the waters off South America, the west coast of the U.S., Alaska, and Japan. Local tsunamis have also been generated by seismic activity on the Island of Hawai'i.

The O'ahu Civil Defense Agency establishes tsunami evacuation zones and maps for all coastal areas in Hawai'i. Tsunami maps for the inland areas of Kaua'i indicate that the proposed project area is not within the tsunami evacuation zone.

**Hurricanes.** The Hawaiian Islands are seasonally affected by Pacific hurricanes from June to November. These storms generally travel toward the islands from a southerly or southeasterly direction and can deposit large amounts of rain with high winds on the Hawaiian Islands. The storms generally contribute to localized flooding and coastal storm surges. Coastal storm surges would not impact the proposed project area, and the proposed project area is also outside the 100-year flood plain. The building is designed to withstand lateral winds of up to 150 mph.

**Earthquakes.** Because Kaua'i is an older Hawaiian island with dormant volcanic activity, it is not particularly prone to seismic activity. Seismic activity usually occurs on the Island of Hawai'i, and has been felt as far away as O'ahu. Kaua'i is listed in Seismic Zone A under the Uniform Building Code of 1997 (ICBO 2000). Zone A indicates a location that has low potential for ground motion created by seismic activity.

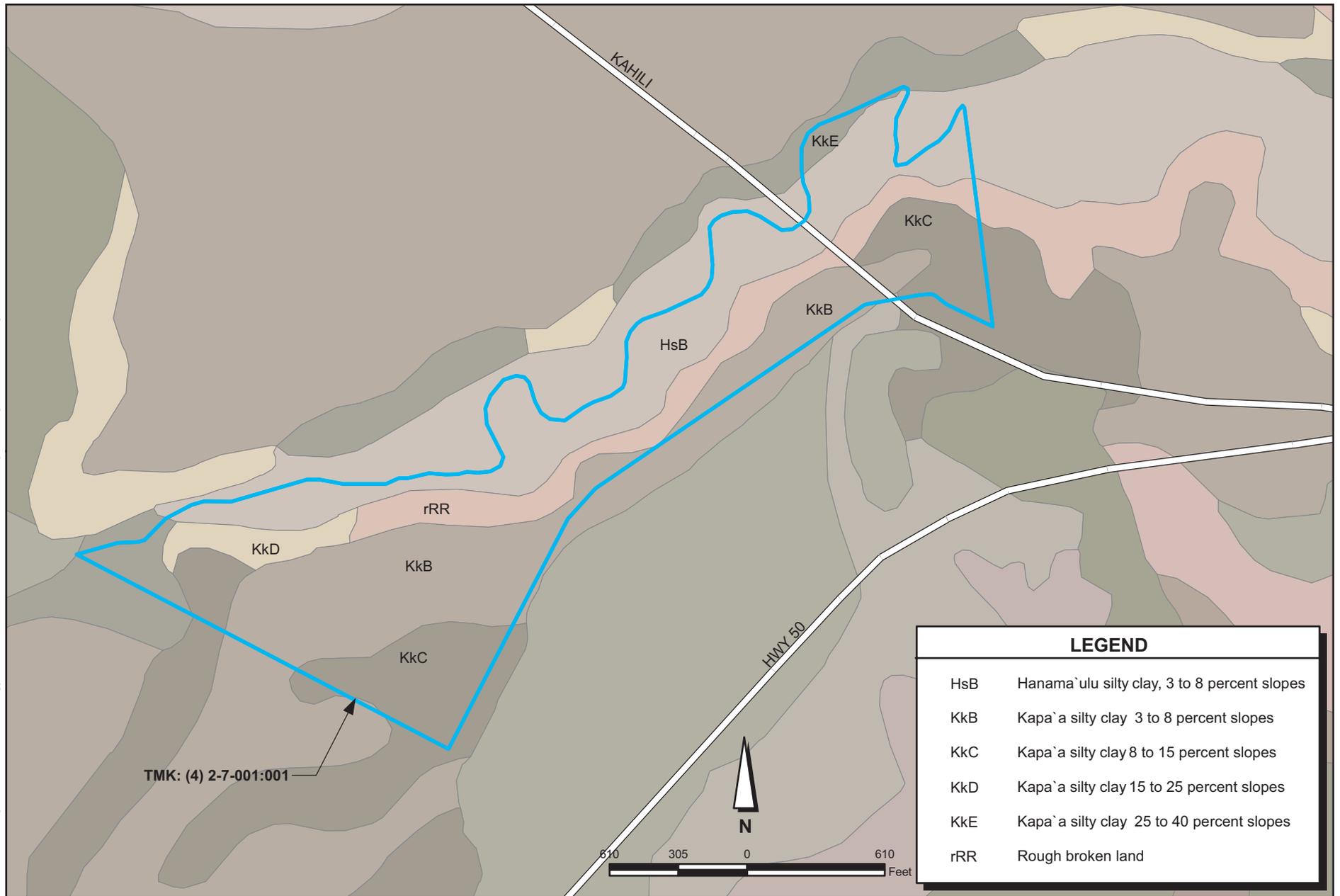
### 3.8 NOISE

The ROI for noise effects is the proposed project area and adjacent areas. Noise is often defined as unwanted sound and is one of the most common environmental issues of concern to the public. A number of factors affect sound, as it is perceived by the human ear. These include the actual level of the sound (or noise), the frequencies involved, the period of exposure to the noise, and changes or fluctuations in the noise levels during exposure.

The loudest sounds the human ear can hear comfortably have one trillion (1,000,000,000,000) times the acoustic energy of sounds the ear can barely detect. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes unwieldy. As a result, a logarithmic unit called decibel (dB) is used to represent the intensity of sound. This representation is called a sound pressure level (SPL).

Because of the logarithmic nature of the decibel unit, SPLs cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. Thus, for example, in the addition of noise levels from two comparable noise sources, the resulting SPL increases by 3 dB, regardless of the initial sound level (60 dB + 60 dB = 63 dB, 80 dB + 80 dB = 83 dB). Moreover, in the addition of noise levels from two incomparable noise sources, the resulting SPL will be dominant from the noisier source (80 dB + 60 dB = 80 dB).

Since the human ear cannot perceive all pitches or frequencies equally well, these measures are adjusted or weighted to compensate for the human lack of sensitivity to low-pitched and high-pitched sounds. This adjusted unit is known as the decibel (A-weighted scale) (dBA). The A-weighted network de-emphasizes both very low- and very high-pitched sounds, so the measured levels correlate well with the human perception of loudness.



**Figure 3-1**  
**Soil Classification Map**  
**Agriculture Biomass-to-Energy Facility, Kōloa, Kaua`i**  
**Environmental Assessment**



Human response to changes in noise levels depends on a number of factors, including the quality of the sound, the magnitude of the changes, the time of day at which the changes take place, whether the noise is continuous or intermittent, and the individual's ability to perceive the changes. Human ability to perceive changes in noise levels varies widely with the individual, as does response to the perceived changes. Generally, changes in noise levels of less than 3 dBA will barely be perceptible to most listeners, whereas a 10 dBA change normally is perceived as a doubling (or halving) of noise levels. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels.

### Noise Ordinance

The State of Hawai'i has adopted specific noise control ordinance in its noise control rules. For stationary noise sources, the rules define the maximum permissible sound levels in dBA (see Table 3-1) and these levels were further used as the evaluation references to determine noise effects with potential to result from proposed facility operations on the surrounding neighborhood areas.

**Table 3-1: Maximum Permissible Sounds Levels in dBA**

Zoning District	Daytime (7 am – 10 pm)	Nighttime (10 am – 7 pm)
Class A (residence, public space, etc.)	55	45
Class B (multi-family dwelling, apartment, commercial, etc.)	60	50
Class C (agriculture, country, industrial, etc.)	70	70

Source: HAR, Title 11, Chapter 46.

### Typical Existing Ambient Noise Conditions

Typical ambient noise levels are summarized in Table 3-2. Given the characteristics of the land uses around the proposed project site, it can be assumed that the likely ambient noise levels in the proposed project-related neighborhood would be around 40–50 dBA during daytime and 30–40 dBA during nighttime, below the maximum permissible sound levels.

**Table 3-2: Noise Levels of Common Sources**

Sound Source	SPL (dBA)
Air Raid Siren at 50 feet	120
Maximum Levels at Rock Concert (Rear Seats)	110
On Platform by Passing Subway Train	100
On Sidewalk by Passing Heavy Truck or Bus	90
On Sidewalk by Typical Highway	80
On Sidewalk by Passing Automobile	70
Typical Urban Area	60–70
Typical Suburban Area	50–60
Quiet Suburban Area at Night	40–50
Typical Rural Area at Night	30–40

Source: Cowan 1994, Egan 1988

### 3.9 SAFETY AND HEALTH

The assessment of safety and health considers activities, occurrences, or operations that have the potential to affect the safety and health of workers or the safety and health of the public, or both.

**Workers.** Workers are persons involved directly with proposed facility construction and operational activities. The ROI for workers includes the proposed facility itself with its associated staging, sorting, loading, chipping, or handling area, and the areas adjacent to the proposed project area. Health and safety issues concerning workers include, but are not limited to, heavy equipment operation, traffic, heat exposure, dust, and noise. Dust and noise are addressed in more detail in the air resources and noise sections of this report.

**Public.** Members of the public are persons who are not workers and who may be near the proposed facility activity areas. The ROI for the public include the areas immediately adjacent to the site, any chipping or handling area, and roads adjacent to the proposed project area. Safety and health issues impacting the public include, but are not limited to, exposure to construction, and chipping and loading activities (i.e., noise pollution, potential fugitive dust exposure, traffic).

### 3.10 SOCIOECONOMICS

This section summarizes the demographic and income characteristics of residents in the vicinity of the proposed project area. Data summarized in Table 3-3 are taken from the 2000 U.S. Census (U.S. Census Bureau 2004). Census data are used to describe the existing social and economic characteristics of the ROI and to determine whether any minority or low-income population may experience disproportionately high adverse impact from the proposed action or alternatives. The ROI for socioeconomics is Omao Census Designated Place (CDP), Kaua'i, Hawai'i, in which the proposed project area is located in close proximity to. Data for the County of Kaua'i is presented for the purpose of comparison.

**Table 3-3: Demographic and Income Characteristics**

Characteristic	County of Kaua'i		Ōmāo CDP	
	No.	Percent	No.	Percent
Population	58,463		1,221	
<b>Ethnicity</b>				
Asian	21,042	36.0	348	28.5
Pacific Islander	5,334	9.1	70	5.7
Black or African American	177	0.3	2	0.2
Hispanic or Latino	4,803	8.2	157	12.9
Caucasian	17,255	29.5	483	39.6
Other Ethnicity	505	0.9	16	1.3
More than one Ethnic Group	13,938	23.8	291	23.8
<b>Income</b>				
Median Family Income	\$51,378		\$61,042	
Per capita income	\$20,301		\$20,175	
<b>Poverty Status in 1999</b>				
Families below poverty level	1,224	8.4	17	6.0
Individuals below poverty level	6,085	10.5	122	10.0

Source: U.S. Census Bureau, 2000 Census of Population and Housing (U.S. Census Bureau 2004)

In 2000, the County of Kaua'i reported 58,463 residents and the Ōmāo CDP reported 1,221 residents. The population within the CDP is 28.5% Asian, 5.7% Pacific Islander, 0.2% Black or African American, 12.9% Hispanic or Latino, and 39.6% Caucasian, compared to 36.0% Asian, 9.1% Pacific Islander, 0.3% Black or African American, 8.2% Hispanic or Latino, and 29.5% Caucasian; within the general population of the Island of Kaua'i.

Median family income and per capita income are \$61,042 and \$20,175, respectively within the CDP. Both the percent of families below the poverty level (6.0%) and the percent of individuals below the poverty level (10.0%) are slightly lower within the CDP when compared to the County of Kaua'i.

The current unemployment rate for the County of Kaua'i is 2.2% (<http://www.hiwi.org>).

### 3.11 TRANSPORTATION

The ROI for transportation is the proposed project area and adjacent roadways. Access to the proposed project area is from Kaumuali'i Highway, north on Old Government Road, through the adjacent parcel identified as TMK (4) 2-8-001-003, which is comprised of pastureland (see Figure 1-3). A dirt road provides access to the subject property via a secured gate from Kaumuali'i Highway.

### 3.12 UTILITIES AND INFRASTRUCTURE

The ROI for utilities and infrastructure is the proposed project area. Existing utilities within the project area include KIUC power lines and utility poles. There currently is no existing infrastructure within the proposed project area.

### 3.13 VISUAL RESOURCES

Visual resources are the aggregate of characteristic features imparting visually aesthetic qualities to a natural, rural, or urban environment. The ROI for visual resources is the proposed project area. This resource is assessed to determine whether the proposed action and alternative would be compatible with the existing landscape and development plans for the area.

Land uses in the vicinity of the proposed project include agricultural land, open space, and minimal residential areas. Land mauka of Kaumuali'i Highway is undeveloped and heavily vegetated with trees and ground cover. This dense vegetation obscures potential view planes or scenic vistas in the direction of the ocean, and Kaumuali'i Highway is not visible from the proposed project area. Current site conditions are presented in the photo log included in Appendix F.

### 3.14 WATER RESOURCES

This section describes the availability and quality of water resources, including surface water and groundwater. Surface water includes lakes, perennial/intermittent streams, and drainage ways. Groundwater includes water present in aquifers (perched, unconfined, confined, or artesian). The ROI for water resources includes the surface water bodies, streams, and drainage features identified within or downgradient of the proposed project area and the underlying aquifer.

**Surface Water.** Generation of surface water typically begins in the mountains as rainfall. As surface water proceeds downgradient it collects in streams and gulches. A portion infiltrates through the ground surface and streambeds, recharging the underlying aquifer. Potential issues arise if the course or carrying capacity of gulches and streams are changed, as this can cause flooding or scour damage and degradation of downstream water quality.

Surface waters do occur within the proposed project area and are predominantly associated with past and present agricultural activities including the Kōloa Ditch. Weoweopilau Stream also occurs

within the proposed project area in the northwest portion of the parcel which is classified as a Class 2 Inland Water per HAR 11-54-3(b)(2). The Kōloa Ditch is not considered to be waters of the U.S.

**Groundwater.** Groundwater beneath the proposed project area occurs in one aquifer within the Kōloa Aquifer System of the Līhu'e Aquifer Sector. The aquifer is identified with the aquifer code 20102212. The aquifer is classified as a high level aquifer containing fresh water not in contact with seawater that is unconfined in dike compartments. The groundwater status is reported as potentially usable for drinking water purposes. The groundwater within this aquifer is described as fresh and irreplaceable with a high vulnerability to contamination (Mink and Lau 1992).

The State of Hawaii Underground Injection Control (UIC) program was established by the DOH Safe Drinking Water Branch to protect the quality of underground sources of drinking water. As part of this program, a UIC line was delineated on USGS maps for each island. Groundwater inland of this line is considered by the State to be a potential source of drinking water. Groundwater in areas seaward of this line are not considered potential drinking water sources. A review of the UIC map for the Island of Kaua'i, which includes the area of the subject property, indicates the subject property is located approximately 5 miles inland of the UIC line.

## 4.0 ENVIRONMENTAL CONSEQUENCES

Project-related effects, both adverse and beneficial, include primary, secondary, and cumulative effects. Primary effects or direct impacts are caused by the action and occur at the same time and place. Secondary effects or indirect impacts are caused by the action and occur later in time or are farther removed in distance, but are still reasonably foreseeable. Cumulative effects refer to impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor yet collectively significant actions taking place over a period of time.

Effects of the proposed project are divided into short-term and long-term effects. Short-term effects are related to construction activities. Long-term effects refer to the effects caused from implementation of the proposed action, and are longer in duration. Anticipated environmental effects of the proposed action and no-action alternative, cumulative impacts, and proposed mitigation measures, where applicable, are summarized below.

### 4.1 AIR QUALITY

**Proposed Action.** Under the Proposed Action, air emissions would be produced during construction of the plant and from plant operations.

The Proposed Action would result in short-term impacts to air quality from emissions generated during construction of the plant. Impacts are expected to be primarily from fugitive dust associated with clearing and grading of the land, and construction vehicles traveling on unpaved surfaces at the construction site. In addition, during construction mobile emissions sources such as construction vehicles and equipment and private autos used to access the work area could contribute to air pollution. However, construction effects on dust emissions would be temporary and would be controlled using standard management practices (i.e., routine sweeping and wetting). In addition, as discussed below under potential noise impacts, Green Energy will utilize new construction equipment as much as possible since new engines are generally cleaner than older equipment. In addition the tree planting and other landscaping features of the project will also mitigate potential fugitive construction dust. Consequently, construction impacts would be short-term in nature and will be mitigated.

The proposed biomass-to-energy plant would include the following main sources of air pollutant emissions:

- Biomass gasifiers/boilers/electrostatic precipitator
- Evaporative cooler
- Standby diesel generator
- Emergency diesel fire pump engine
- Fuel and ash storage and handling systems.

Regulated pollutants that would be emitted by plant activities include CO, NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, and VOCs. The only air emissions produced by the fuel and ash handling systems would be fugitive dust which would be controlled by a water sprinkler system. The estimated emissions from operation of each of the remaining systems and the total maximum emission of regulated air pollutants for the facility are shown in Table 4-1.

**Table 4-1: Maximum Facility Emissions**

Devices	Maximum Annual Emissions (tpy)				
	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	PM <sub>10</sub> /PM <sub>2.5</sub>
Boilers	108.5	44.3	135.3	12.9	15.0
Evaporative Cooler	—	—	—	—	0.66
Diesel Generator	0.85	0.02	0.06	0.0014	0.003
Fire Pump Engine	0.037	0.0012	0.015	0.0007	0.003
<b>TOTALS</b>	<b>109.4</b>	<b>44.3</b>	<b>135.4</b>	<b>12.9</b>	<b>15.7</b>

As shown in Table 4-1, the plant would emit 109.4 tpy of NO<sub>x</sub> and 135.4 tpy of CO; therefore, it would be a major source as defined by HAR because it would emit more than 100 tpy of a criteria pollutant.

HAPs emissions from the plant would be 15.7 tpy from the gasifiers/boilers and less than 0.1 tpy from the emergency diesel engines. Therefore, the plant would not be a major source of HAPS emissions.

Because it would be a major source, the plant would be defined as a covered source by HAR Chapter 11-60.1. The CSP Application is provided in Appendix C. In addition, the plant is subject to NSPS under § 111 of the CAA that govern small industrial, commercial, and institutional steam generating units and stationary internal combustion engines. Sources subject to NSPS are also defined by HAR as covered sources. Therefore, the plant would require a covered source permit from the DOH. New covered sources must apply Best Available Control Technology (BACT) for any pollutants whose emissions are significant. Significant emission thresholds are defined in HAR Chapter 60.1 § 1. The maximum annual emissions of NO<sub>x</sub>, SO<sub>2</sub>, PM/PM<sub>10</sub>, and CO from the project exceed the significance threshold and BACT would be used to limit emissions of these pollutants from the boilers.

The plant is not subject to PSD review because the maximum emissions of the proposed gasifiers/boilers would not exceed the 250 tpy PSD applicability thresholds (Table 4-2).

**Table 4-2: PSD Applicability**

Pollutant	Maximum Annual Emissions from the Gasifiers (tpy)	Major Stationary Source Threshold for the Gasifiers (tpy)	Maximum Annual Emissions from the Facility (tpy)	Major Stationary Source Threshold for the Facility (tpy)	PSD Review Required?
NO <sub>x</sub>	1.8	100	109.4	250	No
SO <sub>2</sub>	1.5	100	44.3	250	No
CO	46.8	100	135.4	250	No
VOC	2.0	100	12.9	250	No
PM <sub>10</sub> /PM <sub>2.5</sub>	2.0	100	15.7	250	No

Ambient air quality modeling was conducted to determine the impact from operation of the plant on ambient air quality. Current background concentration of criteria pollutants and worse case dispersion conditions were used to determine the worst case ground level impacts. The results of modeling are presented in Table 4-3. Because emissions of CO and PM<sub>10</sub> may be higher during gasifier and boiler start-up than during normal operations, ambient air quality modeling was also conducted boiler start-up (Table 4-4). The results of ambient air quality modeling indicate that air emissions from the plant would not cause or contribute to an exceedance of any ambient air quality standard (AAQS).

**Table 4-3: Modeled Maximum Project Impacts**

Pollutant/Averaging Time	Proposed Project Sources ( $\mu\text{g}/\text{m}^3$ )	Background ( $\mu\text{g}/\text{m}^3$ )	Total Impact ( $\mu\text{g}/\text{m}^3$ )	State Standard ( $\mu\text{g}/\text{m}^3$ )	Federal Standard ( $\mu\text{g}/\text{m}^3$ )
NO <sub>2</sub> – annual	19.2	5.7	25	70	100
SO <sub>2</sub>					
3-hr	95.1	39.0	134	1,300	1,300
24-hr	54.9	10.5	65	365	365
annual	9.9	2.7	13	80	80
CO					
1-hr	239.7	2,625	2,865	10,000	40,000
8-hr	134.0	1,222	1,356	5,000	10,000
PM <sub>10</sub>					
- 24-hr	17.2	34	51	150	150
- annual	3.8	16	20	50	50
PM <sub>2.5</sub> <sup>a,b</sup>					
24-hr	17.2	11	28	--	35
- annual	3.8	4.2	8	--	15

Note:

<sup>a</sup> All combustion PM<sub>10</sub> is assumed to be in the PM<sub>2.5</sub> size range so PM<sub>10</sub> and PM<sub>2.5</sub> impacts are equal.

<sup>b</sup> In a 1997 memo to the EPA Regional Directors, John Seitz, Director of EPA Office of Air Quality Planning and Standards, indicated that compliance with the federal PM<sub>2.5</sub> NAAQS for both new source review (NSR) and PSD purposes is established through compliance with the PM<sub>10</sub> NAAQS, rather than through direct permitting for PM<sub>2.5</sub>. The applicability of this guidance was reaffirmed in the February 9, 2006, Advance Notice of Proposed Rulemaking for transition to the new 24-hour PM<sub>2.5</sub> standard. Therefore, the comparison with the PM<sub>2.5</sub> standards is shown here for information only.

**Table 4-4: Modeled Maximum CO and PM<sub>10</sub> Project Impacts during Boiler Start-Up**

Pollutant/Averaging Time	Proposed Project Sources ( $\mu\text{g}/\text{m}^3$ )	Background ( $\mu\text{g}/\text{m}^3$ )	Total Impact ( $\mu\text{g}/\text{m}^3$ )	State Standard ( $\mu\text{g}/\text{m}^3$ )	Federal Standard ( $\mu\text{g}/\text{m}^3$ )
CO					
1-hr	5,474	2,625	2,865	10,000	40,000
8-hr	756	1,222	1,356	5,000	10,000
PM <sub>10</sub>					
- 24-hr	15.4	34	49	150	150
PM <sub>2.5</sub> <sup>a,b</sup>					
24-hr	15.4	11	26	--	35

Notes:

<sup>a</sup> All combustion PM<sub>10</sub> is assumed to be in the PM<sub>2.5</sub> size range so PM<sub>10</sub> and PM<sub>2.5</sub> impacts are equal.

<sup>b</sup> In a 1997 memo to the EPA Regional Directors, John Seitz, Director of EPA Office of Air Quality Planning and Standards, indicated that compliance with the federal PM<sub>2.5</sub> NAAQS for both NSR and PSD purposes is established through compliance with the PM<sub>10</sub> NAAQS, rather than through direct permitting for PM<sub>2.5</sub>. The applicability of this guidance was reaffirmed in the February 9, 2006, shown here for information only.

The major sources of air emissions in the county are mobile sources (such as on- and off-road vehicles), power and heat generation, industrial processes, and the burning of solid waste. The air emissions from the Green Energy Hawai'i project will be a very small contribution to total emissions in the county. Table 4-5 presents a comparison of the major sources of air emissions on Kaua'i when compared with Green Energy's projected emissions that is visually presented in Appendix G.

**Table 4-5: Inventory Comparison Table**

Emissions Source	Emissions, tons per year				
	CO	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>
Fuel combustion	1,712	3,467	1,425	1,239	1,874
Petroleum and Related Industries	3	6	3	2	9
Other Industrial Process	17	12	46	38	1
Waste Disposal and Recycling	212	13	89	82	2
Mobile Sources	17,046	2,633	120	100	179
Misc. Other Combustion	568	12	2,580	489	3
Green Energy Hawaii	135.4	109.4	15.7	15.7	44.3
	Green Energy Hawai'i as Percentage of Total Emissions in Kaua'i County				
	CO	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>
	0.7%	1.7%	0.4%	0.8%	2.1%

**No-Action Alternative.** Under the No-Action Alternative, there would be no change from current conditions. No air emissions from construction and operation of the biomass-to-energy plant would occur. No significant impacts to air quality would be expected.

**Mitigation Measures – Construction Activities.** Construction activities would be conducted in accordance with State of Hawai'i air pollution control regulations (HAR Title 11, Chapter 60.1) and would employ the proper administrative and engineered controls to reduce air emissions. The following dust control measures would be implemented:

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

All activities would comply with the provisions of HAR Chapter 11-60.1-33 on Fugitive Dust. Construction vehicles would either remain on-site or be scheduled to arrive and depart the project site during non-peak traffic hours, to reduce vehicle emissions. It is anticipated that EPA and DOH AAQS would not be exceeded during construction activities.

**Mitigation Measures – Operational Activities.** Biomass plants by their nature emit lower levels of several pollutants associated with fossil fuels such as diesel. However, to further reduce the particulate emissions from the plant, Green Energy would utilize an ESP or Electrostatic Precipitator to be designed into the system. The ESP is considered to be one of the most efficient processes for removing particulates from the exhaust stream. The ESP is capable of collecting 95% or better of the particulates in the exhaust stream. Implementing the ESP as a mitigation measures would assist in further reducing emissions.

Beyond the air emissions noted above, solid waste by-products in the form of toxic ash would not be found. In fact, the non-toxic wood ash resulting from the process represents about 1.5% of the original feedstock tonnage introduced into the system, and would be used as a fertilizer for its tree plantations. This outstanding "closed loop" application demonstrates Green Energy's ambition to be an outstanding sustainable energy provider in an environmentally friendly way.

## 4.2 BIOLOGICAL RESOURCES

**Proposed Action.** Per consultation with the Oahu and Kaua'i DOFAW, two protected seabird species, the Newell's shearwater and the Hawaiian petrel, may occur in the vicinity of the proposed project site. Potential adverse impacts to these species, including injury or death, may result from attraction to outdoor lights. Impacts to these species would be minimized through incorporation of DOFAW's recommendations on outdoor lighting (see Mitigation Measures below). With the implementation of the outdoor lighting recommended by the DOFAW, the impacts to migratory seabirds would be mitigated and no significant adverse impacts to listed seabirds would be expected.

**No-Action Alternative.** Under the no-action alternative, the agriculture biomass-to-energy facility would not be developed and there would be no change to the biological resources of the project area. Therefore, no biological impacts are anticipated with implementation of the no-action alternative.

**Mitigation Measures.** The Newell's shearwater and Hawaiian petrel are migratory seabirds. Migratory seabirds can become attracted to outdoor lighting and as a result often fall to the ground where they are injured or killed if not rescued by humans. To minimize and avoid risk of causing a "take" of listed seabirds, the proposed project would follow the following design principles:

- All outdoor lights would be fully shielded or full cut-off light styles;
- Uplighting would be avoided;
- Use of an amber colored or other color (such as blue or green) filters or bulbs would be used to assist in decreasing risk of seabird attraction;
- The painting of buildings and other facilities white or light reflecting colors would be avoided; earth tones would be utilized;
- Green Energy and or its consultants would consult with DOFAW and U.S. Fish and Wildlife Service prior to finalizing lighting selections; and
- Motion detection-activated lights may be utilized, as recommended by DOFAW, to prevent lights from being on for extended periods of time.

Outdoor wildlife lighting recommended to be utilized at the project site is presented in Appendix B in the letters received from DOFAW. Walkway/path lighting would consist of low profile bollard lights with louvers. Street lighting and parking lighting would consist of full cut-off low pressure sodium streetlights and fully shielded National Electrical Manufacturer's Association (NEMA) lights. It is recommended that during construction and operation architectural lighting such as: recessed can with baffles, glare busters, canister downlight, "eyelid" step light, downlight, and louvered step lights be utilized. The lighting would be designed in multiple switching of lights, so that areas not being used are not illuminated. This includes the loading and chipping areas as well, which may only be active two to three hours per 24 hour time period. Lights would also be extinguished to help protect seabirds.

Unacceptable lighting which would be avoided includes:

- Globe fixtures,
- Unshielded carriages,

- Wallpacks, acorn fixtures,
- Drop-Lens/Sag-Lens with exposed bulbs,
- Unshielded streetlights,
- Nautical Wall Sconce,
- Unshielded high intensity floodlights,
- NEMA security lights,
- Partially shielded floodlights,
- Shielded security lights, and
- Drop-Lens canopy lights.

Design principles would also avoid locating bright lights near utility wires or other objects that could be difficult for birds to see at night. Further information and photos depicting acceptable and unacceptable lighting can be found in Appendix B. If a shearwater falls as a result of flying into facility buildings or utility wires, the bird would be collected as soon as possible and taken to the nearest shearwater aid station located at county fire stations.

### 4.3 CULTURAL RESOURCES

**Proposed Action.** The proposed project would include some minor excavation at the facility site as well as an approximate 4-foot wide by 2-foot deep excavation corridor for the Kōloa Ditch transport pipeline. However, since the land that would be utilized for the proposed facility as well as the pipeline alignment has historically been utilized for the cultivation of sugar cane and is heavily disturbed, no adverse impacts on significant archaeological, cultural, or historic sites would be anticipated with the implementation of the proposed action. In addition, based on a record review and several site visits, no significant historic sites occur within the proposed project area. SHPD concurrence that no historic properties would be affected by implementation of the proposed action was received in a letter dated June 8, 2007 (Appendix B).

The cultural impact assessment, including an archival research at the Bishop Museum, consultation with Hawaiian interest groups, and OHA did not yield any results regarding any known cultural practices or properties within the ROI and therefore, no adverse impact to traditional cultural uses in the project vicinity are anticipated. Letters sent and documentation for follow-up are included in Appendix E. The only identified cultural site within the *ahupua`a*, but outside of the project area, was Kanehaule heiau, at Kaunuieie, Kōloa, which was documented as being a destroyed heiau where rites of circumcision were preformed (Bernice P. Bishop Museum Bulletin 80-83). It was also documented that in 1927 the mauka lands of the Kōloa Plantation planted by the Knudsen Brothers proved unsuitable for the growing of sugar cane with profit and their venture definitively abandoned (Alexander 1985).

**No-Action Alternative.** Under the no-action alternative, the agriculture biomass-to-energy facility would not be implemented and there would be no change to the cultural resources of the project area. Therefore, no cultural impacts are anticipated with implementation of the no-action alternative.

**Mitigation Measures.** Although no archaeological features are believed to be present at the proposed project area, there is a possibility that historic properties could be present below the ground surface. Based on comments from the Commission, a qualified archaeologist would be present during the construction of the facility during any ground disturbing work to monitor the subsurface for any archaeological artifacts or remains. If archaeological or human remains are inadvertently discovered during construction activities, the construction contractor would stop all construction activities and immediately notify the SHPD prior to the continuation of activities. In addition, should iwi kupuna or Native Hawaiian cultural or traditional deposits be found during ground disturbance, work would cease and the appropriate agencies would be contacted pursuant to

applicable law. Based on comments received from the OHA and the Commission, landscaping with native or indigenous species would be implemented during the construction phase of the project using seed bank/plant stock from the *ahupua'a* to the best extent possible. This would assist in further blending the facility into the natural environment and reducing visual impacts, as well as serving to create a more Hawaiian sense of place.

#### 4.4 GEOLOGY AND SOILS

**Proposed Action.** Only short-term construction-related impacts to soils and geology are anticipated with implementation of the proposed action. Clearing, grading, excavating, and recontouring of soils would remove vegetation and expose soil, leaving areas vulnerable to erosion. However, these activities would be of limited duration and impact, and would be mitigated through implementation of site-specific Best Management Practices (BMPs). Therefore, no significant impacts to soils or geology are anticipated with implementation of the proposed action.

**No-Action Alternative.** Under the no-action alternative, no demolition or construction activities would occur at the project area. Therefore, no geological or soil impacts are anticipated with implementation of the no-action alternative.

#### 4.5 HAZARDOUS MATERIALS AND HAZARDOUS WASTE

**Proposed Action – Construction Activities.** Short-term construction-related impacts from hazardous materials and hazardous waste could be possible, but not expected, with implementation of the proposed action. Construction equipment and vehicles contain hazardous materials such as gasoline, diesel, oil, and hydraulic and brake fluids. Accidental release of these materials into the environment could be possible, but not anticipated. Preparation of a hazardous materials spill response plan prior to commencement of construction activities would greatly reduce the likelihood of significant impacts resulting from any spill. No significant long-term impacts are anticipated.

**Proposed Action – Operational Activities.** Power plants use small quantities of chemicals for water treatment as their primary business is the generation of electrical power, not the generation of a product. The three largest amounts of chemicals used would be chemicals found around homes and swimming pools as follows:

- First, bleach would be used to help purify the plant's cooling water;
- Second, muriatic acid would be used to help regenerate the plant's water purifiers; and
- Third, caustic soda would be used in the plant's water purification process.

There are also other specialty chemicals used to help treat the plant's boiler water and cooling water, but the amounts applied are minimal. As such, the majority of chemicals used are fairly common, and the more specialized chemicals are minimal in their use. Additionally, all chemicals would be stored in a double containment arrangement so that if there are any leaks, there are secondary containment vessels to catch the liquids. Per 40 CFR Part 112, the plant would be operated in accordance with a Spill Prevention, Control and Countermeasures (SPCC) Plan which would outline BMPs and spill prevention and containment procedures. No significant long-term impacts are anticipated from the chemicals used in the facility operations.

In addition, the plant would store minor amounts of diesel fuel; the electrical fire pump would have a back-up emergency diesel fire pump containing 25 gallons of diesel, the plant generator would have a back-up emergency diesel generator containing 400 gallons of diesel, and a 500 gallon ConVault tank containing 500 gallons for vehicle fueling. All systems would be self-contained with secondary containment in case of a release. The ConVault tank would have primary/secondary containment, leak monitoring and detection, and spill containment. Therefore, no significant long-term impacts are anticipated from petroleum products used in the facility operations.

Solid waste by-products in the form of toxic ash would not be found; therefore, no hazardous waste would be generated. In fact, the non-toxic wood ash resulting from the process represents about 1.5% of the original feedstock tonnage introduced into the system, and would be used as a fertilizer for its tree plantations. This outstanding "closed loop" application demonstrates Green Energy's ambition to be an outstanding sustainable energy provider in an environmentally friendly way.

**No-Action Alternative.** Under the no-action alternative, the agriculture biomass-to-energy facility would not be developed. No hazardous materials would be transported to or used in the proposed project area. Therefore, no short-term or long-term impacts from hazardous materials are anticipated with implementation of the no-action alternative.

**Mitigation Measures.** Per 40 CFR 112, the plant would be operated in accordance with a SPCC Plan which would outline BMPs and spill prevention procedures. Site-specific BMPs, including procedures for hazardous material storage, handling, and staging; spill prevention and response; waste disposal; and good housekeeping would be developed and implemented by the construction contractor and by the facility operations contractor during construction and operation and maintenance of the proposed facility. BMPs would include items such as storing all chemicals used in 55-gallon drums or other appropriate containers on spill control pallets (plastic "poly-spill" secondary containment pallets); labeling all containers with the name of the chemical, unit number, expiration date, handling instructions, and health or environmental hazards; and establishing a litter control program.

Spill control measures would entail minimization of hazardous materials on the project site, good housekeeping, and rapid spill response in the event of a release. Material management practices shall be used to reduce the risk of spills or other accidental release of materials and substances into the environment. Sorbent materials and hand tools would be stored at each location that chemicals and petroleum products are stored. The following equipment, materials, and supplies would be available at the facility to expeditiously control, contain, and remove spilled material.

- *Sorbent.* Used to absorb small surface spills (25 gallons or less). If the available absorbent cannot contain the entire spill, consider using site soil and contact the referenced cleanup contractor for help in cleaning up the spill.
- *Equipment.* Hand tools, shovels, and site equipment would be available to collect spilled product and to cleanup after the application of absorbent.

In response to *any* spill, the facility personnel would immediately notify his/her supervisor and the supervisor would inspect the spill site. The supervisor would decide on the appropriate means to contain and/or cleanup the spill, and inform the required authorities. The National Response Center Oil Spill Report Form would be completed and submitted to the required authorities following notification.

Inspections of all tanks, containers, valves, and piping would be conducted for evidence of spills or leaks monthly, in accordance with state and federal regulations. Monthly visual inspections would consist of: 1) inspecting exterior surfaces of tanks, pipes, valves and other equipment for leaks and maintenance deficiencies; 2) identifying cracks, areas of wear, corrosion and thinning, poor maintenance and operating practices, excessive settlement of structures, separation or swelling of tank insulation, malfunctioning equipment and structural and foundation weaknesses; and 3) inspecting and monitoring all leak detection systems or other monitoring or warning systems which may be in place at the facility.

Green Energy is committed to preventing discharges to the environment and maintaining the highest standards for SPCC through regular review, updating, and implementation of this SPCC Plan for the facility.

#### 4.6 LAND USE AND OWNERSHIP

**Proposed Action.** No impacts to land use and ownership are anticipated with implementation of the proposed action. Proposed development is consistent with existing agriculture land uses. In addition, the neighboring property owners have provided a Letters of Support for the proposed project (Appendix D).

**No-Action Alternative.** Under the no-action alternative, the agriculture biomass-to-energy facility would not be developed. Therefore, no short-term or long-term impacts to land use or ownership are anticipated with implementation of the no-action alternative.

#### 4.7 NATURAL HAZARDS

**Proposed Action.** The proposed action would result in no adverse impacts for natural hazards.

**No-Action Alternative.** Under the no-action alternative, the agriculture biomass-to-energy facility would not be developed. No significant adverse impacts relative to natural hazards are anticipated with the no-action alternative.

#### 4.8 NOISE

**Proposed Action – Construction Activities.** Impacts on local noise levels during construction activities would include noise from trucks, a crane, a grout mixing machine, sledge hammers, jack hammers, chain saws, and air compressors. Helicopter use to transport materials may also be required. Noise impacts would also vary widely during construction, depending on the activity phase and the specific task being undertaken. However, periods of major activity with greater levels of noise associated with construction of the proposed facility would be relatively short in duration. Moreover, noise sensitive receptors are located at a great distance from the proposed facility construction site. Therefore, the impact from construction activities associated with proposed action would not be significant.

**Proposed Action – Operational Activities.** The proposed facility would process wood chips and other agriculture biomass products as a source of energy to produce electrical power output. It is anticipated that the majority of stationary noise sources at the facility, such as gasifiers, boilers, steam turbines, fork lifts, etc. would be enclosed inside the Energy Plant building and they would have negligible noise effects due to the shielding from this closed door building. However, several pieces of outdoor equipment would likely be utilized on a regular basis for the purposes of 1) material handling using a front end loader and 2) wood chipping using a wood chipper. The wood chipping operations would not be on a set schedule as chipping would need to be on an as-needed basis. As with any biomass-to-energy facility, wood chipping would need to be at any time. As discussed in Section 3.8, with the addition of noise levels from two incomparable noise sources (i.e., indoor sources and outdoor sources), the resulting SPL would be dominant from the noisier sources, i.e., the outdoor front-end loader and chipper in this case.

Based on published typical non-road equipment noise reference levels (Table 4-6), at 50 feet from the source, a front-end loader would generate 80 dBA of noise. For a wood chipper, given the typical size in horsepower rate, it would unlikely result in a level at or greater when compared to a concrete mixer with an 82 dBA emitting noise level. Therefore, it is conservatively assumed that the outdoor continuous noise sources on the proposed project site would involve the operation of one front-end loader with 80 dBA source strength and one wood chipper with 82 dBA strength at the same time. It should be noted, however, that the front-end loader and wood chipper would not really be outdoor continuous noise sources but rather outdoor intermittent noise sources as they would not be run 24 hours a day; further demonstrating the conservative noise analysis.

**Table 4-6: Typical Noise Emission Levels for Construction Equipment**

Type of Equipment	Noise Level at 50 feet (dBA)
Air Compressor	81
Asphalt Spreader (paver)	89
Backhoe	80
Bulldozer	82
Chain Saw	85
Compactor	82
Concrete Pumps	82
Concrete/Grout Pumps	82
Crawler Service Crane (100-Ton)	83
Dump Truck	88
Drill Rigs	88
Excavator	85
Front End Loader	80
Generator	81
Jackhammer (Compressed Air)	85
Lift Booms	85
Pick-Up Trucks	55
Power-Actuated Hammers	88
Roller	74
Street Cleaner	85
Tractor Trailer	84
Water Pump	76
Water Truck	55

Source: DOT 2006b,a

Based on the basic acoustical principles, per doubling distance on a hard and flat surface could achieve approximately a 6 dBA noise reduction. Therefore, the combination of the front-end loader and wood chipper would result in an approximate 45 dBA noise level at the property boundary through a hard and flat surface providing no noise shielding or absorption effects during sound propagation. This predicted conservative level is matching the most stringent permissible sound level (i.e., the 45 dBA nighttime level within a Class A land use area established in the state noise ordinance HAR Title II Chapter 46). Given the conservative approach taken in the calculation, it is expected that the actual noise level resulting from the facility operations would be below 45 dBA. Therefore, the proposed action would unlikely result in a significant noise impact to the surrounding neighborhood located in proximity to the proposed facility.

**No-Action Alternative.** Under the no-action alternative, the agriculture biomass-to-energy facility would not be developed. There would be no change to the existing noise environment; therefore, no noise impacts are anticipated under the no-action alternative.

**Mitigation Measures.** Although the proposed facility would unlikely result in significant noise impacts to the surrounding neighborhood, the proposed action would still include certain noise abatement measures to minimize potential operational noise impacts. To further shield noise from the proposed facility operations, including the operation of the chipper, a landscaped berm would be constructed at the west boundary of the property, built up approximately 5 feet from grade at the south end with the top of the berm remaining consistent and as the ground tapers off, being approximately 12 feet high at the north end. In addition, the location of the chipping operations was moved from the north side of the plant to the south side of the plant to be furthest from the nearest

residences to further reduce any potential noise impacts. Three tree line buffers would also be planted as an additional noise mitigation measure. Figure 4-6 and Figure 4-7 present the proposed tree line buffers. Landscaping with native or indigenous species would also be implemented during the construction phase of the project using seed bank/plant stock from the *ahupua`a* to the best extent possible. This would assist in further blending the facility into the natural environment and reduce noise impacts.

To mitigate short-term equipment noise impacts during construction, standard construction noise specifications that require the contractor to make every reasonable effort to minimize construction noise would be incorporated in the construction plans. Abatement measures and useful construction procedures that would be considered include:

- Providing timely public notice to each affected community of the upcoming construction phasing and activities.
- Mandating that all construction equipment with an internal combustion engine be equipped with a properly maintained muffler.
- Utilizing new construction equipment as much as possible since they are generally quieter than older equipment.
- Eliminating or minimizing impact pile driving operations where possible.

#### 4.9 SAFETY AND HEALTH

**Proposed Action.** Impacts to safety and health relate to worker safety during construction, operation, and maintenance of the proposed facility. Health and safety issues concerning workers include; exposure during operation of construction equipment, traffic, occupational noise, fugitive dust, heavy lifting, slips, trips, and falls while working on uneven terrain, exposure to heat, and biological exposure (bites, stings, and allergens).

**No-Action Alternative.** Under the no-action alternative, the agriculture biomass-to-energy facility would not be developed. Therefore, adverse impacts to public safety and health are not anticipated from implementation of the no-action alternative.

**Mitigation Measures.** The safety and health of workers during construction, operation, and maintenance of the proposed facility would have to comply with OSHA requirements and would be the responsibility of the construction, operation, and maintenance contractors. Mitigation measures addressing air quality at the site and occupational noise exposure are presented in Section 4.1 and Section 4.7, respectively.

#### 4.10 SOCIOECONOMICS

**Proposed Action.** The proposed action would have no significant socioeconomic impact. If anything, there would be a positive impact associated with the generation of employment opportunities (approximately 30 positions). The price of a barrel of oil has risen on average from \$11 in 1998 to \$45 in 2005; an average increase of 22% per year. With this trend not expected to change, the price of renewable energy produced by Green Energy would be significantly less than our dependency on foreign fossil fuel and therefore electricity bill cost-savings would be realized by KIUC members in the long-term. The exact cost savings are not known at this time but would be expected to be significant over time. Monies currently sent off island to foreign countries for approximately 3 million gallons of oil per year would no longer be required. No significant adverse impacts are anticipated from implementation of the proposed action. Therefore, the proposed action is not anticipated to adversely or disproportionately affect a minority or low-income population.

**No-Action Alternative.** No socioeconomic impacts are expected with implementation of the no-action alternative. The no-action alternative should not impact employment, income, or demographics within the ROI.

#### 4.11 TRANSPORTATION

**Proposed Action.** Currently, the only traffic using the Old Government Road is from vehicles associated with the cultivation of Eucalyptus and Albizia trees. Impacts on traffic from the implementation of the proposed action would consist of short-term construction-related vehicles and vehicles associated with the operation of the facility. Access to the plant is via the Old Government Road from Kaumuali'i Highway. Grass and other vegetation will be routinely cut back and maintained to allow maximum visibility at the entrance to the access road. The plant is proposed to be operated and maintained by nine individuals during a 24 hour time period. Operational hours would be 24 hours a day, seven days a week, with one operator per shift, as well as a plant manager and clerical and maintenance staff during the day shift. Each employee is expected to access the plant site once per shift utilizing a car or pickup truck. Approximate shift times would be as follows:

- Evening Shift – 7:00 pm to 7:00 am (One Operator)
- Day Shift – 7:00 am to 7:00 pm (One Operator)
- Day Shift – 8:00 am to 4:30 pm (Plant Manager, Maintenance Staff, and Clerical Staff)

The feedstock transportation network is set up to be as convenient as possible to the feedstock provider while having the least potential for adverse impacts. The plant site itself is located approximately in the center of the tree plantations currently maintained by the feedstock provider. Nearly all of the transportation of the feedstock would be made using existing cane haul roads directly from the tree plantations. Approximately 8 to 10 large 20 yd<sup>3</sup> dump trucks would transport the feedstock to the plant.

A tractor hauling a flatbed trailer would be utilized to move feedstock from the plantations located on the opposite side of Kaumuali'i Highway, to the plant. The crossing of the highway would be at the main cane haul gravel road found immediately west of Huleia ("Halfway") bridge. Of the 3,700 acres to be utilized for the growth of the project biomass, merely 1,400 acres are south of the highway, and therefore would require transport across the road. Approximately 10 trailer loads per day in total would be anticipated for hauling the feedstock. Of these, two to three per day on average would have to cross the highway at the Huleia "Halfway" Bridge. It might be four in one day, and one the next. The crossings would take place during non-peak travel time hours, 10:00 pm to 5:00 am, to have minimal impact on traffic. Safety issues are being discussed with the DOT, such as timing, lighting, etc. Per DOT, the plant driveway would be realigned to make a 90 degree approach to the highway and a no left hand turn sign facing Līhu'e-bound traffic would be placed at the plant entrance. This practice would not be a significant change from what has previously been conducted for sugar cane cultivation and other agricultural-related activities in the area. The wagons would be similar to cane haul trailers, only wider and would haul 20 to 30 tons per trailer of whole logs. No daytime crossings of the highway would be scheduled.

It is not anticipated that the number of vehicles accessing the proposed facility would significantly increase the amount of traffic that travels daily on the Kaumuali'i Highway. In addition, with implementation of the mitigation measures presented below, there would not be any significant impact to traffic and circulation patterns on Kaumuali'i Highway or surrounding neighborhoods.

**No-Action Alternative.** Under the no-action alternative, no construction activities would take place and there would be no change to the transportation resource. No impacts to the transportation resource are anticipated from implementation of the no-action alternative.

**Mitigation Measures.** The local cane haul roads would primarily be used to transport the wood and/or wood chips to the proposed facility for processing and crossings of Kaumuali'i Highway would

be limited to two to four crossings per night during non-peak travel time hours of 10:00 pm to 5:00 am, to have minimal impact on traffic. No daytime crossings of the highway would be scheduled. New entrances for the proposed facility would be constructed off Old Government Road, with some required improvements made to the road to address safety issues. All road surfaces would be designed and paved to allow for proper drainage and to allow transportation of heavy equipment and materials throughout the proposed facility area. Grass and other vegetation would be routinely cut back and maintained to allow maximum visibility approaching the access road and at the entrance to the access road. Safety issues are being discussed with the DOT, such as timing, lighting, etc. Per DOT, the plant driveway would be realigned to make a 90 degree approach to the highway and a no left hand turn sign facing Līhu'e-bound traffic would be placed at the plant entrance. An acceleration/deceleration lane would be constructed on the south side of Kaumuali'i Highway to increase the safety of personnel and other vehicles entering the access road to the facility. All safety mitigations that are developed through ongoing consultation with DOT would be implemented.

#### 4.12 UTILITIES AND INFRASTRUCTURE

**Proposed Action.** As part of the proposed action, a septic system would be installed for on-site treatment and disposal of sanitary waste from the proposed facility's lavatory. The septic system would be designed and maintained in accordance with HAR Title 11 Chapter 62 Wastewater Systems and would, therefore not result in an adverse impact to the environment.

With the development of the proposed facility, Green Energy would be contributing to the electric grid on the Island of Kaua'i by producing a net of 6,400 kW of sustainable energy. Therefore, the implementation of the proposed action would result in a positive impact to utilities and infrastructure on Kaua'i. Additionally, electricity bill cost-savings would be recognized by KIUC members in the long-term.

**No-Action Alternative.** Under the no-action alternative, the agriculture biomass-to-energy facility would not be developed. Kaua'i would continue its complete dependence on imported fossil fuels and would not assist with meeting the mandated RPS, resulting in a negative impact.

#### 4.13 VISUAL RESOURCES

**Proposed Action.** Land mauka of Kaumuali'i Highway is undeveloped and heavily vegetated with trees and ground cover. This dense vegetation obscures potential view planes or scenic vistas in the direction of the ocean, and Kaumuali'i Highway is not visible from the proposed project area. However, a visual assessment was conducted to assess the visual impacts associated with the implementation of the proposed action. Figure 4-1 and Figure 4-2 present a visual presentation from plane view and a visual presentation from a bird's eye view, respectively. With implementation of the mitigation measures presented below, no adverse visual impacts are anticipated with implementation of the proposed action. Additional visual assessment was conducted from Kaumuali'i Highway and is presented in Figure 4-3 through Figure 4-5.

**No-Action Alternative.** Under the no-action alternative, no construction activities would occur and there would be no change to the visual quality of the project area. Therefore, no impacts to visual resources are anticipated under the no-action alternative.

**Mitigation Measures.** Even though the proposed agriculture biomass-to-energy plant would not result in significant visual impacts to the surrounding neighborhood, the proposed action would still include certain visual abatement measures to minimize potential visual impacts. To further shield the public from visually seeing the plant operations, a landscaped berm would be constructed at the west boundary of the property, built up approximately 5 feet from grade at the south end with the top of the berm remaining consistent and as the ground tapers off, being approximately 12 feet high at the north end. Three tree line buffers would also to be planted as an additional visual mitigation measure. Figure 4-7 and Figure 4-7 present the proposed tree line buffers. If deemed necessary, a treeline would also be planted along Kaumuali'i Highway outside of the DOT right-of-way (ROW) to

further reduce the potential for visual impacts. Landscaping with native or indigenous species would be implemented during the construction phase of the project using seed bank/plant stock from the *ahupua`a* to the best extent possible. This would assist in further blending the facility into the natural environment and reducing visual impacts.

#### 4.14 WATER RESOURCES

**Proposed Action.** With implementation of the proposed action, surface water would be utilized from the nearby Kōloa Ditch System from one of two potential ditch tie ins, Alternative #1 and Alternative #2 (Figure 2-3); no other surface water or groundwater would be utilized or impacted. In the event Alternative #1 is selected, Green Energy would request an easement by the DOT for placement of the two irrigation pipes within their ROW which would cross Kaumuali'i Highway under the existing bridge near Maluhia Road. The two 10-inch irrigation pipes would then extend from the agricultural ditch access to the agriculture biomass-to-energy plant. Early consultation with DOT has determined that this alternative is viable.

The Kōloa Ditch System has more than an adequate supply of water for facility use and the water would be returned, thus reused. The average flow of the Kōloa Ditch System is 1,000,000 million gallons every 24-hour period and is regulated manually as water demands fluctuate. The anticipated maximum instantaneous water demand is 286 gallons per minute (gpm), an amount the Kōloa Ditch can maintain. The average water requirement flow rate is expected to be about 60% of the maximum instantaneous amount, or approximately 172 gpm. The maximum instantaneous effluent returned to the Kōloa Ditch would be 100 gpm. The difference between the 286 gpm and 100 gpm is explained by the following:

- Maximum cooling tower evaporation losses = 96 gpm
- Maximum fire protection = 50 gpm
- Maximum domestic sanitation water = 35 gpm
- Maximum plant losses from leaks = 5 gpm

Therefore, the water commitment would be 267,840 gallons per day; a volume that the ditch system can maintain with no adverse impacts.

Samples collected from the Kōloa Ditch indicate that the turbidity of the water is between 2.9 and 10.2 nephelometric turbidity units. The effluent would be treated through an ultrafiltration process such that the turbidity of the effluent water would be as low if not lower than the influent. The effluent tie-in point would be approximately 50 feet downstream of the influent discharge point.

In accordance with facility design specifications, the influent water would be treated prior to use within the facility and the effluent water would be treated prior to being discharged back into the ditch system. Just as in sugar cane days, the water in the ditch system would be accessed to cool the boiler system, and would then be returned to the ditch system after being brought back to within +/- 0.5°F of the original ditch water temperature. The facility design specifications would ensure that the quality of the water discharged back into the ditch system would not have adverse impacts on the overall water quality in the ditch system. The current facility design specifications indicate that the total dissolved solids (TDS) and temperature of the influent (water coming into the facility from the Kōloa Ditch) and the effluent (water being returned to the Kōloa Ditch) would be as follows:

- TDS – influent 85 milligrams per liter (mg/L) and effluent 90 mg/L
- Temperature – influent 75°F and effluent 75.5°F

These influent and effluent operational parameters indicate a slight increase in TDS (+5.0 mg/L) and a nominal increase in temperature (+0.5°F) as a result of use and treatment.

In addition, effluent would be accordance with the priority pollutants, per 40 CFR Part 423, established through consultation with EPA. The priority pollutants that would be monitored with the daily maximum limitations and the effluent values expected from the facility are provided below.

- Oil and Grease – 20 mg/L daily maximum with facility effluent 0.5 mg/L
- pH – 6.0 to 9.0 standard units at all times with facility effluent 6.5 to 9.0 standard units at all times
- Copper, Total – 1.0 mg/L daily maximum with facility effluent 0.02 mg/L
- Iron, Total – 1.0 mg/L daily maximum with facility effluent 0.03 mg/L
- Total suspended solids – 100 mg/L daily maximum with facility effluent > 100 mg/L

All developed design specifications would be coordinated with the DOH CWB and the EPA to ensure that the Kōloa Ditch System water quality would not be adversely impacted with implementation of the proposed action.

Bottled water would be utilized for drinking water. Sanitation water would be either supplied via bottled water or a simple system to partly clarify the ditch water would be constructed.

**No-Action Alternative.** Under the no-action alternative, the agriculture biomass-to-energy facility would not be implemented and there would be no change to the water resources within the project area. Therefore, no impacts to water resources are anticipated with implementation of the no-action alternative.

#### 4.15 CUMULATIVE IMPACTS

Cumulative impacts refer to impacts on the environment that result from the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor yet collectively significant actions taking place over a period of time. Land use in the proposed project vicinity is comprised agricultural land and undeveloped open space. No other past, present, or planned actions associated with these land uses have been identified that would contribute to cumulative impacts for any of the resources considered in this EA. Based on this analysis, no significant cumulative impacts would be anticipated from implementation of either the proposed action or the no-action alternative.





**Figure 4-1**  
**Visual Assessment - Plane View**  
**Agriculture Biomass-to-Energy Facility, Kōloa, Kaua'i**  
**Environmental Assessment**





Figure 4-2  
Visual Assessment - Bird's Eye View  
Agriculture Biomass-to-Energy Facility, Kōloa, Kaua'i  
Environmental Assessment





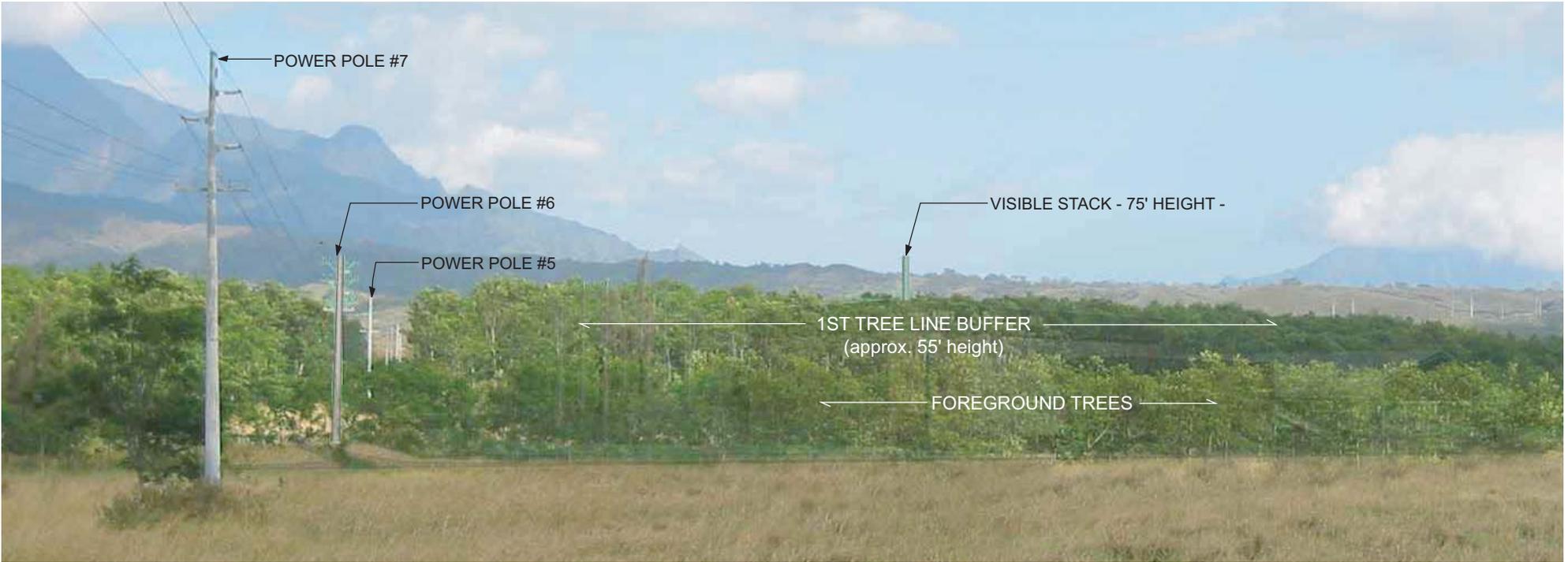
**Figure 4-3**  
**Visual Assessment - Facing Northeast**  
**Agriculture Biomass-to-Energy Facility, Kōloa, Kaua`i**  
**Environmental Assessment**





**Figure 4-4**  
**Visual Assessment - Facing Northwest**  
**Agriculture Biomass-to-Energy Facility, Kōloa, Kauaʻi**  
**Environmental Assessment**





**Figure 4-5**  
**Visual Assessment from Kaunali'i Highway**  
**Agriculture Biomass-to-Energy Facility, Kōloa, Kaua'i**  
**Environmental Assessment**





**Figure 4-6**  
**Proposed Tree Line Buffers**  
**Agriculture Biomass-to-Energy Facility, Kōloa, Kaua'i**  
**Environmental Assessment**





**Figure 4-7**  
**Views of Tree Line Buffers**  
**Agriculture Biomass-to-Energy Facility, Kōloa, Kauaʻi**  
**Environmental Assessment**



## 5.0 FINDINGS AND DETERMINATION

The following sections summarize the significance criteria used to determine whether the proposed action would have a significant effect on the environment (Section 5.1) and the resulting determination (Section 5.2).

### 5.1 SIGNIFICANCE CRITERIA

In accordance with HAR §11-200-12, the proposing agencies have considered every phase of the proposed action, the expected consequences, both primary (direct) and secondary (indirect), and the cumulative as well as the short-term and long-term effects of the action, in order to determine whether the proposed action may have a significant effect on the environment. In making this determination, the proposed action has been evaluated with respect to the significance criteria established in HAR §11-200-12. These significance criteria are summarized below:

- **Involves an irrevocable commitment to, loss or destruction of any natural or cultural resources.** No archaeological features were identified within the proposed project area; therefore, no irrevocable commitment to, loss, or destruction of cultural resources are anticipated with implementation of the proposed action. No impacts to geology and soils, air, water, or biological resources are anticipated with implementation of the proposed action. Therefore, implementation of the proposed action is not anticipated to result in the irrevocable commitment to, loss, or destruction of any natural resource.
- **Curtails the range of beneficial uses of the environment.** There would be a minor change to the current or potential land use within the proposed project area as a result of the proposed action as 6 acres of land currently used as agriculture would be utilized to actually site the facility. Management and use of the surrounding land would remain as agriculture.
- **Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.** The proposed construction is consistent with the State Environmental Policies established in HRS Chapter 344. In addition, the proposed action would provide renewable energy to the Island of Kaua'i, which would assist Kaua'i with obtaining the RPS per HRS Title 15, Chapter 269, Part V that mandates that each electrical utility company shall provide 20% of its net electricity through renewable energy by the end of the year 2020.
- **Substantially affects the economic welfare, social welfare, and cultural practices of the community or State.** No socioeconomic impacts to the community are anticipated with implementation of the proposed action. This proposed project is fully funded by private funds and would actually generate employment opportunities (approximately 30 positions). Therefore, no adverse economic impacts to the State are anticipated; electricity bill cost-savings would be recognized by KIUC members in the long-term. The cultural impact assessment, conducted in compliance with Act 50, has not, to date, identified any current cultural practices within the proposed project area; therefore no adverse impacts to current cultural practices are anticipated with implementation of the proposed action. Based on comments received from the OHA and the Commission, landscaping with native or indigenous species would be implemented during the construction phase of the project using seed bank/plant stock from the *ahupua`a* to the best extent possible. This would assist in further blending the facility into the natural environment and reducing visual impacts, as well as serving to create a more Hawaiian sense of place.
- **Substantially affects public health.** No adverse impacts to public health are anticipated with the implementation of the proposed action. Construction and operation of the proposed facility as well as associated activities would be performed in accordance with all safety standards and pose no threat to public safety.
- **Involves substantial secondary impacts, such as population changes or effects on public facilities.** There would be a minor effect to the traffic along Kaunuaui Highway as

an acceleration/deceleration lane would be constructed on the south side of the highway to increase the safety of entering the access road to the facility. However, since this measure would only increase the safety of drivers, no adverse secondary impacts are anticipated with implementation of the proposed action.

- **Involves a substantial degradation of environmental quality.** No long-term adverse impacts to any resource evaluated in this EA are anticipated with implementation of the proposed action.
- **Is individually limited, but cumulatively has considerable effect on the environment, or involves a commitment for larger actions.** The only concurrent or future actions that have been identified in the vicinity of the proposed project area that would contribute to cumulative impacts for the proposed action would be the use of 2,000 acres of State or other large landowner agriculture lands. However, the use of this land would be closely coordinated with the existing land users and a co-existence plan would be formulated to minimize or avoid any long-term adverse impacts. The activities recommended in the proposed action represent all planned or foreseeable actions deemed necessary for development of the agriculture biomass-to-energy facility within the proposed project area. No additional actions are planned or anticipated.
- **Substantially affects a rare, threatened, or endangered species or its habitat.** Two protected seabird species, the Newell's shearwater and the Hawaiian petrel, may occur in the vicinity of the proposed project site. Potential adverse impacts to these species may result from attraction to outdoor lights. Impacts to these species would be minimized through incorporation of DOFAW's recommendations on outdoor lighting (Section 4.2). Therefore, no significant adverse impacts are anticipated to rare, threatened, or endangered species or its habitat with implementation of the proposed action.
- **Detrimentially affects air or water quality or ambient noise levels.** The proposed action is anticipated to have no long-term adverse impacts to air (Section 4.1) or water quality (Section 4.14). Short-term construction related noise impacts might occur. Noise mitigation measures would be employed during construction to minimize noise levels. In addition, although the proposed facility would unlikely result in significant noise impacts to the surrounding neighborhood, the proposed action would still include certain noise abatement measures to minimize potential operational noise impacts. To further shield noise from the proposed facility operations, a landscaped berm would be constructed at the west boundary of the property, built up approximately 5 feet from grade at the south end with the top of the berm remaining consistent and as the ground tapers off, being approximately 12 feet high at the north end. Three tree line buffers would also be planted as an additional noise mitigation measure. Landscaping with native or indigenous species would also be implemented during the construction phase of the using seed bank/plant stock from the *ahupua'a* to the best extent possible. This would assist in further blending the facility into the natural environment and reduce noise impacts.
- **Affects or is likely to suffer damage by being located in an environmentally sensitive area, such as flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, freshwater, or coastal waters.** The proposed project area is not located in an environmentally sensitive area.
- **Substantially affects scenic vistas and view planes identified in County or state plans or studies.** Siting an agriculture biomass-to-energy facility in an agriculture setting would have some visual impacts. However, to shield the public from visually seeing facility operations, a landscaped berm would be constructed at the west boundary of the property, built up approximately 5 feet from grade at the south end with the top of the berm remaining consistent and as the ground tapers off, being approximately 12 feet high at the north end. Three tree line buffers would also be planted as an additional noise mitigation measure. Figure 4-6 and Figure 4-7 present the proposed tree line buffers. Based on comments received from the OHA and the Commission, landscaping with native or indigenous species would be implemented during the construction phase of the project using seed bank/plant

stock from the *ahupua`a* to the best extent possible. This would assist in further blending the facility into the natural environment and reduce visual impacts.

- **Requires substantial energy consumption.** Implementation of the proposed action is not anticipated to require substantial energy consumption. A significant positive impact would be the actual production of an environmentally friendly renewable energy source.

## 5.2 DETERMINATION

To determine whether the proposed action would have a significant impact on the human, natural, or historic environments, the project, its anticipated direct and indirect effects, and the short-term, long-term, and cumulative impacts have been evaluated in accordance with HAR §11-200-12. In making this determination, the proposed action has been evaluated with respect to the significance criteria established in HAR §11-200-12. Based on the studies performed, discussion of impacts and mitigation measures contained in Section 4.0 of this document, and the evaluation of the significance criteria in Section 5.1, it is anticipated that the proposed project would not have a significant adverse impact on the environment and that the proposed action does warrant an anticipated negative declaration and therefore the preparation of an environmental impact statement is not required. Therefore, a Finding of No Significant Impact has been determined.



## 6.0 CONSULTATION AND COORDINATION

Consultation and coordination with the following agencies and organizations was conducted for the proposed project.

### Federal Agencies

U.S. Department of Agriculture

### State Agencies

Office of the Governor

SHPD

Agribusiness Development Corporation

Department of Business, Economic Development & Tourism

DLNR, DOFAW

DLNR, Land Division

DLNR, Water Commission

DOH CAB

DOH CWB

DOH Environmental Planning Office

DOH HEER

DOH Safe Drinking Water Branch

DOH SHWB

DOH Wastewater Branch

DOT

OHA

### County Agencies

Department of the Mayor

Department of Planning

DPW

Kaua'i Historic Preservation Review Commission

### Other Agencies/Organizations

KIUC

Kōloa Community Association

Kahili Farm LLC

Kahili Adventist School

Kaua'i County Farm Bureau

Garden Isle Resource Conservation & Development, Inc.



## 7.0 LIST OF PREPARERS

Individuals contributing to the preparation of the EA are listed below.

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MS, Ecology and Evolution, University of Illinois, Chicago, 1999  
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Ms. Dricka Brown, Staff Environmental Scientist  
BA, Environmental Science, University of California at Santa Barbara, 2000  
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## 8.0 REFERENCES

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## 9.0 COMMENTS AND RESPONSES

The Draft EA was distributed to state and local agencies, individuals, and organizations for review and comment. The Notice of Availability was published in the Office of Environmental Quality Control's *Environmental Bulletin* and the *Garden Isle* on August 8, 2007 and the 30-day public comment period began on August 8, 2007 and ended September 7, 2007. All comments received were considered and response to all comments prepared. The distribution list for the DEA and dates that comments were received are summarized in Table 9-1. A compilation of the comments received and the responses to the comments are included in Appendix H.

**Table 9-1: Distribution List for the Draft EA**

<b>Distribution List for the DEA</b>	<b>Provided Comments</b>
<b>State of Hawaii Agencies</b>	
Office of Environmental Quality	August 15, 2007
Department of Business, Economic Development, and Tourism	
Department of Health	September 7, 2007
Department of Land and Natural Resources	September 7, 2007
State Historic Preservation Division	
Office of Hawaiian Affairs	September 4, 2007
<b>County of Kauai Agencies</b>	
Department of Planning	September 7, 2007
Department of Public Works	September 17, 2007
Department of Water Supply	
Kauai Historic Preservation Commission	
<b>Public Libraries</b>	
Koloa Public and School Library	
Lihue Regional Library	
Hawaii State Library	
<b>Organizations</b>	
Kauai Island Utilities Cooperative	
Agribusiness Development Corporation	
Hawaiian Mahogany Co., Inc.	
Kahili Farm LLC	September 6, 2007
Kahili Adventist School	
Koloa Community Association	September 6, 2007
<b>Interested Individuals</b>	
Elizabeth Knudsen Toulon	September 6, 2007
Amanda Toulon	
Bob Numbers, Hawai'i Biodiesel Consortium	
Howard Greene, Gay & Robinson, Inc.	
Pat Tummons, Editor, Environment Hawai'i	
Stephen E. S. Smith, Principal, Forestry Management Consultants –Hawai'i	



**Appendix A**  
**Senate Bills and RPS Chapter 269**



**§269-92 Renewable portfolio standards.** (a) Each electric utility company that sells electricity for consumption in the State shall establish a renewable portfolio standard of:

- (1) Ten per cent of its net electricity sales by December 31, 2010;
- (2) Fifteen per cent of its net electricity sales by December 31, 2015; and
- (3) Twenty per cent of its net electricity sales by December 31, 2020.

(b) The public utilities commission may establish standards for each utility that prescribe what portion of the renewable portfolio standards shall be met by specific types of renewable electrical energy resources; provided that:

- (1) At least fifty per cent of the renewable portfolio standards shall be met by electrical energy generated using renewable energy as the source;
- (2) Where electrical energy is generated or displaced by a combination of renewable and nonrenewable means, the proportion attributable to the renewable means shall be credited as renewable energy; and
- (3) Where fossil and renewable fuels are co-fired in the same generating unit, the unit shall be considered to generate renewable electrical energy (electricity) in direct proportion to the percentage of the total heat value represented by the heat value of the renewable fuels.

(c) If the public utilities commission determines that an electric utility company failed to meet the renewable portfolio standard, after a hearing in accordance with chapter 91, the utility shall be subject to penalties to be established by the public utilities commission; provided that if the commission determines that the electric utility company is unable to meet the renewable portfolio standards due to reasons beyond the reasonable control of an electric utility, as set forth in subsection (d), the commission, in its discretion, may waive in whole or in part any otherwise applicable penalties.

(d) Events or circumstances that are outside of an electric utility company's reasonable control may include, to the extent the event or circumstance could not be reasonably foreseen and ameliorated:

- (1) Weather-related damage;
- (2) Natural disasters;
- (3) Mechanical or resource failure;
- (4) Failure of renewable electrical energy producers to meet contractual obligations to the electric utility company;
- (5) Labor strikes or lockouts;
- (6) Actions of governmental authorities that adversely affect the generation, transmission, or distribution of renewable electrical energy under contract to an electric utility company;
- (7) Inability to acquire sufficient renewable electrical energy

due to lapsing of tax credits related to renewable energy  
development;

(8) Inability to obtain permits or land use approvals for  
renewable electrical energy projects;

(9) Inability to acquire sufficient cost-effective renewable  
electrical energy;

(10) Substantial limitations, restrictions, or prohibitions on  
utility renewable electrical energy projects; and

(11) Other events and circumstances of a similar nature. [L  
2001, c 272, §3; am L 2004, c 95, §5; am L 2006, c 162, §5]

[Previous](#)

[Vol05\\_Ch0261-0319](#)

[Next](#)

**Report Title:**

Renewable Energy; Renewable Portfolio Standards; PUC Study

**Description:**

Requires electric utilities to meet a renewable portfolio standard of 15 per cent for 2015 and a goal of 20 per cent for 2020. Directs the PUC to study the feasibility of implementing a rate structure and incentives program to encourage the use of renewable energy. Effective 7/1/2004. (SB2474 HD1)

THE SENATE

TWENTY-SECOND LEGISLATURE,  
2004

STATE OF HAWAII

**S.B. NO.** 2474  
S.D. 3

H.D. 1

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# A BILL FOR AN ACT

relating to renewable energy.

**BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:**

SECTION 1. Building a sustainable future in Hawaii requires the government to take a leadership role in developing programs and initiatives designed to encourage people to live within their means. The legislature finds that a significant impediment to the goal of sustainability is the large imbalance between the amount of goods and services exported from Hawaii in comparison to the amount of goods and services imported to Hawaii. Specifically, the legislature notes that Hawaii exports only \$2,000,000,000 a year in goods and services while importing \$15,000,000,000 a year in goods and services.

Enterprise Honolulu stated that "a key characteristic of a healthy economy is that it exports more than it imports. If payments for imports exceed payments for exports, we have a 'trade deficit.' Just like a negative balance in your checking account impacts your household, if a trade deficit continues too long, the region's quality of life begins a downward slide."

The legislature also finds that Hawaii imports between \$2,000,000,000 and \$3,000,000,000 worth of oil annually. These figures represent a growing dependence on oil imports which allows electric utility companies to enjoy a financial windfall when they sell electricity to Hawaii consumers. The profits realized by electric utility companies lead to the continued importation and dependence on oil.

The legislature finds that economic diversification, import substitution, and export expansion are key to achieving sustainability. Further, import substitution may be achieved by increasing the use of renewable energy resources found in Hawaii, such as wind, solar, ocean thermal, wave, biomass resources, and others enumerated in section 269-91, Hawaii Revised Statutes, as amended by section 2 of this Act.

The purpose of this Act is to encourage import substitution by increasing the use of renewable energy resources found in Hawaii, thereby decreasing the need to import large amounts of oil annually.

In addition, renewable energy resources offer Hawaii important job creation, environmental protection, and energy security benefits. These efforts will contribute to the ultimate success of the State's efforts to develop the infrastructure for a future hydrogen energy economy based upon hydrogen produced primarily from renewable energy.

SECTION 2. Section 269-91, Hawaii Revised Statutes, is amended by amending the definition of "renewable energy" to read as follows:

"Renewable energy" means electrical energy produced by wind, solar energy, hydropower, landfill gas, waste to energy, geothermal resources, ocean thermal energy conversion, wave energy, biomass, including municipal solid waste, biofuels, or fuels derived ~~entirely~~ from organic sources, hydrogen fuels derived ~~entirely~~ from renewable energy, or fuel cells where the fuel is derived ~~entirely~~ from renewable sources. Where biofuels, hydrogen, or fuel cell fuels are produced by a combination of renewable and nonrenewable means, the proportion attributable to the renewable means shall be credited as renewable energy. Where fossil and renewable fuels are co-fired in the same generating unit, the unit shall be considered to produce renewable electricity in direct proportion to the percentage of the total heat value represented by the heat value of the renewable fuels. "Renewable energy" also means electrical energy savings brought about by the use of solar ~~and heat pump~~ water heating~~[-]~~, seawater air conditioning district cooling systems, and solar air conditioning."

SECTION 3. Section 269-92, Hawaii Revised Statutes, is amended to read as follows:

" ~~[+] §269-92 [1]~~ **Renewable portfolio standards.** Each electric utility company that sells electricity for consumption in the State shall ~~[establish]~~ meet a ~~[renewables]~~ renewable portfolio standard ~~[goal]~~ of:

(1) Seven per cent of its net electricity sales by December 31, 2003;

(2) Eight per cent of its net electricity sales by December 31, 2005; ~~[and]~~

(3) ~~[Nine]~~ Ten per cent of its net electricity sales by December 31, 2010 ~~[1]~~;

(4) Fifteen per cent of its net electricity sales by December 31, 2015; and

(5) Twenty per cent of its net electricity sales by December 31, 2020."

SECTION 4. The public utilities commission shall:

(1) Develop and implement a utility rate structure, which may include but is not limited to performance-based ratemaking, by December 31, 2006, to encourage Hawaii's electric utilities to use renewable energy resources found in Hawaii to meet the requirements of section 3;

(2) Gather, review, and analyze empirical data to determine the extent to which this proposed utility rate structure would impact electric utility companies' profit margins and to ensure that these profit margins do not decrease for a period of five years following the implementation of this rate structure;

1. Adopt rules to implement incentives and penalties to assist electric utility companies in meeting the renewable portfolio standards established in section 269-92, Hawaii Revised Statutes, while allowing deviation from the standard in the event of circumstances beyond the control of the utility, which could not have been reasonably anticipated or ameliorated;
2. Using funds from its special fund, contract with qualified technical experts to conduct independent studies to be reviewed by a panel of experts from among such entities as the U.S. Department of Energy, the National Renewable Energy Laboratory, the Electric Power Research Institute, the

University of Hawaii Natural Energy Institute, or other similar institutions with the required expertise. These studies shall:

(A) Make findings and recommendations to the commission as to the capability of Hawaii's electric utility companies to increase the percentage of renewable energy established by the standard in a cost-effective manner, or whether circumstances require that the standard be adjusted. Cost effectiveness and capability shall be assessed by factors such as the impact on consumer rates, utility system reliability and stability, costs and availability of appropriate renewable energy resources and technologies, and other such criteria deemed appropriate by the commission; and

(B) Make findings and recommendations to the commission for projected standards to be set five and ten years beyond the then current standard; and

(5) Based on its own studies and those contracted under paragraph (4), the commission shall report its findings and recommendations, including, in particular, recommendations for new standards and goals, adjustments of percentages, and any proposed legislation, to the legislature no later than twenty days before the convening of the regular session of 2009, and every five years thereafter.

SECTION 5. Statutory material to be repealed is bracketed and stricken. New statutory material is underscored.

SECTION 6. This Act shall take effect on July 1, 2004.

**Report Title:**

Renewable Energy; Renewable Portfolio Standards; PUC Study

**Description:**

Requires electric utilities to meet a renewable portfolio standard of 15 per cent for 2015 and a goal of 20 per cent for 2020. Directs PUC to study the feasibility of implementing a rate structure to encourage the use of renewable energy. Requires DBEDT and DLNR to support and facilitate achievement of the renewable portfolio standards. (SB2474 HD2)

THE SENATE

TWENTY-SECOND LEGISLATURE,  
2004

STATE OF HAWAII

**S.B. NO.** 2474  
S.D. 3

H.D. 2

# A BILL FOR AN ACT

relating to renewable energy.

**BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:**

SECTION 1. Building a sustainable future in Hawaii requires the government to take a leadership role in developing programs and initiatives designed to encourage people to live within their means. The legislature finds that a significant impediment to the goal of sustainability is the large imbalance between the amount of goods and services exported from Hawaii in comparison to the amount of goods and services imported to Hawaii. Specifically, the legislature notes that Hawaii exports only \$2,000,000,000 a year in goods and services while at the same time importing \$15,000,000,000 in goods and services.

Enterprise Honolulu stated that "a key characteristic of a healthy economy is that it exports more than it imports. If payments for imports exceed payments for exports, we have a 'trade deficit.' Just like a negative balance in your checking account impacts your

household, if a trade deficit continues too long, the region's quality of life begins a downward slide."

The legislature finds that Hawaii imports between \$2,000,000,000 and \$3,000,000,000 worth of oil annually. These figures represent a growing dependence on oil imports.

The legislature finds that the key to achieving sustainability lies in economic diversification, export expansion, and import substitution. In the energy context, import substitution may be achieved by increasing the use and development of renewable energy resources found in Hawaii, such as wind, solar, ocean thermal, wave, and biomass resources. In addition, developing Hawaii's renewable energy resources offers important job creation, environmental protection, and energy security benefits.

The legislature further finds that the State should be a strategic partner with the private sector in developing these renewable energy resources, and that the State's willingness and intent to provide relevant and meaningful support for this endeavor should be embedded into public policy.

The purpose of this Act is to decrease Hawaii's need to import large amounts of oil, and increase import substitution, economic efficiency, and productivity, by increasing the use and development of Hawaii's renewable energy resources through a partnership between the State and the private sector.

SECTION 2. Chapter 269, Hawaii Revised Statutes, is amended by adding two new sections to be appropriately designated and to read as follows:

**"§269- State support for achieving renewable portfolio standards.**

(a) The department of land and natural resources and department of business, economic development and tourism shall facilitate the private sector's development of renewable energy projects by supporting the private sector's attainment of the renewable portfolio standards in section 269-92. Both departments shall provide meaningful support in areas relevant to the mission and functions of each department as provided in this section, as well as in other areas the directors of each department may deem appropriate.

(b) The department of land and natural resources shall:

(1) Develop and publish a catalog by December 31, 2006, and every five years thereafter, of potential sites for the development of renewable energy; and

(2) Work with electric utility companies and with

other renewable energy developers on all applicable planning and permitting processes to expedite the development of renewable energy resources.

(c) The department of business, economic development and tourism shall:

(1) Develop a program to maximize the use of renewable energy and cost-effective conservation measures by state government agencies;

(2) Work with federal agencies to develop as much research, development and demonstration funding, and technical assistance as possible to support Hawaii in its efforts to achieve its renewable portfolio standards; and

(3) Biennially, beginning in January 2006, issue a progress report to the governor and legislature.

§269- Renewable portfolio standards study. The public utilities commission shall:

(1) By December 31, 2006, develop and implement a utility ratemaking structure which may include but is not limited to performance-based ratemaking, to provide incentives that encourage Hawaii's electric utility companies to use cost-effective renewable energy resources found in Hawaii to meet the renewable portfolio standards established in section 269-92, while allowing for deviation from the standards in the event that the standards cannot be met in a cost-effective manner, or as a result of circumstances beyond the control of the utility which could not have been reasonably anticipated or ameliorated;

(2) Gather, review, and analyze empirical data to determine the extent to which any proposed utility ratemaking structure would impact electric utility companies' profit margins, and to ensure that these profit margins do not decrease as a result of the implementation of the proposed ratemaking structure;

(3) Using funds from the public utilities special fund, contract with the Hawaii natural energy institute of the University of Hawaii to conduct independent studies to be reviewed by a panel of experts from entities such as the United States

Department of Energy, National Renewable Energy Laboratory, Electric Power Research Institute, Hawaii electric utility companies, and other similar institutions with the required expertise. These studies shall include findings and recommendations regarding:

(A) The capability of Hawaii's electric utility companies to achieve renewable portfolio standards in a cost-effective manner, and shall assess factors such as the impact on consumer rates, utility system reliability and stability, costs and availability of appropriate renewable energy resources and technologies, permitting approvals, impacts on the economy, culture, community, environment, land and water, demographics, and other factors deemed appropriate by the commission; and

(B) Projected renewable portfolio standards to be set five and ten years beyond the then current standards;

(4) Revise the standards based on the best information available at the time if the results of the studies conflict with the renewable portfolio standards established by section 269-92; and

(5) Report its findings and revisions to the renewable portfolio standards based on its own studies and those contracted under paragraph (3), to the legislature no later than twenty days before the convening of the regular session of 2009, and every five years thereafter."

SECTION 3. Section 269-27.2, Hawaii Revised Statutes, is amended by amending subsection (c) to read as follows:

"(c) The rate payable by the public utility to the producer for the nonfossil fuel generated electricity supplied to the public utility shall be as agreed between the public utility and the supplier and as approved by the public utilities commission; provided that in the event the public utility and the supplier fail to reach an agreement for a rate, the rate shall be as prescribed by the public utilities commission according to the powers and procedures provided in this chapter.

In the exercise of its authority to determine the just and reasonable

rate for the nonfossil fuel generated electricity supplied to the public utility by the producer, the commission shall establish that the rate for purchase of electricity by a public utility shall not be ~~[less]~~ more than one hundred per cent of the cost avoided by the utility when the utility purchases the electrical energy rather than producing the electrical energy. ~~[In determining the amount of the payment in relation to avoided cost, as that cost is or shall later be defined in the rules of the commission, the commission shall consider, on a generic basis, the minimum floor a utility should pay, giving consideration not only to the near term adverse consequences to the ultimate consumers of utility provided electricity, but also to the long term desirable goal of encouraging, to the greatest extent practicable, the development of alternative sources of energy.~~

~~Nothing in this subsection shall affect existing contracts between public utilities and suppliers of nonfossil fuel generated electricity.] "~~

SECTION 4. Section 269-91, Hawaii Revised Statutes, is amended as follows:

1. By adding a new definition to be appropriately inserted and to read:

"Cost-effective" means the ability to produce or purchase electric energy or firm capacity, or both, from renewable energy resources at or below avoided costs."

2. By amending the definition of "renewable energy" to read:

"Renewable energy" means electrical energy produced by wind, solar energy, hydropower, landfill gas, waste to energy, geothermal resources, ocean thermal energy conversion, wave energy, biomass, including municipal solid waste, biofuels, or fuels derived [entirely] from organic sources, hydrogen fuels derived [entirely] from renewable energy, or fuel cells where the fuel is derived [entirely] from renewable sources. Where biofuels, hydrogen, or fuel cell fuels are produced by a combination of renewable and nonrenewable means, the proportion attributable to the renewable means shall be credited as renewable energy. Where fossil and renewable fuels are co-fired in the same generating unit, the unit shall be considered to produce renewable electricity in direct proportion to the percentage of the total heat value represented by the heat value of the renewable fuels. "Renewable energy" also means electrical energy savings brought about by the use of solar and heat pump water heating[-], seawater air conditioning district cooling systems, solar air conditioning and ice storage, quantifiable energy conservation measures, use of rejected heat from co-generation and combined heat and power systems excluding fossil-fueled qualifying facilities that sell electricity to electric utility companies, and

central station power projects."

SECTION 5. Section 269-92, Hawaii Revised Statutes, is amended to read as follows:

"~~[+] §269-92 [+~~ **Renewable portfolio standards.** Each electric utility company that sells electricity for consumption in the State shall establish a ~~[renewables]~~ renewable portfolio standard ~~[goal]~~ of:

(1) Seven per cent of its net electricity sales by December 31, 2003;

(2) Eight per cent of its net electricity sales by December 31, 2005; ~~and~~

(3) ~~[Nine]~~ Ten per cent of its net electricity sales by December 31, 2010~~[-]~~;

(4) Fifteen per cent of its net electricity sales by December 31, 2015; and

(5) Twenty per cent of its net electricity sales by December 31, 2020.

The public utilities commission shall determine if an electric utility company is unable to meet the renewable portfolio standards in a cost-effective manner, or as a result of circumstances beyond its control which could not have been reasonably anticipated or ameliorated. If this determination is made, the electric utility company shall be relieved of responsibility for meeting the renewable portfolio standard for the period of time that it is unable to meet the standard."

SECTION 6. Statutory material to be repealed is bracketed

and stricken. New statutory material is underscored.

SECTION 7. This Act shall take effect upon its approval.

**Report Title:**

Public Utilities Commission; Energy

**Description:**

Makes amendments to improve the Renewable Portfolio Standards (RPS) law. (CD1)

THE SENATE

TWENTY-THIRD LEGISLATURE, 2006

STATE OF HAWAII

**S.B. NO.**

3185

S.D. 2

H.D. 2

C.D. 1

# A BILL FOR AN ACT

RELATING TO ENERGY.

**BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:**

SECTION 1. Chapter 269, Hawaii Revised Statutes, is amended by adding four new sections to be appropriately designated and to read as follows:

"§269-A Public benefits fund; authorization. (a) The public utilities commission, by order or rule, may redirect all or a portion of the funds collected through the current demand-side management surcharge by Hawaii's electric utilities into a public benefits fund that may be established by the public utilities commission.

(b) If the public utilities commission establishes a public benefits fund, the surcharge shall be known as the public benefits fee. Moneys in the fund shall be ratepayer funds that shall be used to support energy-efficiency and demand-side management programs and services, subject to the review and approval of the public utilities commission. These moneys shall not be available to meet any current or past general obligations of the State.

§269-B Public benefits fund administrator; establishment. (a) If the public utilities commission establishes a public benefits fund, the

public utilities commission shall appoint a fund administrator to operate and manage any programs established under section 269-A. The fund administrator shall not expend more than ten per cent of the fund in any fiscal year, or other reasonable percentage determined by the public utilities commission, for administration of the programs established under section 269-A.

(b) The fund administrator shall be subject to regulation by the public utilities commission, including pursuant to sections 269-7, 269-8, 269-8.2, 269-8.5, 269-9, 269-10, 269-13, 269-15, 269-19.5, and 269-28, and shall report to the public utilities commission on a regular basis. Notwithstanding any other provision of law to the contrary, the fund administrator shall not be an electric public utility or an electric public utility affiliate.

**§269-C Requirements for the public benefits fund administrator.** (a) Any fund administrator appointed pursuant to section 269-B shall satisfy the qualification requirements established by the public utilities commission by rule or order. These requirements may include experience and expertise in:

(1) Energy-efficient and renewable energy technologies and methods; and

(2) Identifying, developing, administering, and implementing demand-side management and energy-efficiency programs.

(b) The fund administrator's duties and responsibilities shall be established by the public utilities commission by rule or order, and may include:

(1) Identifying, developing, administering, promoting, implementing, and evaluating programs, methods, and technologies that support energy-efficiency and demand-side management programs;

(2) Encouraging the continuance or improvement of efficiencies made in the production, delivery, and use of energy-efficiency and demand-side management programs and services;

(3) Using the energy-efficiency expertise and capabilities that have developed or may develop in the State and consulting with state agency experts;

(4) Promoting program initiatives, incentives, and market strategies that address the needs of persons facing the most significant barriers to

participation;

(5) Promoting coordinated program delivery, including coordination with electric public utilities regarding the delivery of low-income home energy assistance, other demand-side management or energy-efficiency programs, and any utility programs;

(6) Consideration of innovative approaches to delivering demand-side management and energy-efficiency services, including strategies to encourage third party financing and customer contributions to the cost of demand-side management and energy-efficiency services; and

(7) Submitting, to the public utilities commission for review and approval, a multi-year budget and planning cycle that promotes program improvement, program stability, and maturation of programs and delivery resources.

§269-D Transitioning from utility demand-side management programs to the public benefits fund. If the public utilities commission establishes a public benefits fund pursuant to section 269-A, the public utilities commission shall:

(1) Develop a transition plan that ensures that:

(A) Utility demand-side management programs are continued, to the extent practicable, until the transition date; and

(B) The fund administrator will be able to provide demand-side management and energy-efficiency services on the transition date;

(2) Encourage programs that allow all retail electricity customers, including state and county agencies, regardless of the retail electricity or gas provider, to have an opportunity to participate in and benefit from a comprehensive set of cost-effective demand-side management and energy-efficiency programs and initiatives designed to overcome barriers to participation;

(3) Encourage programs, measures, and delivery mechanisms that reasonably reflect current and projected utility integrated resource planning, market conditions, technological options, and

environmental benefits;

(4) Facilitate the delivery of these programs as rapidly as possible, taking into consideration the need for these services and cost-effective delivery mechanisms;

(5) Consider the unique geographic location of the State and the high costs of energy in developing programs that will promote technologies to advance energy efficiency and use of renewable energy and permit the State to take advantage of activities undertaken in other states, including the opportunity for multi-state programs;

(6) Require the fund administrator appointed by the public utilities commission under section 269-B to deliver programs in an effective, efficient, timely, and competent manner and to meet standards that are consistent with state policy and public utilities commission policy; and

(7) Before January 2, 2008, and every three years thereafter, require verification by an independent auditor of the reported energy and capacity savings and incremental renewable energy production savings associated with the programs delivered by the fund administrator appointed by the public utilities commission to deliver energy-efficiency and demand-side management programs under section 269-A."

SECTION 2. Section 269-16, Hawaii Revised Statutes, is amended to read as follows:

**"§269-16 Regulation of utility rates; ratemaking procedures.** (a) All rates, fares, charges, classifications, schedules, rules, and practices made, charged, or observed by any public utility~~[7]~~ or by two or more public utilities jointly~~[7]~~ shall be just and reasonable and shall be filed with the public utilities commission. The rates, fares, classifications, charges, and rules of every public utility shall be published by the public utility in such manner as the public utilities commission may require, and copies shall be furnished to any person on request.

To the extent the contested case proceedings referred to in chapter 91 are required in any rate proceeding [~~in order~~] to ensure fairness and to provide due process to parties [~~which~~] that may be affected by rates approved by the commission, [~~such~~] the evidentiary hearings shall be conducted expeditiously and shall be conducted as a part of

the ratemaking proceeding.

(b) No rate, fare, charge, classification, schedule, rule, or practice, other than one established pursuant to an automatic rate adjustment clause previously approved by the commission, shall be established, abandoned, modified, or departed from by any public utility, except after thirty days' notice to the commission as prescribed in section 269-12(b) [~~to the commission~~], and prior approval by the commission for any increases in rates, fares, or charges. The commission [~~may~~], in its discretion and for good cause shown, may allow any rate, fare, charge, classification, schedule, rule, or practice to be established, abandoned, modified, or departed from upon notice less than that provided for in section 269-12(b). A contested case hearing shall be held in connection with any increase in rates, and [~~such~~] the hearing shall be preceded by a public hearing as prescribed in section 269-12(c) at which the consumers or patrons of the public utility may present testimony to the commission concerning the increase. The commission, upon notice to the public utility, may [~~suspend~~]:

(1) Suspend the operation of all or any part of the proposed rate, fare, charge, classification, schedule, rule, or practice or any proposed abandonment or modification thereof or departure therefrom [~~after~~];

(2) After a hearing, by order [~~regulate~~]:

(A) Regulate, fix, and change all such rates, fares, charges, classifications, schedules, rules, and practices[~~]~~ so that the same shall be just and reasonable [~~and prohibit~~];

(B) Prohibit rebates and unreasonable discrimination between localities[~~]~~ or between users or consumers[~~]~~ under substantially similar conditions[ ~~regulate~~];

(C) Regulate the manner in which the property of every public utility is operated with reference to the safety and accommodation of the public[ ~~prescribe~~];

(D) Prescribe its form and method of keeping accounts, books, and records, and its accounting system[ ~~regulate~~];

(E) Regulate the return upon its public utility property~~[ ]~~;

(F) Regulate the incurring of indebtedness relating to its public utility business~~[ ]~~; and

(G) Regulate its financial transactions; and ~~[do]~~

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(3) Do all things ~~[in addition which]~~ that are necessary and in the exercise of ~~[such]~~ the commission's power and jurisdiction, all of which as so ordered, regulated, fixed, and changed ~~[shall be]~~ are just and reasonable, and ~~[such as shall]~~ provide a fair return on the property of the utility actually used or useful for public utility purposes.

(c) The commission may in its discretion ~~[and]~~, after public hearing ~~[ ]~~ and upon showing by a public utility of probable entitlement and financial need, authorize temporary increases in rates, fares, and charges; provided that the commission shall require by order ~~[require]~~ the public utility to return, in the form of an adjustment to rates, fares, or charges to be billed in the future, any amounts ~~[ ]~~ with interest, at a rate equal to the rate of return on ~~[such]~~ the public utility's rate base found to be reasonable by the commission, received by reason of ~~[such]~~ continued operation ~~[which]~~ that are in excess of the rates, fares, or charges finally determined to be just and reasonable by the commission. Interest on any ~~[such]~~ excess shall commence as of the date that any rate, fare, or charge goes into effect ~~[which]~~ that results in ~~[any such]~~ the excess and shall continue to accrue on the balance of ~~[any such]~~ the excess until returned.

(d) The commission shall make every effort to complete its deliberations and issue its decision as expeditiously as possible and before nine months from the date the public utility filed its completed application; provided that in carrying out this mandate, the commission shall require all parties to a proceeding to comply strictly with procedural time schedules ~~[which]~~ that it establishes. If a decision is rendered after the nine-month period, the commission shall report in writing ~~[report]~~ the reasons therefor to the legislature within thirty days after rendering the decision.

Notwithstanding subsection (c), if the commission has not issued its final decision on a public utility's rate application within the nine-month period stated in this section, the commission ~~[shall]~~, within one month after the expiration of the nine-month period, shall render an interim decision allowing the increase in rates, fares and charges, if any, to which the commission, based on the evidentiary

record before it, believes the public utility is probably entitled. The commission may postpone its interim rate decision for thirty days if the commission considers the evidentiary hearings incomplete. In the event interim rates are made effective, the commission shall require by order ~~[require]~~ the public utility to return, in the form of an adjustment to rates, fares, or charges to be billed in the future, any amounts~~[r]~~ with interest, at a rate equal to the rate of return on ~~[such]~~ the public utility's rate base found to be reasonable by the commission, received under ~~[such]~~ the interim rates ~~[which]~~ that are in excess of the rates, fares, or charges finally determined to be just and reasonable by the commission. Interest on any ~~[such]~~ excess shall commence as of the date that any rate, fare, or charge goes into effect ~~[which]~~ that results in ~~[any such]~~ the excess and shall continue to accrue on the balance of ~~[any such]~~ the excess until returned.

The nine-month period in this subsection shall begin only after a completed application has been filed with the commission and a copy served on the consumer advocate. The commission shall establish standards concerning the data required to be set forth in the application in order for it to be deemed a completed application. The consumer advocate may, within twenty-one days after receipt, object to the sufficiency of any application, and the commission shall hear and determine any ~~[such]~~ objection within twenty-one days after ~~[the same]~~ it is filed. If the commission finds that the objections are without merit, the application shall be deemed to have been completed upon original filing. If the commission finds the application to be incomplete, it shall require the applicant to submit an amended application consistent with its findings, and the nine-month period shall not commence until the amended application is filed.

(e) In any case of two or more organizations, trades, or businesses (whether or not incorporated, whether or not organized in the State of Hawaii, and whether or not affiliated) owned or controlled directly or indirectly by the same interests, the commission may distribute, apportion, or allocate gross income, deductions, credits, or allowances between or among the organizations, trades, or businesses, if it determines that the distribution, apportionment, or allocation is necessary ~~[in order]~~ to adequately reflect the income of any such organizations, trades, or businesses to carry out the regulatory duties imposed by this section.

(f) Notwithstanding any law to the contrary, for public utilities having annual gross revenues of less than \$2,000,000, the commission may make and amend its rules and procedures ~~[which will]~~ to provide the commission with sufficient facts necessary to determine the reasonableness of the proposed rates without unduly burdening the utility company and its customers. In the determination of the reasonableness of the proposed rates, the commission shall:

(1) Require the filing of a standard form application to be developed by the commission. The standard form application for general rate increases shall describe the specific facts that ~~must~~ shall be submitted to support a determination of the reasonableness of the proposed rates, and require the submission of financial information in conformance with a standard chart of accounts to be approved by the commission, and other commission guidelines to allow expeditious review of a requested general rate increase application;

(2) Hold a public hearing as prescribed in section 269-12(c) at which the consumers or patrons of the public utility may present testimony to the commission concerning the increase. The public hearing shall be preceded by proper notice, as prescribed in section 269-12; and

(3) Make every effort to complete its deliberations and issue a proposed decision and order within six months from the date the public utility files a completed application with the commission~~;~~; provided that all parties to the proceeding strictly comply with the procedural schedule established by the commission and no person is permitted to intervene. If a proposed decision and order is rendered after the six-month period, the commission shall report in writing the reasons therefor to the legislature within thirty days after rendering the proposed decision and order. Prior to the issuance of the commission's proposed decision and order, the parties shall not be entitled to a contested case hearing.

If all parties to the proceeding accept the proposed decision and order, the parties shall not be entitled to a contested case hearing, and section 269-15.5 shall not apply. If the commission permits a person to intervene, the six-month period shall not apply and the commission shall make every effort to complete its deliberations and issue its decision within the nine-month period from the date the public utility's completed application was filed, pursuant to subsections (b), (c), and (d).

If a party does not accept the proposed decision and order, either in whole or in part, that party shall give notice of its objection or nonacceptance within the timeframe prescribed by the commission in the

proposed decision and order, setting forth the basis for its objection or nonacceptance; provided that the proposed decision and order shall have no force or effect pending the commission's final decision. If notice is filed, the above six-month period shall not apply and the commission shall make every effort to complete its deliberations and issue its decision within the nine-month period from the date the public utility's completed application was filed as set forth in subsection (d). Any party that does not accept the proposed decision and order under this paragraph shall be entitled to a contested case hearing; provided that the parties to the proceeding may waive the contested case hearing.

Public utilities subject to this subsection shall follow the standard chart of accounts to be approved by the commission for financial reporting purposes. The public utilities shall file a certified copy of the annual financial statements in addition to an updated chart of accounts used to maintain their financial records with the commission and consumer advocate within ninety days from the end of each calendar or fiscal year, as applicable, unless this timeframe is extended by the commission. The owner, officer, general partner, or authorized agent of the utility shall certify that the reports were prepared in accordance with the standard chart of accounts.

(g) Any automatic fuel rate adjustment clause requested by a public utility in an application filed with the commission shall be designed, as determined in the commission's discretion, to:

(1) Fairly share the risk of fuel cost changes between the public utility and its customers;

(2) Provide the public utility with sufficient incentive to reasonably manage or lower its fuel costs and encourage greater use of renewable energy;

(3) Allow the public utility to mitigate the risk of sudden or frequent fuel cost changes that cannot otherwise reasonably be mitigated through other commercially available means, such as through fuel hedging contracts;

(4) Preserve, to the extent reasonably possible, the public utility's financial integrity; and

(5) Minimize, to the extent reasonably possible, the public utility's need to apply for frequent applications for general rate increases to account

for the changes to its fuel costs."

SECTION 3. Section 269-27.2, Hawaii Revised Statutes, is amended by amending subsection (c) to read as follows:

"(c) The rate payable by the public utility to the producer for the nonfossil fuel generated electricity supplied to the public utility shall be as agreed between the public utility and the supplier and as approved by the public utilities commission; provided that in the event the public utility and the supplier fail to reach an agreement for a rate, the rate shall be as prescribed by the public utilities commission according to the powers and procedures provided in this chapter.

In the exercise of its authority to determine the just and reasonable rate for the nonfossil fuel generated electricity supplied to the public utility by the producer, the commission shall establish that the rate for purchase of electricity by a public utility shall not be more than one hundred per cent of the cost avoided by the utility when the utility purchases the electrical energy rather than producing the electrical energy.

The commission's determination of the just and reasonable rate shall be accomplished by establishing a methodology that removes or significantly reduces any linkage between the price of fossil fuels and the rate for the nonfossil fuel generated electricity to potentially enable utility customers to share in the benefits of fuel cost savings resulting from the use of nonfossil fuel generated electricity. As the commission deems appropriate, the just and reasonable rate for nonfossil fuel generated electricity supplied to the public utility by the producer may include mechanisms for reasonable and appropriate incremental adjustments, such as adjustments linked to consumer price indices for inflation or other acceptable adjustment mechanisms."

SECTION 4. Section 269-91, Hawaii Revised Statutes, is amended as follows:

1. By adding two new definitions to be appropriately inserted and to read:

"Biofuels" means liquid or gaseous fuels produced from organic sources such as biomass crops, agricultural residues and oil crops, such as palm oil, canola oil, soybean oil, waste cooking oil, grease, and food wastes, animal residues and wastes, and sewage and landfill wastes.

"Renewable electrical energy" means:

(1) Electrical energy generated using renewable energy as the source;

(2) Electrical energy savings brought about by the use of renewable displacement or off-set technologies, including solar water heating, seawater air-conditioning district cooling systems, solar air-conditioning, and customer-sited, grid-connected renewable energy systems; or

(C) Electrical energy savings brought about by the use of energy efficiency technologies, including heat pump water heating, ice storage, ratepayer-funded energy efficiency programs, and use of rejected heat from co-generation and combined heat and power systems, excluding fossil-fueled qualifying facilities that sell electricity to electric utility companies and central station power projects."

2. By amending the definitions of "cost effective", "renewable energy", and "renewable portfolio standard" and "renewable portfolio standard" to read:

"Cost-effective" means the ability to produce or purchase electric energy or firm capacity, or both, from renewable energy resources at or below avoided costs[-] consistent with the methodology set by the public utilities commission in accordance with section 269-27.2."

~~"Renewable energy" means [electrical energy produced by wind, solar energy, hydropower, landfill gas, waste to energy, geothermal resources, ocean thermal energy conversion, wave energy, biomass, including municipal solid waste, biofuels, or fuels derived from organic sources, hydrogen fuels derived from renewable energy, or fuel cells where the fuel is derived from renewable sources. Where biofuels, hydrogen, or fuel cell fuels are produced by a combination of renewable and nonrenewable means, the proportion attributable to the renewable means shall be credited as renewable energy. Where fossil and renewable fuels are co-fired in the same generating unit, the unit shall be considered to produce renewable electricity in direct proportion to the percentage of the total heat value represented by the heat value of the renewable fuels. "Renewable energy" also means electrical energy savings brought about by the use of solar and heat pump water heating, seawater air conditioning district cooling systems, solar air conditioning and ice storage, quantifiable energy conservation measures, use of rejected heat from co-generation and combined heat and power systems excluding fossil-fueled qualifying facilities that sell electricity to electric~~

~~utility companies, and central station power projects]~~ energy generated or produced utilizing the following sources:

- (1) Wind;
- (2) The sun;
- (3) Falling water;

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- (4) Biogas, including landfill and sewage-based digester gas;
- (5) Geothermal;
- (6) Ocean water, currents and waves;
- (7) Biomass, including biomass crops, agricultural and animal residues and wastes, and municipal solid waste;
- (8) Biofuels; and
- (9) Hydrogen produced from renewable energy sources.

"Renewable portfolio standard" means the percentage of electrical energy sales that is represented by renewable electrical energy."

SECTION 5. Section 269-92, Hawaii Revised Statutes, is amended to read as follows:

"**§269-92 Renewable portfolio standards.** (a) Each electric utility company that sells electricity for consumption in the State shall establish a renewable portfolio standard of:

~~[(1) Seven per cent of its net electricity sales by December 31, 2003;~~

~~[(2) Eight per cent of its net electricity sales by December 31, 2005;~~

~~[(3)]~~ (1) Ten per cent of its net electricity sales by December 31, 2010;

~~[(4)]~~ (2) Fifteen per cent of its net electricity sales by December 31, 2015; and

~~[(5)]~~ (3) Twenty per cent of its net electricity sales by December 31, 2020.

~~[The public utilities commission shall determine if an electric utility company is unable to meet the renewable portfolio standards in a cost effective manner, or as a result of circumstances beyond its control which could not have been reasonably anticipated or ameliorated. If this determination is made, the electric utility company shall be relieved of responsibility for meeting the renewable portfolio standard for the period of time that it is unable to meet the standard.]~~

(b) The public utilities commission may establish standards for each utility that prescribe what portion of the renewable portfolio standards shall be met by specific types of renewable electrical energy resources; provided that:

- (1) At least fifty per cent of the renewable portfolio standards shall be met by electrical energy generated using renewable energy as the source;
- (2) Where electrical energy is generated or displaced by a combination of renewable and nonrenewable means, the proportion attributable to the renewable means shall be credited as renewable energy; and
- (3) Where fossil and renewable fuels are co-fired in the same generating unit, the unit shall be considered to generate renewable electrical energy (electricity) in direct proportion to the percentage of the total heat value represented by the heat value of the renewable fuels.

(c) If the public utilities commission determines that an electric utility company failed to meet the renewable portfolio standard, after a hearing in accordance with chapter 91, the utility shall be subject to penalties to be established by the public utilities commission; provided that if the commission determines that the electric utility company is unable to meet the renewable portfolio standards due to reasons beyond the reasonable control of an electric utility, as set forth in subsection (d), the commission, in its discretion, may waive in whole or in part any otherwise applicable penalties.

(d) Events or circumstances that are outside of an electric utility company's reasonable control may include, to the extent the event or circumstance could not be reasonably foreseen and ameliorated:

- (1) Weather-related damage;
- (2) Natural disasters;

- (3) Mechanical or resource failure;
- (4) Failure of renewable electrical energy producers to meet contractual obligations to the electric utility company;
- (5) Labor strikes or lockouts;
- (6) Actions of governmental authorities that adversely affect the generation, transmission, or distribution of renewable electrical energy under contract to an electric utility company;
- (7) Inability to acquire sufficient renewable electrical energy due to lapsing of tax credits related to renewable energy development;
- (8) Inability to obtain permits or land use approvals for renewable electrical energy projects;
- (9) Inability to acquire sufficient cost-effective renewable electrical energy;
- (10) Substantial limitations, restrictions, or prohibitions on utility renewable electrical energy projects; and
- (11) Other events and circumstances of a similar nature."

SECTION 6. Section 269-95, Hawaii Revised Statutes, is amended to read as follows:

"~~[+] §269-95~~ **[+] Renewable portfolio standards study.** The public utilities commission shall:

- (1) By December 31, ~~[2006,]~~ 2007, develop and implement a utility ratemaking structure, which may include ~~[but is not limited to]~~ performance-based ratemaking, to provide incentives that encourage Hawaii's electric utility companies to use cost-effective renewable energy resources found in Hawaii to meet the renewable portfolio standards established in section 269-92, while allowing for deviation from the standards in the event that the standards cannot be met in a cost-effective manner~~[,]~~ or as a result of events or circumstances, such as described in section 269-92(d), beyond the control of the utility ~~[which]~~ that could not have been reasonably

anticipated or ameliorated;

(2) Gather, review, and analyze empirical data to determine the extent to which any proposed utility ratemaking structure would impact electric utility companies' profit margins[7] and to ensure that ~~[these profit margins do not decrease as a result of the implementation of the proposed ratemaking structure,]~~ the electric utility companies' opportunity to earn a fair rate of return is not diminished;

(3) Using funds from the public utilities special fund, contract with the Hawaii natural energy institute of the University of Hawaii to conduct independent studies to be reviewed by a panel of experts from entities such as the United States Department of Energy, National Renewable Energy Laboratory, Electric Power Research Institute, Hawaii electric utility companies, environmental groups, and other similar institutions with the required expertise. These studies shall include findings and recommendations regarding:

(A) The capability of Hawaii's electric utility companies to achieve renewable portfolio standards in a cost-effective manner[7] and shall assess factors such as the impact on consumer rates, utility system reliability and stability, costs and availability of appropriate renewable energy resources and technologies, permitting approvals, ~~[impacts]~~ effects on the economy, balance of trade, culture, community, environment, land and water, climate change policies, demographics, and other factors deemed appropriate by the commission; and

(B) Projected renewable portfolio standards to be set five and ten years beyond the then current standards;

(4) Revise the standards based on the best information available at the time if the results of the studies conflict with the renewable portfolio standards established by section 269-92; and

(5) Report its findings and revisions to the renewable portfolio standards, based on its own studies and those contracted under paragraph (3), to

the legislature no later than twenty days before the convening of the regular session of 2009, and every five years thereafter."

SECTION 7. In codifying the new sections added by section 1 of this Act, the revisor of statutes shall substitute appropriate section numbers for the letters used in designating the new sections in this Act.

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SECTION 8. Statutory material to be repealed is bracketed and stricken. New statutory material is underscored.

SECTION 9. This Act shall take effect upon its approval.

**Appendix B**  
**Agency Correspondence**



LINDA LINGLE  
GOVERNOR OF HAWAII



PETER T. YOUNG  
CHAIRPERSON

MEREDITH J. CHING  
JAMES A. FRAZIER  
NEAL S. FUJIWARA  
CHIYOME L. FUKINO, M.D.  
LAWRENCE H. MIIKE, M.D., J.D.  
STEPHANIE A. WHALEN

DEAN A. NAKANO  
ACTING DEPUTY DIRECTOR

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

November 8, 2006

Mr. Eric Knutzen  
Green Energy Hawaii LLC  
4313 Kapuna Road  
Kilauea, Hawaii 96754

Request for Determination  
Green Energy Team LLC, Gasification/Thermal Oxidation Plant Project  
Knudsen Gap, Island of Kauai

Dear Mr. Knutzen:

Reference is made to your email, dated October 10, 2006, regarding a request for determination concerning the proposed Gasification/Thermal Oxidation Plant Project.

The Commission on Water Resource Management (Commission), Stream Protection and Management Branch, has the responsibility to protect stream channels from alteration whenever practicable to provide for fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses in the State of Hawaii under the authorization of the State Water Code (Code), Chapter 174C, Hawaii Revised Statutes and Chapter 13-169, Hawaii Administrative Rules (Protection of Instream Uses of Water).

Pursuant to the State Water Code, §174C-71(3) (A), the Commission "shall require persons to obtain a permit from the Commission prior to undertaking a stream channel alteration." The term "stream channel" is defined in the Code, §174C-3, as a "watercourse with a definite bed and banks which periodically or continuously contains flowing water."

Based on the information you submitted, we understand that the water source for the project will be from either of two locations: 1) the adjacent agricultural ditch system across the road from the plant, or 2) the Mauka Reservoir. The Commission does not require a Stream Channel Alteration Permit (SCAP) application to be submitted for the proposed project because the proposed scope of work will not alter the bed and banks of a stream channel.

Please be advised that the project may require other agency approvals regarding wetlands, water quality, grading, stockpiling, and floodways. This letter should not be used for other regulatory jurisdictions or used to imply compliance with other federal, state, or county rules.

Should you have any questions, please contact Ed Sakoda of the Stream Protection and Management Branch, at 587-0234, or toll-free from Kauai at 274-3141 + 70234.

Sincerely,

DEAN A. NAKANO  
Acting Deputy Director

May 21, 2007

Office of Hawaiian Affairs  
711 Kapiolani Boulevard, Suite 500  
Honolulu, Hawai'i 96813

Attention: Mr. Clyde Nāmu`o, Administrator

**Subject: Current Traditional Cultural Uses, Koloa District, Island of Kaua'i, Tax Map  
Keys 2-7-001:001 and 2-7-001:004**

Dear Mr. Nāmu`o:

Green Energy Team, LLC (Green Energy Team) is proposing an agriculture (biomass) waste-to-energy facility on Kaua'i, Hawai'i. The need for the project arises because of the State of Hawai'i Revised Statute (HRS) renewable portfolio standard (Title 15, Chapter 269, Part V) that mandates that each electrical utility company shall provide twenty percent of its net electricity through renewable energy by the end of the year 2020. The facility would utilize Albizia and Eucalyptus tree wood chips as well as other available agricultural waste products as a source of energy to produce an estimated 7,100 kilowatts of gross electrical output. The plant is to strictly use biomass materials (plant materials used specifically as a source of fuel), and they are to come from on-island resources.

The proposed project site is located on the Island of Kaua'i in the Koloa District approximately 9 miles southwest of Līhu'e, 2.5 miles northeast of Omao Town, 3 miles north of Koloa Town, and northeast of Kaumualii Highway and identified with Tax Map Key 2-7-001:00 (Figure 1). The proposed project area is currently undeveloped agricultural land comprised of a single parcel approximately 64 acres in size. The proposed site for the actual agricultural waste-to-energy facility is located on a 5.5 acre parcel within the 64 acres that is cultivated with trees; approximately 1,200 feet north of Kaumualii Highway, approximately 6 miles from the shoreline of the Pacific Ocean. The land is all privately owned and leased by Hawaiian Mahogany, Inc. (HMI).

Since the proposed project is the development of an agriculture waste-to-energy facility it triggers the environmental review process mandated under HRS Chapter 343. The proposed facility would utilize agriculture waste processed into energy as an integral part of an existing agricultural operation. The facility would be an environmentally sound method of handling the waste stream of the agriculture operation, generating clean sustainable energy to the community of Kaua'i while stimulating further agricultural activity. The proposed action would include the construction of a 10-inch subsurface pipeline to transfer/deliver water from the Koloa Ditch System, located approximately one mile southwest of the proposed site in TMK 2-7-001:004. A proposed pipeline alignment is shown on the attached figure. The land to be utilized for the pipeline is also privately owned and leased by HMI.

In order to facilitate consultation and coordination of the consultation process, Green Energy Team has designated Earth Tech, Inc. (Earth Tech) to act as an authorized representative for this action (see attached authorization letter). Earth Tech is currently in the process of conducting a cultural impact assessment for the proposed action in compliance with Act 50 of HRS 343 and is therefore seeking statements from current traditional Hawaiian practitioners with regards to cultural uses in the project areas. Cultural uses include but are not limited to, hunting, fishing, gathering and religious services. If you can provide a list of current traditional Hawaiian practitioners in the project area and/or provide statements, please contact:

Ms. Michelle Mason, Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, Hawaii 96813  
Fax: (808) 523-8950  
Email: Michelle.Mason@earthtech.com

In addition, we would appreciate receiving any additional information you may have regarding native Hawaiian cultural beliefs, practices, and places that might be adversely affected by this proposed project. We have reviewed several documents and visited the site several times and no evidence of cultural practices within the project area were identified. Since the 19<sup>th</sup> century, the vicinity was heavily utilized for agriculture and sugar cane cultivation. These disturbances have removed all evidence of cultural practices.

We would appreciate a response within 30 days of the receipt of this letter to ensure that any information or concerns you may have will be included in the cultural assessment. Thank you for your assistance, and should you have any questions, please contact me at 356-5322 or michelle.mason@earthtech.com.

Sincerely,



Michelle Mason  
Project Manager

Enclosures: Letter of Authorization  
Site Location Maps  
Proposed Water Pipeline Alignment

cc: Ms. Melanie A. Chinen, SHPD, Administrator – Via Email Transmission  
Ms. Nancy McMahon, SHPD, Kaua'i Island Archaeologist – Via Email Transmission  
Mr. Eric Knutzen, Green Energy Team – Via Email Transmission  
Ms. Tanya Copeland, Earth Tech – Transmittal Letter Only

TO: FEDERAL, STATE OF HAWAII, AND LOCAL AGENCIES

FROM: ERIC KNUTZEN, AUTHORIZED OFFICER, GREEN ENERGY TEAM LLC

SUBJECT: BIOMASS-TO-ENERGY PROJECT, KNUDSEN GAP, DISTRICT OF LIHUE,  
ISLAND OF KAUAI

Green Energy Team LLC (Green Energy Team) is proposing a Biomass-to-Energy (BTE) Facility on Kauai, Hawaii. The proposed project site is located approximately 1.5 miles northeast of Knudsen Gap on the south side of the island of Kauai and identified with Tax Map Key (TMK) 2-7-001:001 (see Figure 1-1). The proposed BTE site is located approximately 1,200 feet north of Kaumualii Highway and approximately 6 miles from the shoreline of the Pacific Ocean and is situated on a 6 acre plot of agricultural land cultivated with trees.

The proposed project is the development of a waste-to-energy facility, and therefore, triggers the environmental review process mandated under Hawaii Revised Statutes (HRS) Chapter 343. The proposed BTE facility would utilize agriculture waste processed into energy as an integral part of an existing agriculture operation. The facility would be an environmentally sound method of handling the waste stream of the agriculture operation, generating clean sustainable energy to the community of Kauai while stimulating further agricultural activity.

The need for the project arises because of the State of Hawaii Revised Statute (Title 15, Chapter 269, Part V) renewable portfolio standard (RPS) that mandates that each electrical utility company shall provide twenty percent of its net electricity through renewable energy by the end of the year 2020.

In order to expedite the project schedule, Green Energy Team has designated Earth Tech, Inc. (Earth Tech) to act as our authorized representative for coordination and consultation with appropriate federal, state, and local agencies. I would appreciate all courtesies to be extended to Earth Tech during the coordination and consultation period.

In response, please reply to the attention of Michelle Mason of Earth Tech at the following address and reference Project No. 98108:

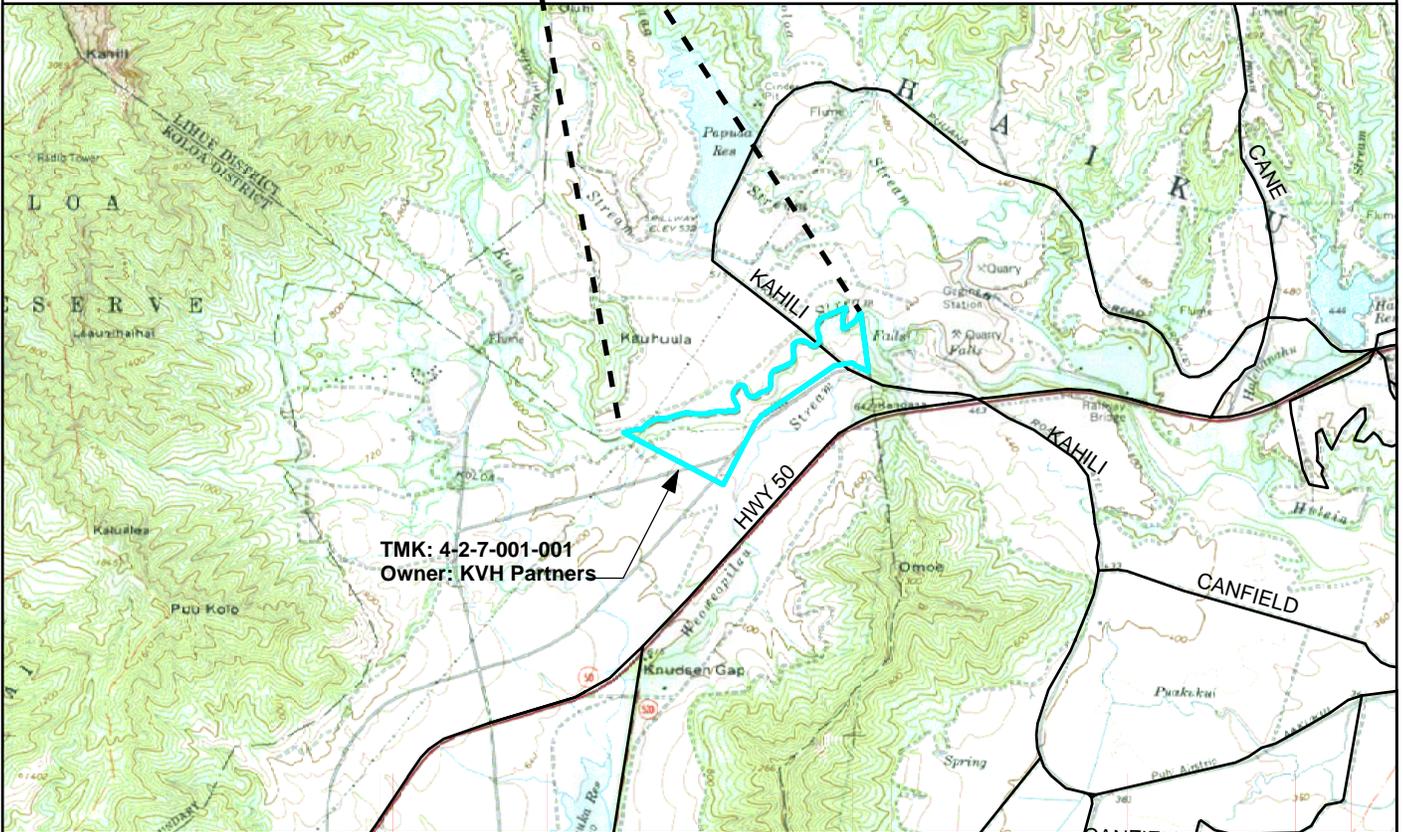
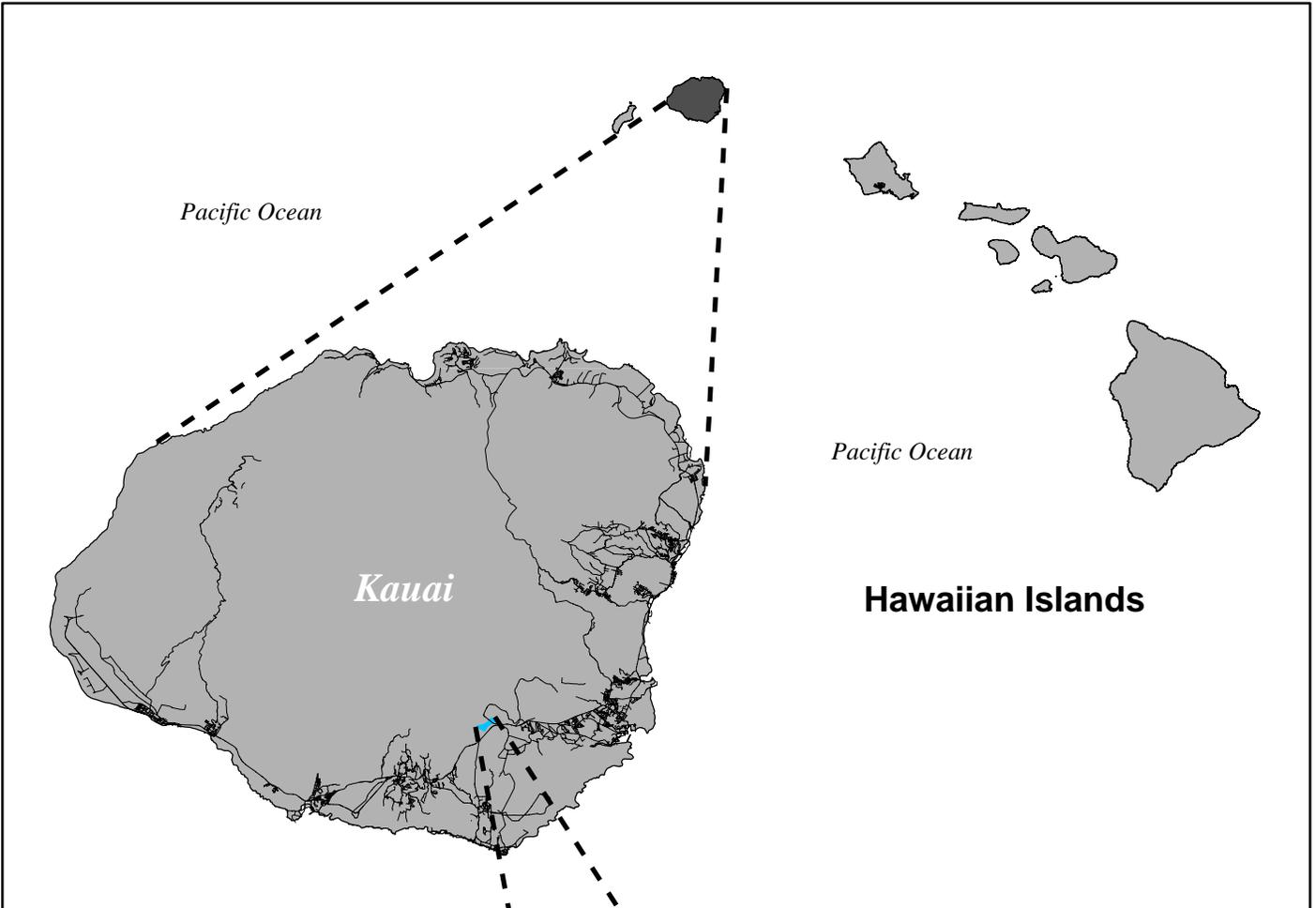
Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, Hawaii 96813

Should you have any questions or require additional information, please contact Michelle Mason of Earth Tech at (808) 356-5322.

Sincerely,



Eric Knutzen, Project Engineer  
Green Energy Team LLC



Map Document: (Q:\GIS\2007\Green\_Energy\_Hawaii\Mxd\Site\LocMap.mxd)  
 4/18/2007 -- 11:13 AM

**Figure 1**  
**Site Location and Topographic Map**  
**Phase I Environmental Site Assessment**  
**TMK (4) 2-7-001:001**  
**Koloa, Kauai, Hawaii**

Koloa Ditch



GEH Site

Kolao Ditch Tie In

Maluhia Rd

Kaumualli Hwy

Kahili Rd

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USGS  
© 2007 Navteq

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PHONE (808) 594-1888

FAX (808) 594-1865



**STATE OF HAWAII**  
**OFFICE OF HAWAIIAN AFFAIRS**  
711 KAPI'OLANI BOULEVARD, SUITE 500  
HONOLULU, HAWAII 96813

June 19, 2007

HRD07\_3047

Michelle Mason  
Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, Hawai'i 96813

Dear Ms. Mason:

**Re: Cultural Impact Assessment, Koloa District, Island of Kaua'i  
Tax Map key 2-7-001:001 and 2-7-001:004**

The Office of Hawaiian Affairs (OHA) is in receipt of your May 21, 2007 letter initiating consultation for a cultural impact assessment for a proposed agriculture waste to energy facility on tax map key (TMK) parcel 2-7-001:001 which is 64 acres in size. The actual project area would be 5.5 acres within the larger 64 acre parcel. A 10-inch subsurface pipeline would be constructed to transfer/deliver water to the project site from the Koloa Ditch System, located approximately one mile to the southwest of the project site on TMK 2-7-001:004.

OHA has no specific comments at this time, but seeks assurances that the cultural impact assessment will follow the guidelines established by the Office of Environmental Quality Control (OEQC). The OEQC has recommended that the extent of the assessment should be greater than the project area to ensure that cultural practices which may not occur within the boundaries of the project area, but which may be affected, are included in the assessment.

Please contact our Kaua'i Island Community Resource Coordinator, Ms. Kanani Kagawa at (808) 241-3506. Ms Kagawa may be able to identify individuals who should be contacted and of particular cultural and historic sites or protected traditional and cultural practices which should be considered.

Michelle Mason  
Earth Tech  
June 19, 2007  
Page 2

OHA seeks assurances that if this project moves forward, should Native Hawaiian traditional, cultural, or burial sites be identified during ground disturbance, all work will immediately cease, and the appropriate agencies notified pursuant to applicable law.

Thank you for initiating consultation at this early stage and we look forward to the opportunity for a comprehensive review of the completed cultural impact assessment. Should you have any questions, please contact Keola Lindsey, Lead Advocate-Culture at (808) 594-1904 or [keolal@oha.org](mailto:keolal@oha.org).

'O wau iho nō,



Clyde W. Nāmu'o  
Administrator

---

C: Kanani Kagawa, OHA- Kaua'i Island Community Resource Coordinator  
3-3100 Kuhio Highway, Suite C4  
Lihue, Hawai'i 96766-1153

May 21, 2007

Division of Forestry and Wildlife  
State of Hawaii Department of Land and Natural Resources  
1151 Punchbowl Street, Room 325  
Honolulu, Hawai'i 96813

**Subject: Letter of Determination, Division of Forestry and Wildlife Review, Agriculture (Biomass) Waste-to-Energy Project, Koloa District, Island of Kaua'i Tax Map Keys 2-7-001:001 and 2-7-001:004**

Dear Division of Forestry and Wildlife:

Green Energy Team, LLC (Green Energy Team) is proposing an agriculture waste-to-energy facility on Kaua'i, Hawai'i. The need for the project arises because of the State of Hawai'i Revised Statute (HRS) renewable portfolio standard (Title 15, Chapter 269, Part V) that mandates that each electrical utility company shall provide twenty percent of its net electricity through renewable energy by the end of the year 2020. The facility would utilize Albizia and Eucalyptus tree wood chips as well as other available agricultural waste products as a source of energy to produce an estimated 7,100 kilowatts of gross electrical output. The plant is to strictly use biomass materials (plant materials used specifically as a source of fuel), and they are to come from on-island resources.

The proposed project site is located on the Island of Kaua'i in the Koloa District approximately 9 miles southwest of Līhu'e, 2.5 miles northeast of Omao Town, 3 miles north of Koloa Town, and northeast of Kaumualii Highway and identified with Tax Map Key 2-7-001:00 (Figure 1). The proposed project area is currently undeveloped agricultural land comprised of a single parcel approximately 64.2 acres in size. The proposed site for the actual agricultural waste-to-energy facility is located on a 5.5 acre parcel within the 64.2 acres that is cultivated with trees; approximately 1,200 feet north of Kaumualii Highway, approximately 6 miles from the shoreline of the Pacific Ocean. The land is all privately owned and leased by Hawaiian Mahogany, Inc. (HMI).

Since the proposed project is the development of an agriculture waste-to-energy facility it triggers the environmental review process mandated under HRS Chapter 343. The proposed facility would utilize agriculture waste processed into energy as an integral part of an existing agricultural operation. The facility would be an environmentally sound method of handling the waste stream of the agriculture operation, generating clean sustainable energy to the community of Kaua'i while stimulating further agricultural activity. The proposed action would include the construction of a 10-inch subsurface pipeline to transfer/deliver water from the Koloa Ditch System, located approximately one mile southwest of the proposed site in TMK 2-7-001:004. A proposed pipeline alignment is shown on the attached figure. The land to be utilized for the pipeline is also privately owned and leased by HMI.

In order to facilitate consultation and coordination of the consultation process, Green Energy Team has designated Earth Tech, Inc. to act as an authorized representative for this action (see attached authorization letter). Actions relevant to the Division of Forestry and Wildlife for this project include a review of threatened and/or endangered species which may be impacted by the proposed action.

The proposed project would include some minor excavation at the facility site as well as an approximate 4 foot wide by 2 foot deep excavation corridor for the pipeline. The land that would be utilized for the proposed facility as well as the pipeline alignment has historically been utilized for the cultivation of sugar cane, is heavily disturbed, and is currently cultivated with trees. Based on our record review and several site visits, we do not anticipate any adverse impacts on threatened or endangered plants and/or wildlife. On behalf of Green Energy Team, we are seeking your concurrence that the proposed project would not adversely affect any threatened and/or endangered plants or wildlife in the project vicinity.

We would appreciate a response within 30 days of the receipt of this letter. Thank you for your assistance, and should you have any questions, please contact me at 356-5322 or [michelle.mason@earthtech.com](mailto:michelle.mason@earthtech.com).

Sincerely,



Michelle Mason  
Project Manager

Enclosures: Letter of Authorization  
Site Location Maps  
Proposed Water Pipeline Alignment

cc: Mr. Eric Knutzen, Green Energy Team – Via Email Transmission  
Ms. Tanya Copeland, Earth Tech – Transmittal Letter Only

TO: FEDERAL, STATE OF HAWAII, AND LOCAL AGENCIES

FROM: ERIC KNUTZEN, AUTHORIZED OFFICER, GREEN ENERGY TEAM LLC

SUBJECT: BIOMASS-TO-ENERGY PROJECT, KNUDSEN GAP, DISTRICT OF LIHUE,  
ISLAND OF KAUAI

Green Energy Team LLC (Green Energy Team) is proposing a Biomass-to-Energy (BTE) Facility on Kauai, Hawaii. The proposed project site is located approximately 1.5 miles northeast of Knudsen Gap on the south side of the island of Kauai and identified with Tax Map Key (TMK) 2-7-001:001 (see Figure 1-1). The proposed BTE site is located approximately 1,200 feet north of Kaumualii Highway and approximately 6 miles from the shoreline of the Pacific Ocean and is situated on a 6 acre plot of agricultural land cultivated with trees.

The proposed project is the development of a waste-to-energy facility, and therefore, triggers the environmental review process mandated under Hawaii Revised Statutes (HRS) Chapter 343. The proposed BTE facility would utilize agriculture waste processed into energy as an integral part of an existing agriculture operation. The facility would be an environmentally sound method of handling the waste stream of the agriculture operation, generating clean sustainable energy to the community of Kauai while stimulating further agricultural activity.

The need for the project arises because of the State of Hawaii Revised Statute (Title 15, Chapter 269, Part V) renewable portfolio standard (RPS) that mandates that each electrical utility company shall provide twenty percent of its net electricity through renewable energy by the end of the year 2020.

In order to expedite the project schedule, Green Energy Team has designated Earth Tech, Inc. (Earth Tech) to act as our authorized representative for coordination and consultation with appropriate federal, state, and local agencies. I would appreciate all courtesies to be extended to Earth Tech during the coordination and consultation period.

In response, please reply to the attention of Michelle Mason of Earth Tech at the following address and reference Project No. 98108:

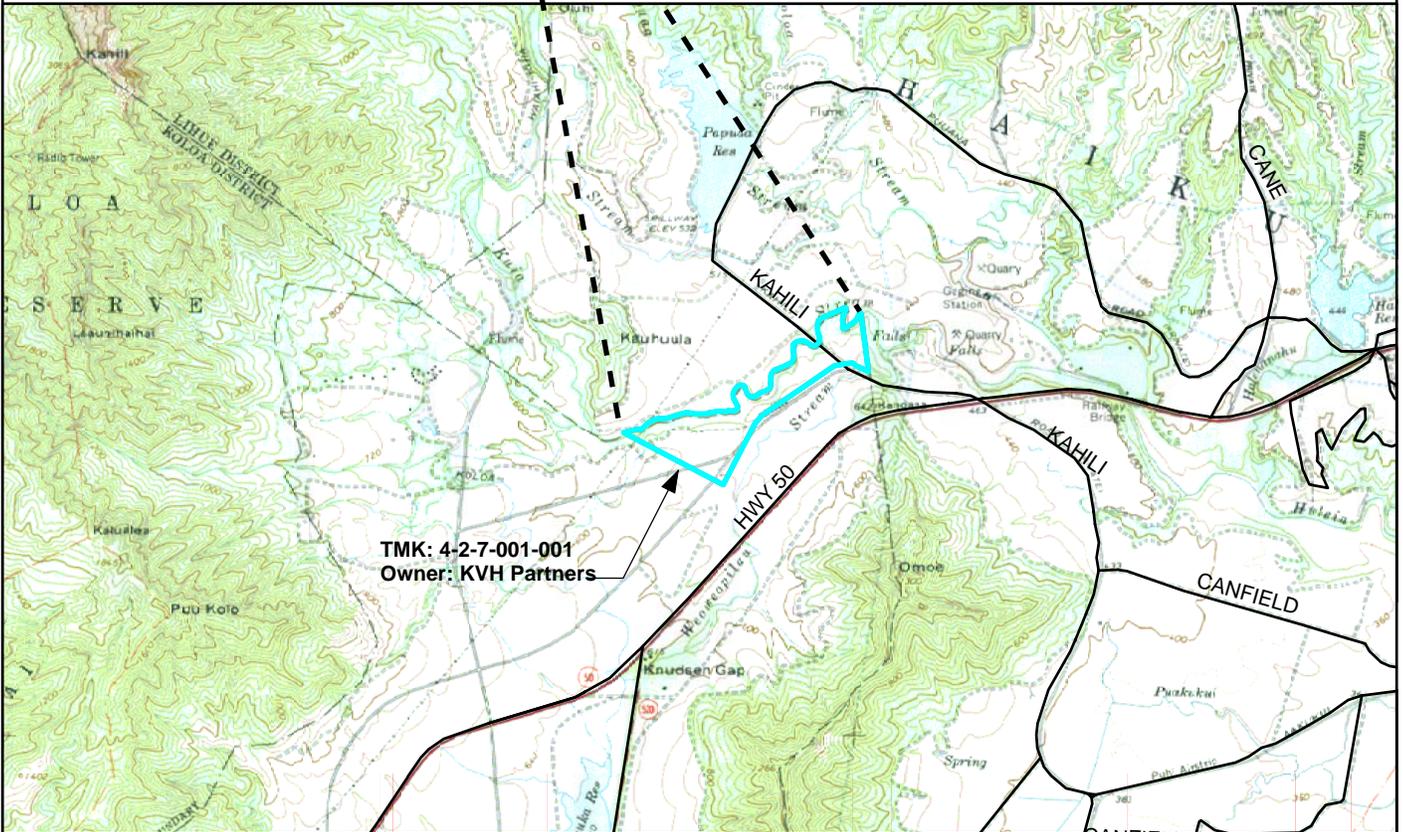
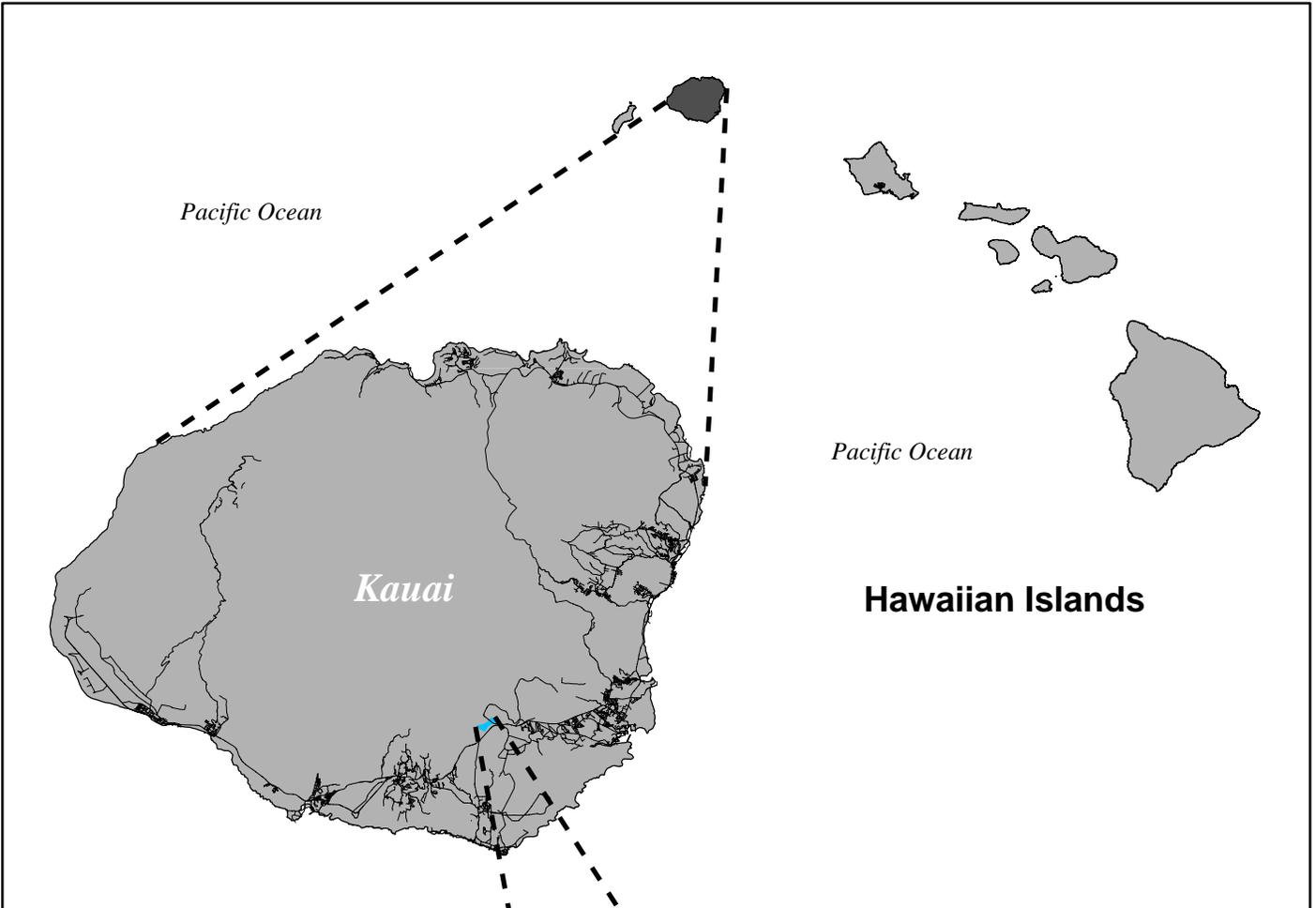
Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, Hawaii 96813

Should you have any questions or require additional information, please contact Michelle Mason of Earth Tech at (808) 356-5322.

Sincerely,



Eric Knutzen, Project Engineer  
Green Energy Team LLC



Map Document: (Q:\GIS\2007\Green\_Energy\_Hawaii\Mxd\Site\LocMap.mxd)  
 4/18/2007 -- 11:13 AM

**Figure 1**  
**Site Location and Topographic Map**  
**Phase I Environmental Site Assessment**  
**TMK (4) 2-7-001:001**  
**Koloa, Kauai, Hawaii**

Koloa Ditch



GEH Site

Kolao Ditch Tie In

Maluhia Rd

Kaumualli Hwy

Kahili Rd

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USGS  
© 2007 Navteq

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LINDA LINGLE  
GOVERNOR OF HAWAII



**STATE OF HAWAII**  
**DEPARTMENT OF LAND AND NATURAL RESOURCES**  
DIVISION OF FORESTRY AND WILDLIFE  
1151 PUNCHBOWL STREET, ROOM 325  
HONOLULU, HAWAII 96813  
TEL (808) 587-0166 FAX (808) 587-0160

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BOARD OF LAND AND NATURAL RESOURCES  
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Peter T. Young  
DEPUTY DIRECTOR - LAND

DEPUTY DIRECTOR - WATER

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COMMISSION ON WATER RESOURCE MANAGEMENT  
CONSERVATION AND COASTAL LANDS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

May 31, 2007

Ms. Michelle Mason  
Project Manager  
EarthTech  
641 Bishop Street, Suite 500  
Honolulu, Hawaii 96813-3920

Dear Ms. Mason:

Subject: Letter of Determination, DLNR Forestry and Wildlife review of Agriculture (Biomass) Waste-to-Energy Project, Koloa District, Island of Kauai. TMK: 2-7-001: 001 and 004.

DLNR, Division of Forestry and Wildlife has reviewed the information relating to the proposed Waste-to-Energy Project near Koloa, Kauai and provide the following comments for your consideration. Relating to seabirds attraction to lights, the attached brochure will help reduce these problems that will occur for petrels and shearwaters. Please incorporate all mitigation measures explained in this brochure into the planning of the project. All questions should be made through the Kauai Branch of the Division of Forestry and Wildlife office at (808) 274-3433. Thank you for the opportunity to comment on your project.

Sincerely yours,

Paul J. Conry  
Administrator

C: DOFAW Kauai Branch

Attachment

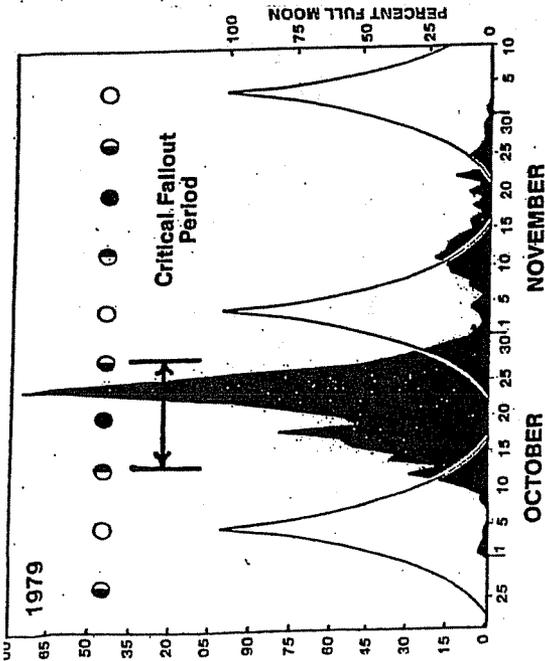


Figure 4. Relationship of shearwater "fallout" to the moon phases. The critical period of fallout occurs during the week before and after the new moon (darkest nights). Dowsing lights that are not absolutely necessary during that period could substantially reduce the annual shearwater fallout problem.

**What To Do If Shearwaters Fall In Your Area**

1. Collect birds as soon as possible to avoid losses to dogs and cats. They are generally docile birds and are easily handled. Take them to the nearest "shearwater aid station" located at county fire stations and at a few private business locations around the island. If birds must be held overnight, keep them in ventilated cardboard box with a secure lid.
2. Do not release birds by tossing them into the air. They may have unseen internal injuries and could become more badly injured.

TECHNICAL ASSISTANCE IS AVAILABLE  
FOR ADDITIONAL INFORMATION, CONTACT:

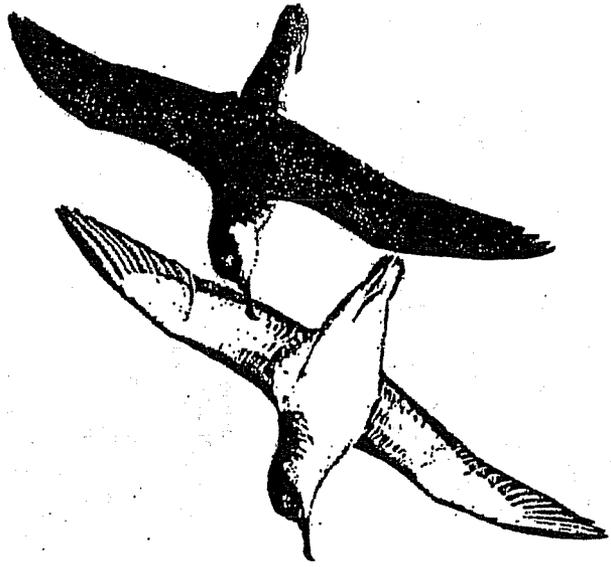
State of Hawaii  
Department of Land and Natural Resources  
Division of Forestry and Wildlife  
P.O. Box 1671  
Lihue, Hawaii 96766  
245-4433

U.S. Dept. of the Interior  
Fish and Wildlife Service  
P.O. Box 87  
Kilauea, Hawaii 96754  
828-1413

The Nature Conservancy  
of Hawaii  
1026 Nuuanu Avenue, Suite 201  
Honolulu, Hawaii 96813  
537-4508



DEPARTMENT OF  
LAND AND NATURAL RESOURCES



# THE NEWELL'S SHEARWATER LIGHT ATTRACTION PROBLEM

A GUIDE FOR ARCHITECTS,  
PLANNERS, AND RESORT MANAGERS

## INTRODUCTION:

The future of a native Hawaiian seabird, the Newell's Shearwater, is threatened by the growth of new urban developments. Every year on Kauai, nearly 1,500 Newell's Shearwaters are attracted to bright urban lights, fly into unseen objects and fall to the ground. Fortunately, 90% of them are recovered and successfully returned to the wild through the "SOS" (save our shearwater) program which involves the cooperation of the general public.

This brochure is designed to describe the bird, its problems with lights and specifically what architects planners, resort managers and the general public can do to reduce or avoid the light attraction problem.

## THE BIRD

The Newell's Shearwater once nested on all of the major Hawaiian Islands, but the mongoose, introduced to Hawaii, Maui, Molokai and Oahu in the late 1800's is believed to have caused the extinction of shearwaters on those islands. Kauai is the last stronghold for this unique native Hawaiian seabird.

Newell's Shearwaters nest during the spring and summer months in the interior mountains of Kauai. They dig a long burrow in the ground beneath dense vegetation and lay a single egg each year. The eggs hatch during July and August, and the nestlings are reared within the burrow. The adult birds abandon the nestings a week or two before they are old enough to fly. The nestlings become hungry, and leave the nesting grounds by themselves shortly after nightfall. They head for the open ocean, and must depend upon their instincts to find food. They do not return to their nest; but fly south towards the equator where they will remain all winter on the open seas until the following spring.

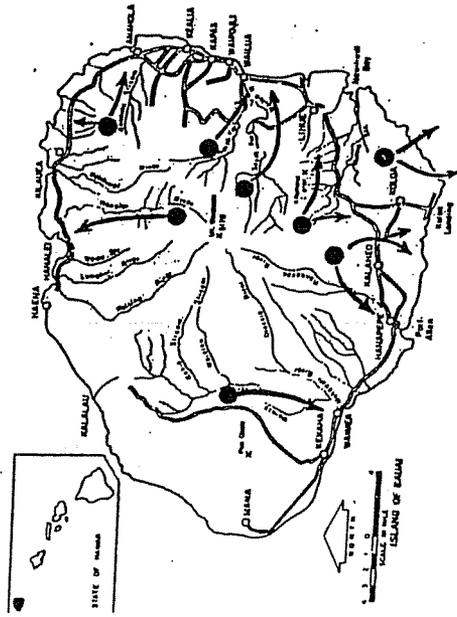


Figure 1. Map showing known nesting areas of the Newell's

## THE THREATS:

**PREDATORS:** Dogs, cats, rats and feral pigs are known to kill some shearwaters and their young on the nesting grounds each year. The accidental establishment of a new predator to Kauai such as the mongoose, could cause the rapid extinction of this bird. Mongoose sightings on Kauai should be reported to wildlife officials promptly.

**LIGHT ATTRACTION:** Young shearwaters leaving their nests for the first time, do so only after dark. They are inexperienced and have a natural attraction to bright lights. Flying near urban areas, they become temporarily blinded by the lights and fly into unseen objects such as utility wires, trees, buildings and automobiles. Oftentimes they are just confused and exhausted. Most often they are only stunned and fall to the ground, but about 10 percent of them die each year. The problem is growing because of the increased number of urban lights associated with new resort and residential developments. The greatest "fallout" problem occurs near coastal towns, particularly near river mouths.

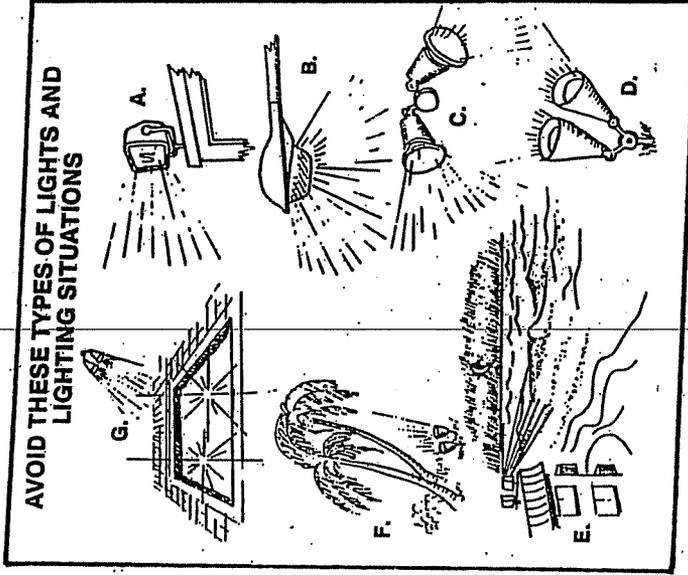


Figure 2. Avoid these types of lights: A. Unshielded high intensity floodlights on tall structures, B. Street lights without shields, C. Unshielded spotlights, D. Spotlights aimed upwards. Avoid using these types of lighting situations during peak fall out periods (new moon) during October and November: E. Floodlights on surf, F. Spotlights aimed up at vegetation, G. Spotlights

## WHAT CAN WE DO TO HELP ?

### Architects and Planners

Be aware of the light attraction problem during the planning stages of new development.

Make every effort to avoid lighting situations where light glare projects upwards or laterally (see figure 2). Avoid large high-intensity floodlights located on building tops or poles whenever possible.

Use shielded lights, cut-off luminaires, or indirect lighting whenever possible. (see figure 3).

Avoid locating bright lights near utility wires or other objects that could be difficult for birds to see at night.

### Hotel, Resort and Condominium Managers

When converting to new exterior light fixtures, consider installing shielded lights, cut-off luminaires or indirect lighting.

Consider installing shields on exterior lights that are known to attract shearwaters. Some light manufacturers offer ready made shields. In some cases inexpensive shields can be fabricated.

Avoid using unnecessary lighting during the critical shearwater fall out period: (October and November each year). **Note:** The heaviest fall out occurs on and around the new moon, generally for only 10 to 12 days. (See figure 4). Dowsing unnecessary floodlights that light up the surf or shine upward upon buildings or trees for that short period, could significantly reduce shearwater fall-out.

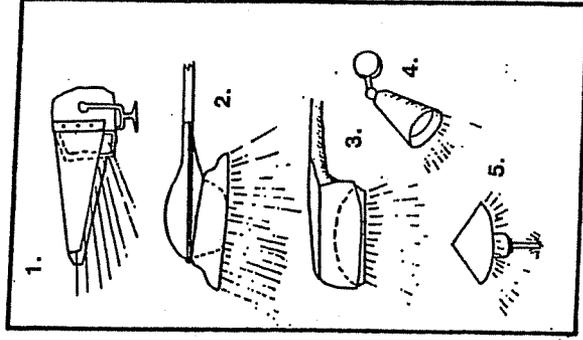
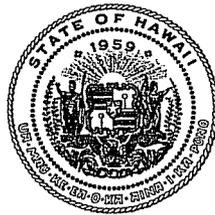
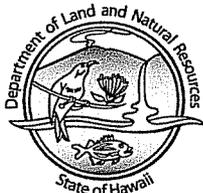


Figure 3. Use these types of lights whenever possible: 1. Shielded floodlights, 2. Shielded streetlights, 3. Cut-off luminaire, 4. Shielded entrance lights aimed downwards, 5. Indirect

LINDA LINGLE  
GOVERNOR OF HAWAII



**STATE OF HAWAII**  
**DEPARTMENT OF LAND AND NATURAL RESOURCES**

DIVISION OF FORESTRY AND WILDLIFE  
KAUAI DISTRICT  
3060 EIWA STREET, ROOM 306  
LIHUE, KAUAI, HAWAII 96766

ALLAN A. SMITH  
INTERIM CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA  
DEPUTY DIRECTOR

PETER T. YOUNG  
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES  
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BUREAU OF CONVEYANCES  
COMMISSION ON WATER RESOURCE MANAGEMENT  
CONSERVATION AND COASTAL LANDS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

Michelle Mason  
Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, HI 96813

Re: Project 98108

Aloha Ms. Mason,

The Division of Forestry and Wildlife (DOFAW) received the letter dated May 21, 2007 regarding Green Energy Team Inc and the proposed Agricultural Waste-to-Energy-Facility in Koloa, Kaua'i . This letter provides recommendations on outdoor lighting that will assist the project in minimizing the risk of causing "take" of listed seabirds.

Newell's shearwater and Hawaiian petrel are protected by one or more state and federal laws including the federal Migratory Bird Treaty Act (16 USC 703 et seq.), the federal Endangered Species Act (16 USC 1531 et seq.), and the Hawaii Revised Statutes Chapter 195D pertaining to protection of endangered and threatened species. Each of these laws defines the killing and/or injury of protected species as "take". Unauthorized "take" is punishable by criminal and/or civil provisions and can include substantial monetary fines (\$25,000-\$50,000 per bird) and/or imprisonment, depending on circumstances. In order to obtain authorization to cause "take" an entity consults with the State and Federal agencies to determine if such authorization is required.

The proposed project is located on Kaua'i which supports approximately 80% of the world's remaining Newell's shearwater breeding population. Hawaiian petrels also breed on Kaua'i but in smaller numbers than Newell's petrels. Both of these species nest in mountainous forest habitat and fly over the lowland areas to reach the sea. During this migration they can become attracted to outdoor lights and as a result often fall to the ground where they are injured or killed if not rescued by humans. The fledgling seabirds are particularly sensitive to lighting during their first flight to the sea, a migration that occurs annually from mid September through mid December.

### **Recommendations for the Proposed Agriculture Waste-to-Energy Facility**

Based on the project location, certain type of outdoor lighting are likely to cause adverse effects to listed seabirds. To minimize and avoid risk of causing "take" of listed seabirds, the proposed project should follow the following design principles:

1. All outdoor lights should be fully shielded or full cut-off light styles;
2. Uplighting should be avoided;

3. Use of an amber colored or other color (blue, green) filter or bulb can be used to assist in decreasing risk of seabird attraction;
4. Avoid painting buildings and other facilities white or light reflecting colors. Earth tones are preferred;
5. It is recommended that Green Energy Team LLC and or it's consultants consult with DLNR and USFWS prior to finalizing lighting selections; and
6. Motion detection-activated lights are recommended to prevent lights from being on for extended periods of time.

Collisions of seabirds with facility wires and other structures should also be analyzed and avoided as much as possible. If you have questions or would like additional information please do not hesitate to contact us.

Aloha,



Andrea Erichsen  
Kaua'i Seabird Habitat Conservation Plan Coordinator  
Department of Land and Natural Resources  
P.O. Box 458  
Waimea, HI 96796  
(808) 346-3489 mobile  
(808) 338-1361 office/fax  
Andrea.L.Erichsen@hawaii.gov

Thomas K. Kaiakapu  
Wildlife Manager –Kaua'i District  
Department of Land and Natural Resources  
Division of Forestry and Wildlife  
State Office Building  
3060 Eiwa Street  
Lihue, Kaua'i, HI 96766-1875  
(808) 274-3440 office



www.hawaii.gov/dlnr/



www.dofaw.net

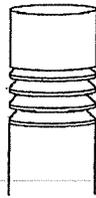
# ACCEPTABLE ONLY WITH PROPER BULB(S)

# UNACCEPTABLE

WALKWAY/PATH LIGHTING

STREET/PARKING LIGHTING

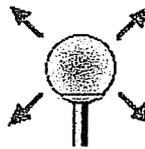
ARCHITECTURAL LIGHTING



Low Profile Bollards with Louvers



Unshielded Carriage



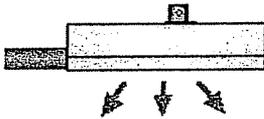
Globe Fixture



Wallpack



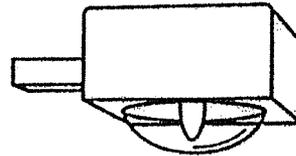
Acorn Fixture



Full Cutoff Low Pressure Sodium Streetlight



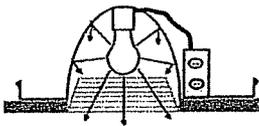
Fully Shilded NEMA Light



Drop-Lens/Sag-Lens w/ exposed bulb



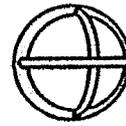
Unshielded Streetlight



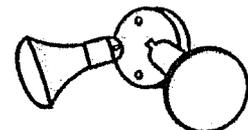
Recessed Can w/ baffles



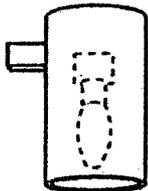
Glare Buster



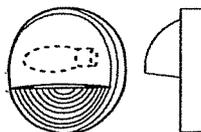
Nautical Wall Sconce



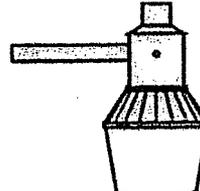
Floodlight



Canister Downlight



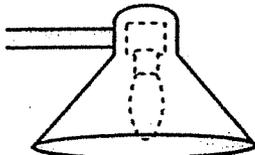
'Eyelid' Step Light



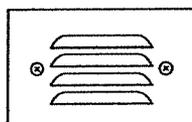
NEMA Security Light



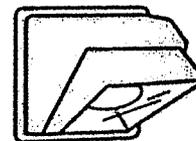
Partially Shilded Floodlight



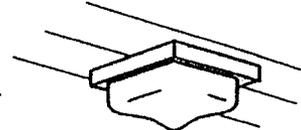
Downlight



Louvered Step Light



Shielded Security Light



Drop-Lens Canopy Light

Bulbs for all fixtures should be of the Yellow 'Bug' Light variety incandescent or compact fluorescent.

May 21, 2007

State Historic Preservation Division  
State of Hawai'i Department of Land and Natural Resources  
Kakuhihewa Building, 601 Kamokila Blvd., Suite 555  
Kapolei, Hawai'i 96707

Attention: Ms. Melanie A. Chinen, Administrator

**Subject: Letter of Determination, Historic Preservation Review, Agriculture (Biomass)  
Waste-to-Energy Project, Koloa District, Island of Kaua'i  
Tax Map Keys 2-7-001:001 and 2-7-001:004**

Dear Ms. Chinen:

Green Energy Team, LLC (Green Energy Team) is proposing an agriculture waste-to-energy facility on Kaua'i, Hawai'i. The need for the project arises because of the State of Hawai'i Revised Statute (HRS) renewable portfolio standard (Title 15, Chapter 269, Part V) that mandates that each electrical utility company shall provide twenty percent of its net electricity through renewable energy by the end of the year 2020. The facility would utilize Albizia and Eucalyptus tree wood chips as well as other available agricultural waste products as a source of energy to produce an estimated 7,100 kilowatts of gross electrical output. The plant is to strictly use biomass materials (plant materials used specifically as a source of fuel), and they are to come from on-island resources

The proposed project site is located on the Island of Kaua'i in the Koloa District approximately 9 miles southwest of Lihue, 2.5 miles northeast of Omao Town, 3 miles north of Koloa Town, and northeast of Kaunualii Highway and identified with Tax Map Key 2-7-001:00 (Figure 1). The proposed project area is currently undeveloped agricultural land comprised of a single parcel approximately 64.2 acres in size. The proposed site for the actual agricultural waste-to-energy facility is located on a 5.5 acre parcel within the 64 acres that is cultivated with trees; approximately 1,200 feet north of Kaunualii Highway, approximately 6 miles from the shoreline of the Pacific Ocean. The land is all privately owned and leased by Hawai'ian Mahogany, Inc. (HMI).

Since the proposed project is the development of an agriculture waste-to-energy facility it triggers the environmental review process mandated under HRS Chapter 343. The proposed facility would utilize agriculture waste processed into energy as an integral part of an existing agricultural operation. The facility would be an environmentally sound method of handling the waste stream of the agriculture operation, generating clean sustainable energy to the community of Kaua'i while stimulating further agricultural activity. The proposed action would include the construction of a 10-inch subsurface pipeline to transfer/deliver water from the Koloa Ditch System, located approximately one mile southwest of the proposed site in TMK 2-7-001:004. A proposed pipeline

alignment is shown on the attached figure. The land utilized for the pipeline is also privately owned and leased by HMI.

In order to facilitate consultation and coordination of the consultation process, Green Energy Team has designated Earth Tech, Inc. to act as an authorized representative for this action (see attached authorization letter). Actions relevant to the State Historic Preservation Division for this project include historic preservation review. On behalf of Green Energy Team, we are seeking a determination as to whether the proposed project would have any adverse effect on significant historic properties. The proposed project would include some minor excavation at the facility site as well as an approximate 4 foot wide by 2 foot deep excavation corridor for the pipeline. However, since the land that would be utilized for the proposed facility as well as the pipeline alignment has historically been utilized for the cultivation of sugar cane and is heavily disturbed, we do not anticipate any adverse impacts on significant historic properties. In addition, based on our record review and several site visits, we have not identified any significant historic sites within the project area and are seeking your concurrence that no adverse impacts would be anticipated with the implementation of the proposed action.

We would appreciate a response within 30 days of the receipt of this letter. Thank you for your assistance, and should you have any questions, please contact me at 356-5322 or [michelle.mason@earthtech.com](mailto:michelle.mason@earthtech.com).

Sincerely,



Michelle Mason  
Project Manager

Enclosures: Letter of Authorization  
Site Location Maps  
Proposed Water Pipeline Alignment

cc: Mr. Eric Knutzen, Green Energy Team – Via Email Transmission  
Ms. Nancy McMahon, Kaua'i Island Archaeologist – Via Email Transmission  
Ms. Tanya Copeland, Earth Tech – Transmittal Letter Only

TO: FEDERAL, STATE OF HAWAII, AND LOCAL AGENCIES

FROM: ERIC KNUTZEN, AUTHORIZED OFFICER, GREEN ENERGY TEAM LLC

SUBJECT: BIOMASS-TO-ENERGY PROJECT, KNUDSEN GAP, DISTRICT OF LIHUE,  
ISLAND OF KAUAI

Green Energy Team LLC (Green Energy Team) is proposing a Biomass-to-Energy (BTE) Facility on Kauai, Hawaii. The proposed project site is located approximately 1.5 miles northeast of Knudsen Gap on the south side of the island of Kauai and identified with Tax Map Key (TMK) 2-7-001:001 (see Figure 1-1). The proposed BTE site is located approximately 1,200 feet north of Kaumualii Highway and approximately 6 miles from the shoreline of the Pacific Ocean and is situated on a 6 acre plot of agricultural land cultivated with trees.

The proposed project is the development of a waste-to-energy facility, and therefore, triggers the environmental review process mandated under Hawaii Revised Statutes (HRS) Chapter 343. The proposed BTE facility would utilize agriculture waste processed into energy as an integral part of an existing agriculture operation. The facility would be an environmentally sound method of handling the waste stream of the agriculture operation, generating clean sustainable energy to the community of Kauai while stimulating further agricultural activity.

The need for the project arises because of the State of Hawaii Revised Statute (Title 15, Chapter 269, Part V) renewable portfolio standard (RPS) that mandates that each electrical utility company shall provide twenty percent of its net electricity through renewable energy by the end of the year 2020.

In order to expedite the project schedule, Green Energy Team has designated Earth Tech, Inc. (Earth Tech) to act as our authorized representative for coordination and consultation with appropriate federal, state, and local agencies. I would appreciate all courtesies to be extended to Earth Tech during the coordination and consultation period.

In response, please reply to the attention of Michelle Mason of Earth Tech at the following address and reference Project No. 98108:

Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, Hawaii 96813

Should you have any questions or require additional information, please contact Michelle Mason of Earth Tech at (808) 356-5322.

Sincerely,



Eric Knutzen, Project Engineer  
Green Energy Team LLC



Koloa Ditch



GEH Site

Kolao Ditch Tie In

Maluhia Rd

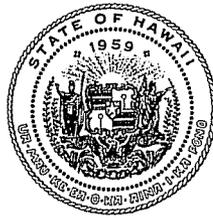
Kaumualli Hwy

Kahili Rd

Image © 2007 DigitalGlobe  
© 2007 TeleAtlas  
USGS  
© 2007 Navteq

©2007 Google™

LINDA LINGLE  
GOVERNOR OF HAWAII



ALAN A. SMITH  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA  
DEPUTY DIRECTOR - LAND

PETER T. YOUNG  
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES  
BOATING AND OCEAN RECREATION  
BUREAU OF CONVEYANCES  
COMMISSION ON WATER RESOURCE MANAGEMENT  
CONSERVATION AND COASTAL LANDS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION  
601 KAMOKILA BOULEVARD, ROOM 555  
KAPOLEI, HAWAII 96707

June 8, 2007

Michelle Mason, Project Manager  
Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, Hawaii 96813-3920

LOG NO: 2007.1515  
DOC NO: 0705NM25  
Archaeology

Dear Ms. Mason:

**SUBJECT: Chapter 6E-42 Historic Preservation Review – Agriculture Biomass Waste to Energy Project (Green Energy Team LLC)  
Koloa, Kauai  
TMK: (4) 2-7-001: 001 and 004**

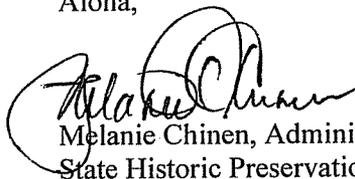
The aforementioned project is to construct a facility to convert biomass waste to energy.

We believe that “no historic properties will be affected” by this undertaking because:

- a) intensive cultivation has altered the land
- b) residential development/urbanization has altered the land
- c) previous grubbing/grading has altered the land
- d) an acceptable archaeological assessment or inventory survey found no historic properties
- e) this project has gone through the historic review process, and mitigation has been completed
- f) other:

In the event that historic resources, including human skeletal remains, are identified during the construction activities, all work needs to cease in the immediate vicinity of the find, the find needs to be protected from additional disturbance, and the State Historic Preservation Division, Kauai Section, needs to be contacted immediately at (808) 742-7033.

Aloha,

  
Melanie Chinen, Administrator  
State Historic Preservation Division

NM:jen

PHONE (808) 594-1888

FAX (808) 594-1865



**STATE OF HAWAII**  
**OFFICE OF HAWAIIAN AFFAIRS**  
711 KAPI'OLANI BOULEVARD, SUITE 500  
HONOLULU, HAWAII 96813

June 19, 2007

HRD07\_3047

Michelle Mason  
Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, Hawai'i 96813

Dear Ms. Mason:

**Re: Cultural Impact Assessment, Koloa District, Island of Kaua'i**  
**Tax Map key 2-7-001:001 and 2-7-001:004**

The Office of Hawaiian Affairs (OHA) is in receipt of your May 21, 2007 letter initiating consultation for a cultural impact assessment for a proposed agriculture waste to energy facility on tax map key (TMK) parcel 2-7-001:001 which is 64 acres in size. The actual project area would be 5.5 acres within the larger 64 acre parcel. A 10-inch subsurface pipeline would be constructed to transfer/deliver water to the project site from the Koloa Ditch System, located approximately one mile to the southwest of the project site on TMK 2-7-001:004.

OHA has no specific comments at this time, but seeks assurances that the cultural impact assessment will follow the guidelines established by the Office of Environmental Quality Control (OEQC). The OEQC has recommended that the extent of the assessment should be greater than the project area to ensure that cultural practices which may not occur within the boundaries of the project area, but which may be affected, are included in the assessment.

Please contact our Kaua'i Island Community Resource Coordinator, Ms. Kanani Kagawa at (808) 241-3506. Ms Kagawa may be able to identify individuals who should be contacted and of particular cultural and historic sites or protected traditional and cultural practices which should be considered.

Michelle Mason  
Earth Tech  
June 19, 2007  
Page 2

OHA seeks assurances that if this project moves forward, should Native Hawaiian traditional, cultural, or burial sites be identified during ground disturbance, all work will immediately cease, and the appropriate agencies notified pursuant to applicable law.

Thank you for initiating consultation at this early stage and we look forward to the opportunity for a comprehensive review of the completed cultural impact assessment. Should you have any questions, please contact Keola Lindsey, Lead Advocate-Culture at (808) 594-1904 or [keolal@oha.org](mailto:keolal@oha.org).

'O wau iho nō,



Clyde W. Nāmu'o  
Administrator

C: Kanani Kagawa, OHA- Kaua'i Island Community Resource Coordinator  
3-3100 Kuhio Highway, Suite C4  
Lihue, Hawai'i 96766-1153

COUNTY OF KAUAI  
PLANNING DEPARTMENT  
4444 RICE STREET, SUITE A473  
LIHUE, KAUAI, HAWAII 96766-1326  
(808) 241-6677

MEMORANDUM

**DATE:** October 8, 2007

**TO:** Green Energy Team LLC – Eric Knutzen  
4343 Kapuna Road  
Kilauea, HI 96754

**FROM:**  Kauai Historic Preservation Review Commission

**SUBJECT:** Draft Environmental Assessment (EA), Agricultural Waste-To-Energy Facility, Green Energy Team LLC, TMK: (4)2-7-001:00, Koloa, Kauai.

---

Thank you for attending the Kauai Historic Preservation Review Commission [KHPRC] on October 4, 2007 to discuss the Draft Environmental Assessment (EA), Agricultural Waste-To-Energy Facility, Green Energy Team LLC, TMK: (4)2-7-001:00, Koloa, Kauai. It is the KHPRC's understanding that this request is to construct, operate, and maintain an agriculture waste-to-energy facility.

In light of the information provided, the KHPRC concurs with the State Historic Preservation Division's findings and offers the following additional recommendations:

- Incorporate place names of the area and their significance;
- Research history of area from the mele data bank at the Bishop Museum and research aerial and plantation maps of the area for pre and historic documentation on such matters such as but not limited to ditch systems, trails, kuleana, etc.;
- Obtain input from the community thru project informational meetings including consultation with local experts and cultural practitioners;
- That an archeologist monitor be present for ground disturbing work involving the tie into ditch line and other sub-surface work beneath prior disturbances caused by cultivation;
- Consider development of an interpretive area for school children, tourists, interested persons;
- Minimize impacts to cultural view plains mauka and makai; and
- The applicant use native plants in landscaping plan using the seed bank/plant stock from the ahupuaa as best extent as possible.

The KHPRC would like the opportunity to review this project again as part of the permitting process.

Please feel free to contact us should you have any questions regarding this matter.

Mahalo.

cc: State Historic Preservation Division  
Planning Department



Green Energy Team, LLC, A Renewable Agriculture Waste-to-Energy Plant

August 10, 2007

To: Steve Kyono, Department of Transportation, State of Hawai'i

Cc: Ian Costa, Director of Planning, County of Kaua'i

From: Eric Knutzen, Green Energy Team LLC

Re: Transportation Plan, Permit Application for Renewable Energy Plant

### **Proposed Transportation Plan**

There are two flows of traffic to and from the plant which we are proposing as described below:

#### **1. Traffic Flow One, Plant Personnel Transportation**

##### Staff Total, Nine Individuals

The plant is proposed to be manned by nine individuals during each 24 hour time period. Operational hours would be 24 hours, seven days a week, with one operator per shift, as well as a plant manager, clerical, and maintenance staff during the day shift.

##### Access from Highway Proposed

Proposed ingress would be from a southbound manner, with a right turn onto the gravel road known locally as the gravel road with "the American flag" or "Old Government Road", as depicted on attached Exhibit A. Going forward, the access road is proposed to be referred to as "Green Energy Road".

##### No northbound left turns

Left turns would be prohibited, which will preclude employees traveling north from taking a left turn onto Green Energy Road to access the plant site.

##### Maintenance

Grass and other vegetation would be cut back and maintained to allow maximum visibility at the entrance to the access road.



Green Energy Team, LLC, A Renewable Agriculture Waste-to-Energy Plant

### Frequency and Time Frame of Access

Each employee is expected to access the plant site once per shift in either a car or truck (pick-up). Shift times would be as follows (estimates):

Evening Shift - 4:00 pm to 12:30 am, One Operator

Night Shift - 12:00 am to 8:30 am, One Operator

Day Shift - 8:00 am to 4:30 pm, One Operator, Plant Manager, Maintenance and Clerical staff

## **2. Traffic Flow Two, Feedstock Transportation**

### Overview

The plant site can generally be described as being located at the epicenter of the tree plantations maintained by the feedstock vendor - Hawaiian Mahogany, Inc. (HMI). Nearly all of the transportation of the feedstock would be made using the local cane haul roads, directly from the tree plantations. Approximately 8 to 10 large 20 yd<sup>3</sup> dump trucks would be used to transport the feedstock to the plant.

However, when accessing plantations found on the opposite side of the highway from the plant, HMI would need to cross the highway. Average crossings estimated are two to four per night, between the hours of 8:00 pm to 6:00 am, using a tractor hauling a flatbed trailer.

### Proposed Access from Highway

The crossing of the highway is proposed to be at the main cane haul gravel road found immediately west of Huleia (“Halfway”) Bridge, recently named “Green Energy Feedstock Road”. The entrance is shown as attached on Exhibit A.

### Maintenance

Grass and other vegetation would be cut back and maintained to allow maximum visibility at the entrance to Green Energy Feedstock Road.

### Time Frame of Access

No daytime crossings of the highway would be scheduled, as all crossings would be made between the hours of 8:00 pm and 6:00 am daily.



Green Energy Team, LLC, A Renewable Agriculture Waste-to-Energy Plant

### **Proposed Highway Easement**

Green Energy is also requesting to be granted an easement by the State of Hawai'i regarding two plastic pipes to be placed beneath the highway through the use of lateral drilling, as depicted on Exhibit A. Specifics are outlined below.

Two 10-inch pipes, which extend from the plant to the agricultural ditch access found just on the opposite side of the highway, would be required.

The pipes themselves would be made of typical ABS plastic, commonly used in such irrigation pipes. Just as in sugar cane days, the water in the ditch system would be accessed to cool the boiler system, and would then be returned to the ditch system after being brought back to within +/- 0.5°F of the original ditch water temperature.

### **Hawaiian Mahogany Inc.**

Our feedstock supplier - Hawaiian Mahogany Inc., is a separate legal entity. As confirmed by signature from the President of Hawaiian Mahogany Inc. - Bill Cowern, Green Energy Team LLC is authorized by Hawaiian Mahogany Inc to act as their agent with regards to this application, and all related easement and transportation issues.

Please call Eric Knutzen with any comments or questions you may have at (808) 651-5042, or email at [eric@knutzen.se](mailto:eric@knutzen.se)

Sincerely,

Eric Knutzen  
Authorized Representative  
Green Energy Team LLC

Bill Cowern  
Authorized Representative  
Hawaiian Mahogany Inc.



Mr. Knutzen,

I asked our engineering staff to review the information that you provided. Please see their comments below. Please contact me if you need further information.

Thanks

Ray

----- Forwarded by Raymond J McCormick/HWY/HIDOT on 09/12/2007 09:58 AM

-----

Ramon  
Acob/HWY/HIDOT

To  
09/10/2007 09:36 AM Raymond J [McCormick/HWY/HIDOT@HIDOT](mailto:McCormick/HWY/HIDOT@HIDOT)  
cc

Fred [Reyes/HWY/HIDOT@HIDOT](mailto:Reyes/HWY/HIDOT@HIDOT),  
Stanford M [Iwamoto/HWY/HIDOT@HIDOT](mailto:Iwamoto/HWY/HIDOT@HIDOT)

Subject  
Re: Fw: Green Energy Hawaii,  
Traffic Plan and related info  
(Document link: Raymond J McCormick  
(Archive) )

Ray,

Below are consolidated comments from Fred and me:

1. Green Energy team LLC shall be fully responsible for all required permits and environmental processes such as: public involvement, EA, Ag Master Plan, NCRS, County Planning Commission, etc.
2. On HDOT-Highways issues only: R/W - a Use and Occupancy Agreement, and/or Grant of Easement shall be Applicant's responsibility to obtain from HDOT (HWY-R), prior to start of operations.
3. Applicant shall submit plans to HWY-K, prepared by Hawaii-licensed civil engineer, for all proposed work within the State Highway R/W. Includes plant driveway access imps., directional drilling plans and details for the proposed 2 ea. 10" ABS pipes under Kaumualii Hwy. Plant driveway should be realigned to make a 90-degree approach to the highway. Accel/decel lanes be constructed on the north (Waimea-bound) side of highway, and No Left Turn sign facing Lihue-bound traffic. Street light(s) at driveway entrance should be included for night crossings, also Trucks Crossing Highway signs. Prefer crossing hours be more restricted, from 10 pm to 5 am (instead of 8 pm to 6 am proposed), to reduce the chances of broadside collisions when slow vehicles cross the highway.
4. The 2 pipelines shall also be installed perpendicular to the roadway.
5. When "work within R/W" plans are acceptable by HWY-K, Applicant shall obtain Permit to Perform Work and pay required fees to HWY-K. All work shall be at no cost to the State and be subject to all Permit conditions.
6. Permit to Operate or Transport Oversize/Overweight Permit Vehicles and Loads over State Highways shall be obtained from Kauai District.
7. The letter mentions about "Exhibit A" for both Traffic Flow One and Traffic Flow Two. Is attached Figure 2-3 same as "Exhibit A"? Said figure does not show the ingress west of Halfway Bridge.

Please see me or Fred if you have questions.

Thanks.

Ramon

Raymond J  
McCormick/HWY/HID  
OT

To  
Ramon [Acob/HWY/HIDOT@HIDOT](mailto:Acob/HWY/HIDOT@HIDOT), Fred

11/12/2007

09/07/2007 05:30 PM      Reyes/HWY/HIDOT@HIDOT  
cc

Subject  
Fw: Green Energy Hawaii, Traffic  
Plan and related info

Ramon,

Please take a look at the attached and let me know if you have comments.

Thanks

Ray

----- Forwarded by Raymond J McCormick/HWY/HIDOT on 09/07/2007 05:29 PM  
-----

Steven  
Kyono/HWY/HIDOT

To

08/27/2007 02:40 PM      Raymond J  
McCormick/HWY/HIDOT@HIDOT, Stanford  
M Iwamoto/HWY/HIDOT@HIDOT, Michael  
K Hinazumi/HWY/HIDOT@HIDOT

cc

Subject  
Fw: Green Energy Hawaii, Traffic  
Plan and related info

FYI

Ray for Steve

11/12/2007

----- Forwarded by Steven Kyono/HWY/HIDOT on 08/27/2007 02:39 PM -----

"Eric Knutzen"

<[eric@knutzen.se](mailto:eric@knutzen.se)>

To

08/26/2007 02:19

PM

<[Steven.kyono@hawaii.gov](mailto:Steven.kyono@hawaii.gov)>

cc

Subject

Green Energy Hawaii, Traffic Plan  
and related info

Aloha, Steve

Please find attached our traffic plan and related information regarding our Ag Waste-to-Energy project.

If there's any other info you believe we should add or if you suggest changes to the attached, pls let me know.

If you're comfortable with this document, Steve - would you pls forward this on to the respective DOT team members within Highways and perhaps other DOT agencies which need this info?

Thank you,

Eric

Eric Knutzen

Green Energy Hawaii LLC

4313 Kapuna Rd

Kilauea, HI, USA 96754

[eric@knutzen.se](mailto:eric@knutzen.se)

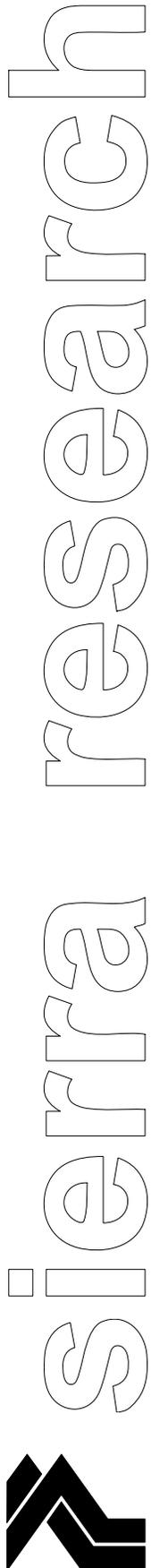
Tel +1 808 651 5042

[attachment "Green Energy Hawaii, Benefiting All on Kaua'i, Economically and Sustainably, August 2007 DOT.pdf" deleted by Ramon Acob/HWY/HIDOT]  
[attachment "Exhibit A, Ditch Tie in.pdf" deleted by Ramon Acob/HWY/HIDOT]

11/12/2007

**Appendix C**  
**CSP Application**





# **Application to the State of Hawaii Department of Health for a Covered Source Permit for a Biomass-to-Energy Plant in Koloa, Kauai, Hawaii**

prepared for:

**Green Energy Team LLC**

May 2007

prepared by:

Sierra Research, Inc.  
1801 J Street  
Sacramento, California 95814  
(916) 444-6666

APPLICATION  
to the  
STATE OF HAWAII DEPARTMENT OF HEALTH  
for a  
COVERED SOURCE PERMIT  
for a  
BIOMASS-TO-ENERGY PLANT  
in  
KOLOA, KAUAI, HAWAII

Submitted by:  
Green Energy Team LLC

May 2007

Prepared by:

Sierra Research, Inc.  
1801 J Street  
Sacramento, California 95814  
(916) 444-6666

## **SUMMARY**

Green Energy Team LLC is applying for a Covered Source Permit (CSP) for a proposed nominal 6.4 megawatt biomass-to-energy plant located north of Koloa, Kauai. This application is made pursuant to the State of Hawaii Administrative Rules, Chapter 11-60.1 Subchapter 5. The facility consists of two wood chip gasifiers with two nominal 40,000 pound per hour wood gas boilers (equipped with multiclones and an electrostatic precipitator for particulate control), a steam turbine, an evaporative cooler, two small emergency Diesel engines and associated fuel storage and handling equipment. As emissions of all pollutants will be below applicable thresholds, the proposed project will not be subject to PSD review.

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Appendix A Engineering Specifications

Appendix B Emissions Calculations

Appendix C Ambient Air Quality Modeling Analysis

## **PART I. FACILITY DESCRIPTION**

### **A. Applicant's Name and Business Description**

Name of Applicant: Green Energy Team LLC

Facility Address: Old Government Road  
Koloa, Kauai, HI 96784

Mailing Address: 4313 Kapuna Road  
Kilauea, Kauai, Hawaii 96754

Contact: Eric Knutzen  
(808) 651-5042

General Business

Description: Energy generation

Submitting Officer: Eric Knutzen, Partner

Consultants: Sierra Research  
1801 J Street  
Sacramento, California 95814  
Contact: Nancy Matthews  
(916) 444-6666

Type of Use Entitlement: Green Energy Team LLC will own and operate all of the equipment at the plant.

Estimated

Construction Date: Construction of the project is expected to begin January 1, 2008.

### **B. Type of Application**

This is an application for an initial Covered Source Permit (CSP) for a new stationary source. This application is being made to the State of Hawaii Department of Health pursuant to Hawaii Administrative Rules, Title 11, Chapter 11-60.1, Air Pollution Control.

### **C. Purpose**

The proposed project is a 6.4 MW net steam boiler-based electric generating plant fueled with wood chips. The project will require a CSP because it will be subject to several New Source Performance Standards (NSPS).

### **D. Facility Description**

The planned agricultural biomass-to-energy plant will be located in an agricultural area on the island of Kauai. As illustrated in Figure 1, the project will be located north of Old Government Road (Maluhia Road) in Koloa. The project will be constructed at an elevation of approximately 500 feet above mean sea level. The land surrounding the proposed project site includes grassland and forested land. The immediate vicinity of the site is fairly level, with hills to the south and west.

The property on which the project will be constructed is owned by Green Energy Team LLC. A site plan is included as Figure 2.

The Green Energy biomass-to-energy plant will utilize albizia and eucalyptus wood chips and small amounts of other available agricultural waste products and clean wood as a source of energy to produce an estimated 7,100 kW gross electrical output. All biomass materials are expected to come from the island of Kauai. All of the components for the plant are proven technologies that have been used for the past decade in similar applications. The technology used to produce power will be two 50 MMBtu/hr (HHV) biomass gasifiers in combination with two 40,000 pph industrial water tube boilers, followed by a multistage condensing steam turbine generator.

The steam-electric generating plant will have a maximum production capacity of approximately 7.1 MW (gross) and 6.4 MW (net). The plant will consist of fuel preparation, fuel storage, biomass gasification and power generation operations. The power plant will be operated up to 24 hours per day and 8,400 hours per year. Relevant structures and equipment include the following:

- The main Energy Plant building, which will house the biomass gasifiers, the steam boilers, the steam turbine and the other required auxiliary equipment. Administrative, mechanical and electrical rooms will also be housed in the Energy Plant building.
- The Feedstock Storage building, a pre-engineered fabric covered structure, which will store two days of chipped material under cover. The wood chipping operation will also occur under this roofed structure.

Figure 1  
General Facility Location

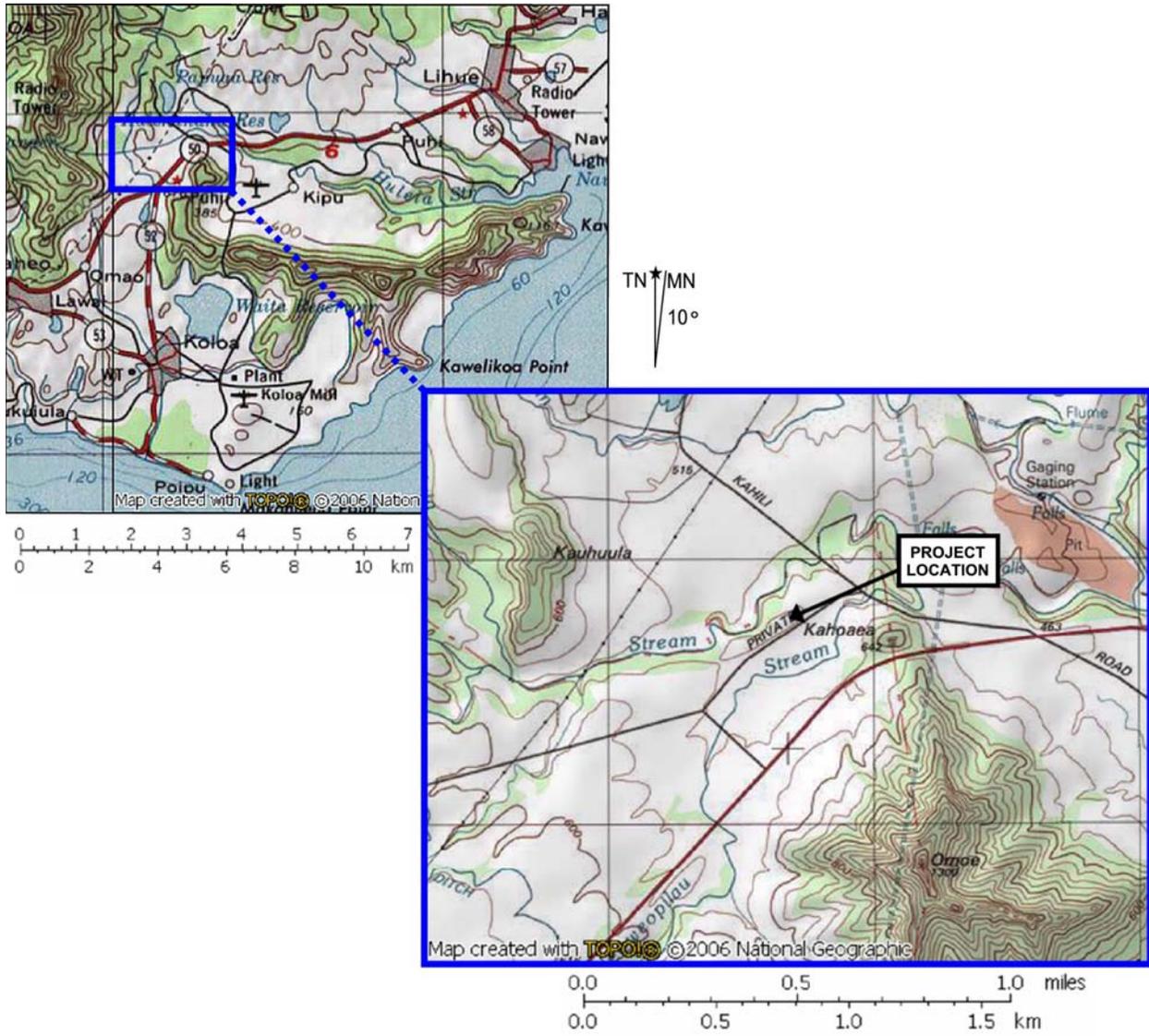
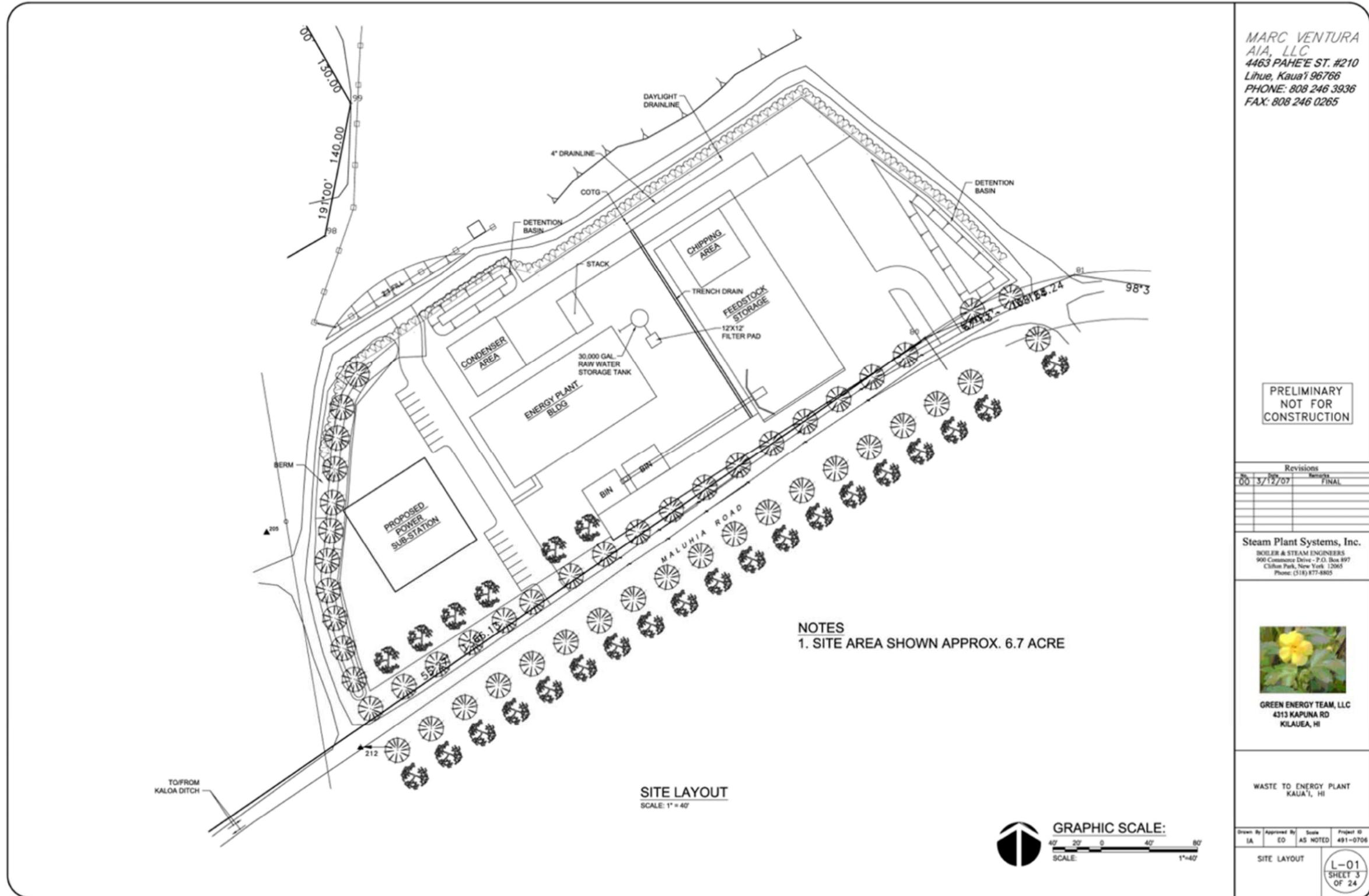


Figure 2  
Site Plan



MARC VENTURA  
AIA, LLC  
4463 PAHE'E ST. #210  
Lihue, Kaua'i 96766  
PHONE: 808 246 3936  
FAX: 808 246 0265

PRELIMINARY  
NOT FOR  
CONSTRUCTION

Revisions		
No.	Date	Remarks
00	3/12/07	FINAL

Steam Plant Systems, Inc.  
BOILER & STEAM ENGINEERS  
900 Commerce Drive - P.O. Box 897  
Clifton Park, New York 12065  
Phone: (518) 877-8805

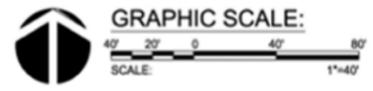


GREEN ENERGY TEAM, LLC  
4313 KAPUNA RD  
KILAUEA, HI

WASTE TO ENERGY PLANT  
KAUAI, HI

NOTES  
1. SITE AREA SHOWN APPROX. 6.7 ACRE

SITE LAYOUT  
SCALE: 1" = 40'



Drawn By	Approved By	Scale	Project ID
IA	EO	AS NOTED	491-0706

SITE LAYOUT

L-01  
SHEET 3  
OF 24

- Fuel surge bins, to hold the chipped wood fuel for metering into the gasifiers.
- Water treatment system.
- Small Diesel fuel storage tanks.
- A new electric substation.
- An electrostatic precipitator for control of particulate matter emissions from the boilers.
- An evaporative cooler.
- A nominal 500 kW Diesel emergency generator.
- A nominal 55 kW Diesel fire water pump engine.

### **E. Process Description**

The biomass gasification and steam generation process consists of the following operations, as illustrated in Figures 3 and 4.

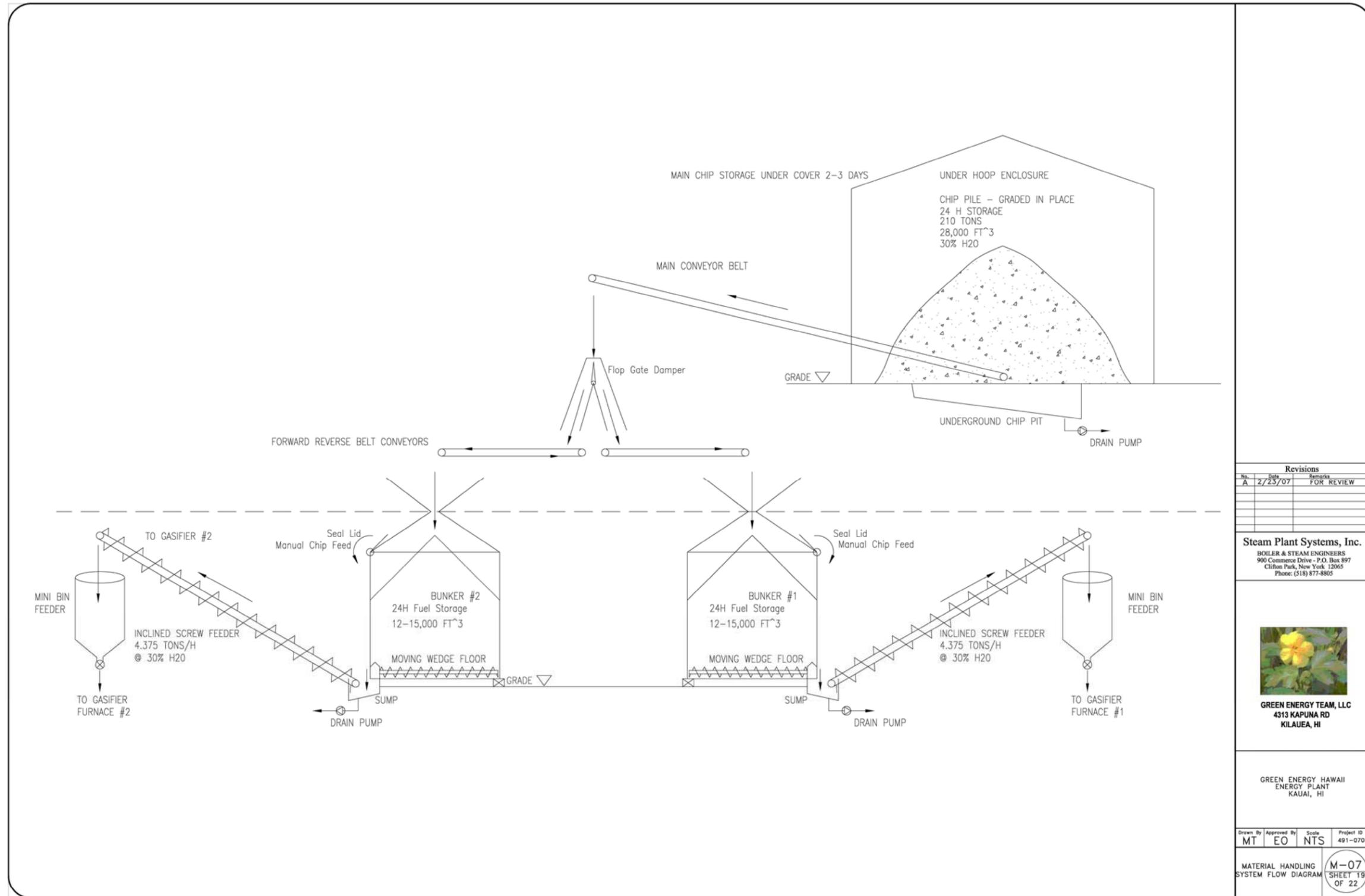
A majority of the biomass used to fuel the project will be derived from albizia and eucalyptus wood chips. The albizia and eucalyptus trees are grown in the Puhi area of Kauai. Most of the albizia and eucalyptus trees will be transported along cane haul roads to the plant site for chipping. The remaining portion of the fuel will be chipped at remote locations and hauled to the plant site in chipped form over cane haul roads. A small amount of other agricultural waste products, such as bushes and other woody plant material, and clean wood waste (dunnage), will also be used. No solid or liquid fossil fuels or treated wood will be used in the boilers for power production.\*

The chipped wood fuel will be stored for up to two days of drying in the feedstock storage building. The fuel will be pushed by a front-end loader into a pit. An underfeed conveyance system will transport the fuel up to surge bins which will meter the chips into the gasification chambers. Biomass fuel will enter a hot refractory lined chamber where the temperature will be elevated to the point where the volatile pyrolysis gas (wood gas) is released into an oxygen-deprived environment. In the gasifier, the biomass will undergo three processes:

---

\* A small quantity of Diesel fuel will be used to ignite the chipped wood fuel during boiler startup. See Section II.A.

**Figure 3**  
**Material Handling System Flow Diagram**



Revisions		
No.	Date	Remarks
A	2/23/07	FOR REVIEW

**Steam Plant Systems, Inc.**  
 BOILER & STEAM ENGINEERS  
 900 Commerce Drive - P.O. Box 897  
 Clifton Park, New York 12065  
 Phone: (518) 877-8805



**GREEN ENERGY TEAM, LLC**  
 4313 KAPUNA RD  
 KILAUEA, HI

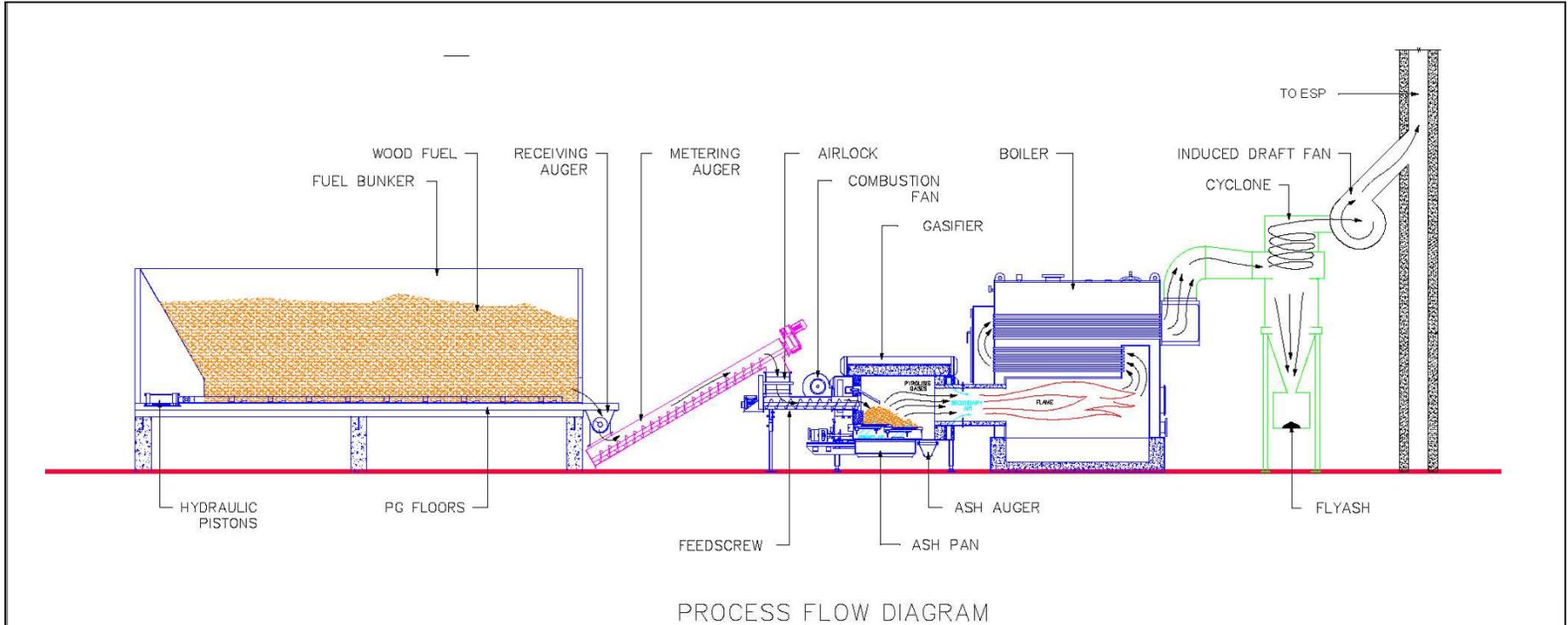
GREEN ENERGY HAWAII  
 ENERGY PLANT  
 KAUAI, HI

Drawn By	Approved By	Scale	Project ID
MT	EO	NTS	491-0708

MATERIAL HANDLING  
 SYSTEM FLOW DIAGRAM

M-07  
 SHEET 19  
 OF 22

**Figure 4**  
**Gasifier Process Flow Diagram**



<p align="center"><b>CHIPT EC</b> WOOD ENERGY SYSTEMS</p>  <p>48 Helen Avenue South Burlington Vermont 05403 Tel: 802-658-0956 Fax: 802-660-8904 Shop: 802-453-4919</p>	PROJECT NAME:	DRAWING TITLE:	SIZE:
	XXX XXX	SAMPLE DRAWING	B
	NOTE: DO NOT SCALE!! THIS DRAWING MAY HAVE BEEN REPRODUCED AT A SMALLER SIZE THAN THE ORIGINAL AND IS NOT NECESSARILY TO SCALE.	DATE: 10-20-98 DRAWN BY: KP FILE: CX-4 FUNCTION.DWG	SCALE: NONE CHECKED BY: JT

- The pyrolysis (or devolatilization) process occurs as the carbonaceous particles (wood) heat up. Volatiles are released and char is produced.
- The combustion process occurs as the volatile products and some of the char reacts with oxygen to form carbon dioxide and carbon monoxide, which provides heat for the subsequent gasification reactions. Pyrolysis and combustion are very rapid processes.
- The gasification process occurs as the char reacts with carbon dioxide and steam to produce carbon monoxide and hydrogen. The resulting gas is called wood gas.

Each gasifier is sealed so that the products of gasification cannot exit the gasification chamber except through the boilers. The gasifiers are close-coupled to industrial water-tube steam boilers. The wood gas generated in each gasifier travels through the boiler burner nozzle where it is superheated and mixed with air for complete combustion. The steam generated in each boiler will be used in a multistage condensing steam turbine generator to generate up to 7.1 MW (gross) of electricity. The steam is superheated and collected in a header and then piped to the multistage condensing turbine at 600 psi/750 deg F. The steam will turn the turbine to produce electricity and be exhausted after the last turbine stage to the condenser. The evaporative cooler will cool and condense the steam. The condensed steam will be collected in the surge tank to start the cycle again. Supplemental plant systems that result in air emissions will include wood chipping, storage and handling equipment; ash handling equipment; a nominal 500-kW Diesel standby generator; a nominal 55-kW emergency Diesel fire pump engine; and an electrostatic precipitator for control of particulate emissions from the boilers.

## **F. Emission Sources**

The proposed project includes the following main sources of air pollutant emissions:

- Biomass gasifiers/boilers/electrostatic precipitator (ESP)
- Evaporative cooler
- Standby Diesel generator
- Emergency Diesel fire pump engine
- Fuel and ash storage and handling systems

Following is a description of each emissions source.

1. Biomass Gasifiers/Boilers

The biomass gasification process was described in the preceding section and illustrated in Figure 4. The gasifiers and boilers will be operated up to 24 hours per day and 8,400 hours per year. Equipment specifications for the proposed gasifiers/boilers are summarized in Table 1. Each boiler will be equipped with a multiclone for primary particulate emissions control. The boilers will exhaust through the ESP for additional particulate emissions control.

<b>Table 1 Design Specifications –Gasifiers and Steam Boilers</b>	
Manufacturer	to be determined
Boiler Model	to be determined
Primary Fuel	Albizia and eucalyptus wood chips
Backup Fuels	other agricultural material
Nominal Steam Generating Rate (lb/hr)	40,000 (each)
Nominal Steam Pressure (psig)	600
Maximum Heat Input Rate (MMBtu/hr)	50 (each)
Nominal Fuel Feed Rate (tph wood)	4.3 (each) <sup>1</sup>
Exhaust Temperature (°F)	340
Note: 1. Fuel feed rate will vary depending upon moisture content. Typical moisture content will be about 30%, and the nominal fuel feed rate shown reflects a heat input of 50 MMBtu/hr (HHV) at that moisture. Fuel feed rate may be higher or lower than the nominal rate shown as the moisture content of the wood may vary between 10% and 50%.	

Typical fuel characteristics for the albizia and eucalyptus biomass fuels are provided in Table 2.

<b>Table 2 Typical Fuel Specifications</b>	
Albizia	
Nitrogen, Wt. %	0.25 (typical)
Sulfur, Wt. %	0.05 (maximum)
Moisture, Wt. %	30 (typical)
Ash, Wt. %	1.25 (typical)
Heat Content, Btu/lb HHV (dry)	8400 (typical)
Eucalyptus	
Nitrogen, Wt. %	0.5 (typical)
Sulfur, Wt. %	0.02 (maximum)
Moisture, Wt. %	30 (typical)
Ash, Wt. %	1.75 (typical)
Heat Content, Btu/lb HHV (dry)	8400 (typical)

## 2. Evaporative Cooler

An evaporative cooler will remove heat from the cooling water return stream so that the water can be recycled and reused as cooling water. In an evaporative cooler, warm process fluids or vapors are cooled in a closed-loop tube bundle so that the process fluid being cooled never comes in contact with the outside air. The evaporative cooler will be equipped with mist eliminators to minimize drift (i.e., entrained water droplets) from the cooling water that is sprayed on the tube bundles. The evaporative cooler will be operated up to 24 hours per day and 8,760 hours per year. The design assumptions for the evaporative cooler are summarized in Table 3. Engineering specifications are contained in Appendix A.

<b>Table 3 Design Specifications – Evaporative Cooler</b>	
Manufacturer	Marley
Model	MHF702D061 or equivalent
Recirculation Rate (gpm)	4,000
Drift Rate (wt %)	0.005
Total Dissolved Solids (mg/L)	1500

### 3. Multiclones and Electrostatic Precipitator

Each boiler exhausts through a multicyclone. The cyclones are used as precleaners to remove larger particles before the exhaust streams enter the electrostatic precipitator (ESP).

Cyclones use inertia to remove particles from the gas stream. The cyclone imparts centrifugal force on the gas stream, usually within a conical shaped chamber. Cyclones operate by creating a double vortex inside the cyclone body. The incoming gas is forced into circular motion down the cyclone near the inner surface of the cyclone walls. At the bottom of the cyclone, the gas turns and then spirals up through the center of the cyclone and exits out of the top outlet. Particles in the gas stream are forced toward the cyclone walls by the centrifugal force of the spinning gas.

An ESP will be used to further control particulate emissions from the boilers. ESPs use an electric charge to ionize particulate matter in the exhaust stream and attract the particles to a plate that is periodically cleaned. The particles collected using an ESP are released to a hopper by physically rapping the ESP collection plates to loosen the particles so that they will fall due to gravity. The exhaust from both boilers will exit through a single ESP. The ESP design parameters are shown in Table 4 below.

<b>Table 4 Design Specifications – Electrostatic Precipitator</b>	
Manufacturer	PPC Industries or equivalent
Design exhaust volume (acfm)	34,728
Exhaust Temperature (°F)	340
Gas velocity (ft/sec)	4.35
Treatment time (seconds)	5.5
SCA (sq. ft./1000 acfm)	191.9
Number/spacing of gas passages	11 @ 11.5 inches
Number of discharge electrodes	176
Guaranteed emission rate (lb/MMbtu)	0.025

4. Diesel Electric Generator

A Diesel electric generator set will provide a backup supply of electricity to meet the electricity demands of the plant when the boilers are not operating and electricity is not available from the serving utility. A 670 bhp internal combustion engine will drive a 500 kW electrical generator. The engine is a four-stroke, compression ignition design with turbocharging and aftercooling. The DEG will be fueled exclusively with Diesel fuel, and will be limited to the equivalent of 200 hours of full load operation per year.

Equipment specifications for the Diesel generator are summarized in Table 5.

Engineering specifications are contained in Appendix A.

<b>Table 5 Design Specifications – Emergency Diesel Generator</b>	
Manufacturer	Caterpillar or equivalent
Model	C15 ATAAC or equivalent
Emissions Certification	EPA Tier 2
Fuel	Diesel
Generator Power Output (kW)	500
Engine Work Output (bhp)	670
Fuel Feed Rate (gal/hr)	37.4
Maximum Heat Input Rate (MMBtu/hr)	5.2
Annual Heat Input Limit (MMBtu/yr)	520
Heat Rate (Btu/bhp-hr)	7,756
Exhaust Temperature (°F)	948.4
Exhaust Flow Rate (wacfm)	3,927
Stack Height (feet)	15
Stack Diameter (inches)	12

5. Diesel Fire Pump Engine

A nominal 55 bhp Diesel engine will drive an emergency fire pump. This unit will be operated for mandatory testing and maintenance on average one hour per week; maximum annual emissions are evaluated assuming a maximum of 100 hours per year of operation. Although the unit is classified as an insignificant activity under HAR 11-60.1, fire pump engines are now subject to federal new source performance standards and therefore must be included in the permit application. Equipment specifications for the Diesel generator are summarized in Table 6. Equipment specifications are included in Appendix A.

<b>Table 6 Design Specifications – Diesel Fire Pump Engine</b>	
Manufacturer	Clarke or equivalent
Model	JU4H-UF12 or equivalent
Emissions Certification	EPA Tier 2
Fuel	Diesel
Engine Work Output (bhp)	59
Fuel Feed Rate (gal/hr)	3.4
Maximum Heat Input Rate (MMBtu/hr)	0.5
Annual Heat Input Limit (MMBtu/yr)	50
Heat Rate (Btu/bhp-hr)	7,877
Exhaust Temperature (°F)	1055
Exhaust Flow Rate (wacfm)	531
Stack Height (feet)	15
Stack Diameter (inches)	6

#### 6. Fuel and Ash Preparation, Storage and Handling Systems

As discussed above, the wood chip fuel for the gasifiers will be prepared either onsite or at the locations where the trees are harvested. In the latter case, the wood chips will be transported by truck to the facility and dumped into the receiving pit. For fuel prepared onsite, logs will be transported by truck from the storage area to the receiving area, where they will be fed into an electric chipper/screener. The chipped wood fuel will be stored in the feedstock storage building for approximately two days, and will then be pushed from the storage area to the receiving pit by front-end loader.

The wood chip material handling system will transport screened wood chips via conventional inclined belt conveyor from the underground receiving pit/reclaimer to the two wood chip storage bunkers located just in front of the two gasifier units. The wood chips will be drawn out of the bottom of the bunkers via a live bottom hydraulically operated moving wedge floor which will feed into a horizontal/inclined drag conveyor. At the drag conveyor outlets, the wood chips will be dropped into screw auger feeders which will transport the fuel to gasifier air lock openings. From here, the wood chips will enter a fuel distributor which will further split the fuel to the wood chip openings in the gasifier furnace frontwalls.

The ash from the multi-cyclones will be deposited in steel tipping dumpsters employing drop chutes into the dumpsters. Ash from the ESP will be collected via drop chutes into tipping dumpsters. The ash will be used for local agricultural needs as a natural fertilizer. Because the gasification process is extremely efficient, there will be very little boiler

bottom ash to be disposed of. This small quantity of bottom ash will also be used as fertilizer.

Fugitive dust from both the fuel and ash handling systems will be controlled by water sprinkler systems. GEH will prepare and submit a fuel and ash emissions control plan.

### **G. Insignificant Activities**

Insignificant activities at the proposed biomass-to-energy plant include those listed below.

- Water treatment system. The Koloa Ditch source water that is used for cooling tower makeup will undergo cloth-media filtration, pH adjustment, and sodium hypochlorite disinfection. The filter design also provides for the addition of sodium hypochlorite (as an oxidizing reagent) to the inlet of the cloth-media filters should the iron and/or manganese concentrations be higher than that allowed for the downstream processing needs. The treated water for the evaporative cooler will also require treatment with ortho-phosphate and polyacrylate chemicals for scale and corrosion control. These filtered waters also provide water for fire protection, factory service, and pretreated water for the treatment systems that meet the combined boiler make-up water and potable water service requirements. The water treatment system will have no air pollutant emissions.
- Diesel fuel storage tanks and dispenser. Fuel for the emergency Diesel generator and fire pump engine and for plant mobile equipment will be stored in small, aboveground storage tanks with capacities of approximately 400 gallons, 25 gallons, and 500 gallons, respectively. These tanks are insignificant activities under HAR 11-60.1-82(f)(1).

### **H. Operating Scenarios**

No alternative operating scenarios are proposed for the biomass-to-energy facility.

## PART II. PROJECT EMISSIONS

Regulated pollutants emitted from the biomass-to-energy plant will include carbon monoxide (CO), NO<sub>x</sub>, particulate matter (PM), particulate matter less than 10 microns in diameter (PM<sub>10</sub>), particulate matter less than 2.5 microns in diameter (PM<sub>2.5</sub>), sulfur dioxide (SO<sub>2</sub>), and VOCs. This part of the application presents the proposed maximum hourly and annual emissions of regulated pollutants from the following emission units associated with the proposed project:

- Biomass gasifiers/boilers/electrostatic precipitator (ESP);
- Evaporative cooler;
- Standby Diesel generator; and
- Emergency Diesel fire pump engine.

This part also presents the maximum hazardous air pollutant (HAP) emissions from the biomass-to-energy plant. Tables containing the detailed emission calculations are presented in Appendix B.

### A. Biomass Gasifiers/Boilers/ESP Emissions

The gasifiers will feed the fuel gas generated from the biomass directly to the boilers and the boilers will exhaust through the ESP. Emissions guarantees provided by a gasifier/boiler supplier (for NO<sub>x</sub> and CO) and by the ESP vendor (for PM<sub>10</sub>) were used as the basis for calculating emissions of these pollutants. Emissions of SO<sub>2</sub> are calculated stoichiometrically based on the maximum sulfur in the biomass fuel. Emissions of VOC are taken from AP-42. Maximum annual emissions reflect full-load operation of two gasifier/boilers at a maximum gasifier heat input rate of 50 MMBtu/hr (HHV) each for 8,400 hours per year. Maximum emissions from the boilers are summarized in Table 7.

Because the gasifiers will feed the wood gas directly to the boilers, the gasifiers themselves will have no air pollutant emissions under normal operating conditions. The only time the gasifiers will emit any air pollutants is during startup and shutdown operations. Gasifier and boiler startups and shutdowns will generally require up to eight hours, and will occur in two stages. During the first stage, which will require approximately two hours, combustion will begin in the gasifiers and emissions will be vented directly to the atmosphere. During the second phase, gas will be generated and burned in the boilers, but the boilers will not have reached normal operating conditions and therefore will not be operating in compliance with their proposed emission limits for

normal operation. Estimated emissions during gasifier and boiler startup and shutdown are shown in detail in Attachment B. Emissions are calculated for an assumed 50 startups per year (approximately one per week) per boiler, each lasting approximately eight hours.

<b>Table 7</b> <b>Maximum Emissions from the Boilers During Normal Operation</b> <b>(total, two units)</b>		
Pollutant	lb/hr (3-hour average)	tpy
NO <sub>x</sub>	25.0	105.0
SO <sub>x</sub>	10.0	42.0
CO	20.0	84.0
VOC	2.55	10.7
PM <sub>10</sub> /PM <sub>2.5</sub>	2.56	10.7

1. Gasifier Startup and Shutdown

To start one of the gasifiers, the operator fills the gasifier box to approximately one-half to two-thirds of capacity and approximately five gallons of Diesel fuel is sprayed on top of the fuel pile. The fuel pile is lighted and burns with the rear access doors open to provide combustion air until a sufficient bed of incandescent charcoal has been developed to allow the burner to ignite when the access doors are closed. Until the access doors are closed, the gasifier emissions will exit through the access doors

During a system shutdown, the fuel feed is turned off and the fuel pile is allowed to burn down. Once gas is no longer being generated in the gasifier, the fuel will continue to burn in the fuel pile until the fuel supply is exhausted.

Emissions from the gasifiers during startup and shutdown will not be typical of those from a wood-fired boiler because of the large volumes of excess air. After a review of AP-42 emission factor categories related to various types of wood combustion, it was decided that emission factors from a process called “air curtain combustion” would best represent emissions from the gasifiers during the startup and shutdown process. An air curtain burner is a steel container lined with refractory, with an open top. High velocity air is directed across and downwards at a specific angle into the combustion area creating the air curtain on top and a rotational turbulence within the combustion chamber. The rotational turbulence provides an oxygen enriched environment within the combustion

zone. Air curtain combustors are used by the US Forest Service for efficient disposal of wood waste from forest clearing. Data from emissions tests on air curtain combustors were obtained from <http://www.airburners.com/ab-tdownloads.htm>. Estimated emissions from the gasifiers are shown in Table 8.

<b>Table 8</b>		
<b>Maximum Emissions from the Gasifiers During Startups/Shutdowns</b>		
Pollutant	lb/hr, each unit	tpy (total, two units)
NO <sub>x</sub>	18.0	1.8
SO <sub>x</sub>	15.1	1.5
CO	468	46.8
VOC	19.8	2.0
PM <sub>10</sub> /PM <sub>2.5</sub>	19.8	2.0

## 2. Boiler Startup and Shutdown

Once the burners ignite, the speed of the induced draft fan is increased and the oxygen level in the gasifiers is adjusted to slowly increase the gasifier and boiler output. At this point the fuel gas generated in the gasifiers is burned in the boilers, but both the gasifiers and the boilers are operated at reduced loads with relatively high oxygen levels. Until the excess air is reduced to normal operating levels (below approximately 8% O<sub>2</sub>), the ESP cannot be energized so the only particulate control is provided by the multiclones.

For a planned system shutdown, the operator will place the system into manual operation and turn off the fuel feed to the gasifier. As the fuel is consumed, less and less fuel gas will be generated until there is no longer any gas to be burned in the boiler.

Emissions from the boilers during this phase of the startup and shutdown activities are expected to be comparable to those from an uncontrolled wood-fired boiler. Emission factors for estimating emissions during boiler startup and shutdown were taken from AP-42, Section 1.6, Wood Residue Combustion in Boilers. Estimated emissions are summarized in Table 9 and calculations and assumptions are shown in Appendix B.

<b>Table 9</b>		
<b>Estimated Emissions from the Boilers During Startup/Shutdown</b>		
Pollutant	lb/hr, each unit	tpy (total, two units)
NO <sub>x</sub>	5.5	1.7
SO <sub>x</sub>	2.5	0.8
CO	15.0	4.5
VOC	0.6	0.2
PM <sub>10</sub> /PM <sub>2.5</sub>	7.7	2.3

### **B. Evaporative Cooler Emissions**

The evaporative cooler will emit only PM, PM<sub>10</sub>, and PM<sub>2.5</sub>. PM is assumed to be 100% PM<sub>10</sub>/PM<sub>2.5</sub>. Maximum hourly PM<sub>10</sub>/PM<sub>2.5</sub> emissions of 0.15 lb/hr from the cooling tower were calculated from the recirculation rate, the mist eliminator drift rate, and the maximum cooling water TDS concentration. Maximum annual PM<sub>10</sub>/PM<sub>2.5</sub> emissions of 0.7 tpy reflect operation for 8,760 hours per year. Spreadsheets containing detailed emission calculations are presented in Appendix B.

### **C. Emergency Diesel Generator Emissions**

Maximum hourly emissions of NO<sub>x</sub>, CO, VOC, and PM<sub>10</sub>/PM<sub>2.5</sub> from the emergency Diesel generator were obtained from Caterpillar for a typical 500 kW Diesel generator meeting Tier 2 emission standards. PM was assumed to be comprised of 100% PM<sub>10</sub>/PM<sub>2.5</sub>. Emission factors were calculated from the hourly emission rate and the engine work output. Maximum hourly SO<sub>x</sub> emissions were calculated from the emission factor and the engine work output. The SO<sub>x</sub> emission factor was derived from the fuel consumption rate, the fuel density, the maximum fuel sulfur content (0.05% by weight), and the engine work output. Maximum annual emissions reflect a proposed fuel use limitation that is equivalent to 200 hours per year of full load operation, including up to 100 hours per year of operation for reliability testing. The maximum emissions from the Diesel generator are summarized in Table 10. Detailed emission calculations are presented in Appendix B.

<b>Table 10</b>		
<b>Maximum Emissions from the Emergency Diesel Generator</b>		
Pollutant	Emission Rate	
	lb/hr	tpy
NOx	8.54	0.85
SOx	0.26	0.026
CO	0.58	0.058
VOC	0.01	0.0014
PM <sub>10</sub> /PM <sub>2.5</sub>	0.03	0.003

#### **D. Diesel Fire Pump Engine Emissions**

Maximum hourly emissions of NOx, CO, VOC, and PM<sub>10</sub>/PM<sub>2.5</sub> from the Diesel fire pump engine were obtained from Clarke for a typical 55 to 60 hp Diesel fire pump engine meeting Tier 2 emission standards. PM was assumed to be comprised of 100% PM<sub>10</sub>/PM<sub>2.5</sub>. Emission factors were calculated from the hourly emission rate and the engine work output. Maximum hourly SOx emissions were calculated from the emission factor and the engine work output. The SOx emission factor was derived from the fuel consumption rate, the fuel density, the maximum fuel sulfur content (0.05% by weight), and the engine work output. Maximum annual emissions reflect a proposed fuel use limitation that is equivalent to 100 hours per year of full load operation, including up to 50 hours per year of operation for reliability testing. The maximum emissions from the Diesel fire pump engine are summarized in Table 11. Detailed emission calculations are presented in Appendix B.

<b>Table 11</b>		
<b>Maximum Emissions from the Diesel Fire Pump Engine</b>		
Pollutant	Emission Rate	
	lb/hr	tpy
NOx	0.74	0.037
SOx	0.024	0.0012
CO	0.30	0.015
VOC	0.01	0.0007
PM <sub>10</sub> /PM <sub>2.5</sub>	0.05	0.003

**E. Facility Emissions**

Maximum facility emissions are summarized in Table 12 below.

<b>Table 12 Maximum Facility Emissions</b>					
Device(s)	Maximum Annual Emissions (tpy)				
	NOx	SOx	CO	VOC	PM <sub>10</sub> /PM <sub>2.5</sub>
Boilers (excluding startups/shutdowns)	105.0	42.0	84.0	10.7	10.7
Boilers (startups/shutdowns)	1.7	0.8	4.5	0.2	2.3
Gasifiers (startups/shutdowns only)	1.8	1.5	46.8	2.0	2.0
Evaporative Cooler	--	--	--	--	0.66
Diesel Generator	0.85	0.02	0.06	0.0014	0.003
Fire Pump Engine	0.037	0.0012	0.015	0.0007	0.003
<b>TOTALS</b>	109.4	44.3	135.4	12.9	15.7

**F. Monitoring, Emissions and Fuel Use Limits**

1. Emissions and Fuel Use Limits

An annual fuel use limit is proposed for each of the Diesel engines to limit annual emissions from these units. The fuel use limits for the emergency Diesel generator and Diesel fire pump engine are equivalent to 200 hours per year and 100 hours per year, respectively, of full load operation for each unit. These limits are summarized in Table 13.

<b>Table 13 Proposed Annual Limits</b>	
Unit/Fuel	Limit
Emergency Diesel generator, fuel use	7,500 gallons per year
Diesel fire pump engine, fuel use	50 gallons per year

## 2. Monitoring

### a. Fuel Use

Fuel consumption will be continuously monitored in the emergency Diesel generator and the Diesel fire pump engine. Fuel flow to the emergency engines will be monitored using nonresettable fuel meters.

### b. Emissions Monitoring

The gasifiers/boilers will be equipped with a continuous emissions monitoring system for NO<sub>x</sub> and diluent (O<sub>2</sub> or CO<sub>2</sub>), and exhaust flow rate. The emissions data will be collected and processed by a data acquisition and handling system (DAHS). Emissions concentrations will be converted to mass emission rates using monitored exhaust flow data and will be recorded in permanent form. Hourly, daily, monthly, and annual emissions of NO<sub>x</sub> will be maintained. Compliance with emission limits will be determined on a three-hour average basis, excluding periods of startup and shutdown.

### c. Monitoring Periods of Gasifier Startup and Shutdown

The applicant will monitor periods of gasifier startup and shutdown by recording the following for each gasifier:

- The date and time combustion begins in the gasifier (beginning of gasifier startup period);
- The date and time the rear gasifier doors are closed and the burner ignites (end of gasifier startup period);
- The date and time combustion terminates in the boiler (beginning of gasifier shutdown period); and
- The date and time combustion terminates in the gasifier (end of gasifier shutdown period).

The lb/hr emission rates shown for gasifier startup and shutdown in Table 8 will be used to calculate emissions from each gasifier during each startup and shutdown period. Startup and shutdown emissions will be included in the calculation of daily, monthly and 12-month rolling average emissions from the boilers.

### **G. Non-Criteria Pollutant Emissions**

Noncriteria pollutant emissions from the gasifiers/boilers and the emergency engines were calculated using AP-42 emission factors and the results of fuel analyses, where available, as well as daily and annual fuel use. Detailed calculations are shown in Appendix B. Total HAPs from the gasifiers/boilers will be 15.7 tons per year. HAP emissions from the emergency Diesel engines will be well below 0.1 ton per year. As emissions of each HAP are below 10 tpy and total HAP emissions are below 25 tpy, the facility will not be a major source of HAPs.

## **PART III. COMPLIANCE WITH APPLICABLE RULES AND REGULATIONS**

### **A. Covered Source Applicability**

Section 1 (Definitions) of Subchapter 1 (General Requirements) of Chapter 11-60.1 (Air Pollution Control) of the State of Hawaii Administrative Rules defines a “covered source” as any of the following:

- Any “major source,” which Section 1 further defines as a stationary source emitting at least 100 tpy of criteria pollutant, 10 tpy of any single hazardous air pollutant (HAP), or 25 tpy of all HAPs;
- Any source subject to a new source performance standard (NSPS) or other requirement under Section 111 of the Act;
- Any source subject to a national emissions standard for hazardous air pollutants (NESHAP) or other requirement pursuant to Section 112 of the Act, with the exception of those sources solely subject to regulations or requirements pursuant to Section 112(r) of the Act; and
- Any source subject to the rules for prevention of significant deterioration (PSD) of air quality as established in this chapter.

The proposed biomass-to-energy plant will be a major source of criteria pollutants because maximum facility emissions, as shown previously in Table 8, will exceed 100 tpy. The plant will not be a major source of HAPs because maximum facility HAP emissions, as shown previously in Part II.F, will not exceed 10 tpy for any single HAP and 25 tpy for all HAPs. However, the biomass-to-energy plant will be subject to the NSPS that govern small industrial, commercial and institutional steam generating units and stationary internal combustion engines. Therefore, the proposed biomass-to-energy plant will be a covered source.

Section 83 (Initial Covered Source Permit Application) of Subchapter 5 (Covered Sources) Chapter 11-60.1 requires that every application for a covered source permit include “a description of all applicable requirements and applicable test methods for determining the compliance status.” “Applicable requirements” are defined in Section 81 (Definitions) as all of the following as they apply to emission units in a covered source:

1. Any standard or other requirement provided for in the state implementation plan (SIP) approved or promulgated by EPA;

2. Any term or condition of any preconstruction permit issued pursuant to regulations approved or promulgated through rulemaking pursuant to Title I, including Part C of the Act;
3. Any standard or other requirement approved pursuant to Section 111 of the Act, including Section 111(d);
4. Any standard or other requirement approved pursuant to Section 112 of the Act, including any requirement concerning accident prevention approved pursuant to Section 112(r)(7) of the Act;
5. Any requirement approved pursuant to Section 504(b) or 114(a)(3) of the Act;
6. Any standard or other requirement governing solid waste incineration approved pursuant to Section 129 of the Act;
7. Any standard or other requirement for consumer and commercial products, approved pursuant to Section 183(e) of the Act;
8. Any standard or other requirement for tank vessels approved pursuant to Section 183(f) of the Act;
9. Any standard or other requirement of the program to control air pollution from outer continental shelf sources approved pursuant to Section 328 of the Act;
10. Any standard or other requirement of the regulations promulgated to protect stratospheric ozone approved pursuant to Title VI of the Act, unless the Administrator has determined that such requirements need not be contained in a Title V permit;
11. Any NAAQS or increment or visibility requirement approved pursuant to Part C of Title I of the Act, but only as it would apply to temporary sources permitted pursuant to Section 504(e) of the Act;
12. Any NAAQS or state ambient air quality standard;
13. Any standard or other requirement approved pursuant to Title I, including Part C of the Act;
14. The application of best available control technology to control those pollutants subject to any NAAQS or state ambient air quality standard, but only as best available control technology would apply to new covered sources and significant modifications to covered sources that have the potential to emit or increase emissions above significant amounts considering any limitations, enforceable by the director, on the covered source to emit a pollutant; and

15. Any standard or other requirement provided for in chapter 342B, HRS; this chapter; or chapter 11-59.

Compliance with each of these requirements is discussed in the following sections.

## **B. Relevant Requirements That Are Not Applicable**

Relevant requirements classified under the 15 elements identified above, which nonetheless are not applicable to the proposed biomass-to-energy plant, include the following, which are discussed below in greater detail:

- PSD Review;
- § 11-60.1-174 (Maximum Achievable Control Technology [MACT] emission standards.)

### 1. PSD Review

Section 132 (Source Applicability) of Subchapter 4 (PSD Review) specifies that any new “major stationary source” must undergo PSD review on a pollutant-specific basis. Section 131 (Definitions) further defines a “major stationary source” as a listed facility (one of 26 PSD source categories listed in Section 132) that emits at least 100 tpy or as any other facility that emits at least 250 tpy. The biomass gasifiers are considered to be “fuel conversion plants,” one of the 26 listed source categories, and thus those units are subject to the 100 tpy PSD threshold. Separately, and in addition to the 100 tpy threshold for the gasifiers, the entire power plant facility, including the gasifiers, is subject to the 250 tpy limit. The facility has two possible ways to be "major" for PSD: 1) emissions from the fuel conversion activities (the gasifiers) exceed 100 tpy; or 2) emissions from all activities exceed 250 tpy. If either threshold is exceeded, the entire facility is major.

The maximum emissions of the proposed gasifiers, as shown previously in Table 8, are compared with the 100 tpy PSD applicability thresholds and total facility emissions are compared with the 250 tpy applicability thresholds in Table 14. Since the maximum gasifier emissions will not exceed 100 tpy and total facility emissions will not exceed 250 tpy for any criteria pollutant, the proposed biomass-to-energy plant will not be subject to PSD review.

<b>Table 14 PSD Applicability</b>					
Pollutant	Maximum Annual Emissions from the Gasifiers (tpy)	Major Stationary Source Threshold for the Gasifiers(tpy)	Maximum Annual Emissions from the Facility (tpy)	Major Stationary Source Threshold for the Facility (tpy)	PSD Review Required?
NOx	1.8	100	109.4	250	No
SOx	1.5	100	44.3	250	No
CO	46.8	100	135.4	250	No
VOC	2.0	100	12.9	250	No
PM/ PM <sub>10</sub>	2.0	100	15.7	250	No

2. State Regulations

a. §11-60.1-174 – MACT Emission Standards

Section 174 of Chapter 60.1 adopts by reference the federal NESHAPS of 40 CFR Part 63. Section 174 requires any major source of HAPs to apply MACT to minimize the emissions of HAPs. The maximum facility emissions of the proposed biomass-to-energy plant, as shown previously in Part II.D, are compared with the HAP major source thresholds in Table 15. Since the maximum facility emissions will not exceed 10 tpy for any single HAP nor 25 tpy for total HAPs, the proposed biomass-to-energy plant will not be a major source of HAPs and therefore will not be subject to MACT standards under 40 CFR Part 63.

<b>Table 15 MACT Applicability</b>			
Source	Maximum Annual HAP Emissions for the Permit Units <sup>a</sup> (tpy)	Major Stationary Source Threshold (tpy)	Major Source of HAPs?
Gasifiers/boilers	15.7	25	No
Emergency Diesel generator	<<1.0	25	No
Diesel fire pump engine	<<1.0	25	No
Facility Total	15.7	25	No
Note: a. Total, all HAPs. See Appendix B.			

### **C. Applicable Requirements**

Applicable requirements classified under the 15 elements identified above include the following:

- § 11-60.1-2 – Prohibition of Air Pollution;
- § 11-60.1-3 – General Conditions for Considering Applications;
- § 11-60.1-4 – Certification;
- § 11-60.1-6 – Holding of Permit;
- § 11-60.1-7 – Transfer of Permit;
- § 11-60.1-8 – Reporting Discontinuance;
- § 11-60.1-9 – Cancellation of a CSP;
- § 11-60.1-11 – Sampling, Testing, and Reporting;
- § 11-60.1-12 – Air Quality Models;
- § 11-60.1-13 – Operations of Monitoring Stations;
- § 11-60.1-15 – Reporting of Equipment Shutdown;
- § 11-60.1-16 – Prompt Reporting of Deviations;
- § 11-60.1-16.5 – Emergency Provisions;
- § 11-60.1-17 – Prevention of Air Pollution Emergency Episodes;
- § 11-60.1-18 – Variances;
- § 11-60.1-32 – Visible Emissions;
- § 11-60.1-33 – Fugitive Dust;
- § 11-60.1-34 – Motor Vehicles;
- § 11-60.1-37 – Process Industries;
- § 11-60.1-38 – Sulfur Oxides from Fuel Combustion;
- § 11-60.1-39 – Storage of VOCs;
- § 11-60.1-41 – Pump and Compressor Requirements;
- § 11-60.1-82 – Covered Source Permit Applicability;
- § 11-60.1-83 – Initial CSP Application;
- § 11-60.1-85 – Compliance Plan;

- § 11-60.1-86 – Compliance Certification of Covered Sources;
- 40 CFR Part 60, Subpart Dc – Small Industrial, Commercial, and Institutional Steam Generators;
- 40 CFR Part 60, Subpart IIII – Stationary Compression Ignition Internal Combustion Engines;
- Best Available Control Technology; and
- Ambient Air Quality Standards.

Sections 6, 7, 8, 9, 11, 13, 15, 16, 16.5, 17, 18, 33, and 34 are not preconstruction requirements and will—or may be—applicable to the biomass-to-energy plant upon issuance of a CSP. The applicant will comply with any such requirements included in the CSP. Compliance with the preconstruction requirements is discussed below.

1. State Regulations

a. §11-60.1-2 – Prohibition of Air Pollution

Section 2 of Chapter 60.1 prohibits the engagement of any activity that causes air pollution without first securing written approval from the director. This CSP application satisfies this requirement for the proposed biomass-to-energy plant.

b. §11-60.1-3 – General Conditions for Considering Applications

Section 3 of Chapter 60.1 requires an applicant to demonstrate compliance with all of the applicable provisions of Chapter 60.1, including NSPS, NESHAPS, PSD requirements, and the maintenance or attainment of any NAAQS or state air quality standard. This CSP application demonstrates compliance with all applicable NSPS, NESHAPS, and NAAQS and state air quality standards, as discussed in detail below. The proposed biomass-to-energy plant will not be subject to PSD review.

c. §11-60.1-4 – Certification

Section 4 of Chapter 60.1 requires that all information submitted in the permit application be certified by a responsible official as true, accurate, and complete. This CSP application contains the required certification.

d. §11-60.1-12 – Air Quality Models

Section 12 of Chapter 60.1 requires that all air quality modeling be performed in accordance with 40 CFR Part 51, Appendix W, unless otherwise approved by the director. As discussed in Part V of this CSP application, all modeling conducted in conjunction with this CSP application satisfies this requirement.

e. §11-60.1-32 – Visible Emissions

Section 32 of Chapter 60.1 limits the emission of visible air pollutants (not including uncombined water vapor) to 20% opacity, except during start-up, shutdown, or equipment breakdown, when emissions may not exceed 60% opacity for more than 6 minutes in any 60-minute period. The project will comply with the visible emission criteria set forth in this section by utilizing clean distillate fuel in the emergency generator and fire pump engine, installing an electrostatic precipitator on the gasifiers/boilers, and using good combustion practices on all devices. In addition, a continuous opacity monitor will be installed in the ESP stack in accordance with the requirements of 40 CFR 60.47c.

f. §11-60.1-37 – Process Industries

Section 37 of Chapter 60.1 limits particulate emissions based on a process weight throughput rate. Liquid fuels and combustion air are not included in the “process weight.” Therefore, only the fuel and ash handling operations are subject to this requirement. The applicant will apply best management practices to minimize PM emissions during fuel and ash handling.

g. §11-60.1-38 – Sulfur Oxides from Fuel Combustion

Section 38 of Chapter 60.1 limits fuel sulfur content to 2% by weight. The biomass-to-energy plant will burn wood with sulfur content below 0.05% sulfur by weight. The sulfur content of the distillate fuel used in the emergency generator and fire pump engine is limited to 500 ppm (0.05% by weight) by the applicable NSPS. Therefore, the biomass-to-energy plant will comply with the fuel sulfur content limits of Section 38.

h. §11-60.1-39 – Storage of VOCs

Section 39 of Chapter 60.1 requires all VOC storage vessels larger than 250 gallons to have a permanent submerged fill pipe, be a pressure vessel, or be vented to a control device. Diesel fuel is a VOC as defined in Section 1 of Chapter 60.1. The 400- and 500-gallon Diesel fuel storage tanks for the emergency generator and mobile plant equipment will be equipped with a submerged fill pipe.

Section 39 further requires controls for storage vessels whose capacities exceed 40,000 gallons and that contain VOCs with true vapor pressures exceeding 1.5 psia. Diesel fuel has a true vapor pressure much lower than 1.5 psia and therefore is not subject to these additional controls.

i. §11-60.1-41 – Pumps and Compressors

Section 41 of Chapter 60.1 requires that pumps and compressors handling VOCs with true vapor pressures exceeding 1.5 psia be equipped with mechanical seals (or other equipment of equal effectiveness) to minimize VOC emissions. Diesel fuel has a true vapor pressure much less than 1.5 psia and therefore the pumps in distillate oil service will not be subject to this section.

j. §11-60.1-82 – Covered Source Permit Applicability

Section 82 of Chapter 60.1 prohibits a covered source from commencing construction without first obtaining a CSP. As discussed at the beginning of this section, the proposed biomass-to-energy plant will be a covered source. The applicant has not yet commenced construction of the proposed biomass-to-energy plant and has submitted this CSP application in accordance with the requirements of Section 82.

k. §11-60.1-83 – Initial CSP Application

Section 83 of Chapter 60.1 identifies all items that must be submitted in an initial CSP application. This CSP application satisfies the requirements of Section 83.

l. §11-60.1-85 – Compliance Plan

Section 85 of Chapter 60.1 requires the submission of a compliance plan with each CSP application. The compliance plan must identify applicable requirements and state that the source will comply with these requirements in the future. This CSP application satisfies the requirements of Section 85.

m. §11-60.1-86 – Compliance Certification of Covered Sources

Section 86 of Chapter 60.1 requires the submission of a compliance certification with each CSP application. The compliance certification must describe the methods used to determine compliance. This CSP application satisfies the requirements of Section 86.

2. New Source Performance Standards

Section 161 of Chapter 60.1 incorporates, by reference, the federal NSPS. Title 40 CFR Part 60 Subparts Dc and IIII are applicable to sources at the proposed facility.

a. 40 CFR Part 60, Subpart Dc – Industrial, Commercial, and Institutional Steam Generators

Subpart Dc contains the applicable NSPS for new wood-fired boilers\* with a maximum heat input capacity exceeding 10 MMBtu/hr but not exceeding 100 MMBtu/hr. The proposed boilers will have a maximum heat input rating of 50 MMBtu/hr each, and will therefore be subject to the NSPS.

Subpart Dc regulates NO<sub>x</sub> and SO<sub>2</sub> emissions from boilers fired on coal or oil, but there are no NO<sub>x</sub> or SO<sub>2</sub> standards in the NSPS for boilers firing only wood. For wood-fired boilers, Subpart Dc limits PM emissions to 0.03 lb/MMBtu, prohibits visible emissions in excess of 20% opacity and requires installation of a continuous opacity monitoring system (COMS). The ESP controls for PM emissions and the COMS, in conjunction with good combustion practices, will ensure that the steam boiler complies with the NSPS particulate and opacity standards.

b. Subpart IIII – Stationary Compression Ignition Internal Combustion Engines

Subpart IIII regulates emissions from stationary compression ignition engines, including the Diesel engine generator and the fire pump engine proposed for this project. The regulation applies to engines constructed or modified after July 11, 2005. The regulation includes several sets of standards that apply to engines of various sizes and take effect at various times. It is expected that the applicant will purchase 2008 model year engines. For engines in the size ranges to be purchased, the manufacturer must certify that the engine supplied meets the applicable emission standards. The applicant will purchase certified engines for the proposed project.

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\* 40 CFR §60.41c (Definitions) defines “wood” as follows:

“*Wood* means wood, wood residue, bark, or any derivative fuel or residue thereof, in any form, including but not limited to sawdust, sanderdust, wood chips, scraps, slabs, millings, shavings, and processed pellets made from wood or other forest residues.”

EPA applicability determinations have interpreted this definition for the purposes of 40 CFR Part 60, Subpart Db as follows:

“The synthetic gas produced from wood in the two rotary wood gasifiers is a derivative fuel of wood, and thus meets the definition of wood in 40 CFR 60.41b. The secondary combustion chamber is also subject to the opacity standard in 40 CFR 60.43b(f).”

As the definitions of “wood” are the same in Subparts Db and Dc, the standards for wood firing in Subpart Dc are applicable to the firing of wood gas.

### 3. Ambient Air Quality Standards

Section 83(12) of Chapter 60.1 requires an assessment of the impact of emissions from a new covered source upon ambient air quality. An ambient air quality impact analysis was prepared using AERMOD and representative meteorological data. The analysis indicates that emissions from the proposed biomass-to-energy plant would not cause or contribute to an exceedance of any ambient air quality standard. A detailed discussion of the ambient air quality impact analysis is presented in Part V of the application support document.

### 4. Best Available Control Technology

Section 81 of Chapter 60.1 identifies BACT as an applicable requirement for new covered sources. New covered sources must apply BACT for any pollutants whose emissions are “significant.” Emissions from all sources at the facility were shown in Table 12; only emissions from the boilers are significant. The maximum emissions from the boilers are compared with significant emission thresholds, as defined in Section 1 of Chapter 60.1, in Table 16. The maximum annual emissions of NO<sub>x</sub> from each boiler will exceed the BACT threshold. Therefore, an analysis was conducted to identify BACT for the boilers. As a result of this analysis, the following control technologies and emission limits were identified for the boilers: good combustion practices to limit NO<sub>x</sub> emissions to 0.25 lb/MMBtu.

Pollutant	Maximum Emissions (tpy, each boiler)	Significant Emissions Threshold (tpy)	BACT Required?
NO <sub>x</sub>	53.4	40	Yes
SO <sub>x</sub>	21.4	40	No
CO	44.3	100	No
VOC	5.5	40	No
PM/PM <sub>10</sub>	6.5	25/15	No

## **PART IV. BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS**

Under the requirements of Subchapter 5, Covered Sources, best available control technology (BACT) must be applied to any source that has the potential to emit criteria pollutants in significant amounts. As discussed earlier, the steam boilers are the only sources at the facility that have the potential to emit pollutants in excess of the significance thresholds, so BACT must be applied for NO<sub>x</sub> emissions from the boilers. This chapter presents the results of the BACT determination for the boilers.

HDOH regulations define BACT as the following:

*...an emissions limitation...based on the maximum degree of reduction for each pollutant subject to regulation approved pursuant to the Act which would be emitted from any proposed stationary source or modification which the director, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through the application of production techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant.*

The following tasks were performed for the BACT analysis for NO<sub>x</sub>:

- Reviewed published BACT guidelines;
- Reviewed federal NSPS; and
- Reviewed EPA's RBLC database.

As summarized in the following sections, this BACT analysis concludes that BACT for wood-fired boilers with a maximum heat input capacity of less than 100 MMBtu/hr is a NO<sub>x</sub> emission limit of 0.25 lb/MMbtu, using good combustion practices.

### **A. Published BACT Guidelines**

Published BACT determinations from air quality agencies in California were reviewed. The San Joaquin Valley Air Pollution Control District has published a CO BACT determination for a 259 MMBtu/hr biomass boiler; BACT was not triggered for this boiler for NO<sub>x</sub>. BACT determinations were also made for biomass boilers utilizing fluidized bed technology, which is a fundamentally different combustion technology than the conventional technology to be utilized for this project. Therefore, the BACT determinations for fluidized bed units are not applicable to the proposed project.

## B. Federal NSPS

Title 40 CFR Part 60 Subpart Dc contains the applicable NSPS for boilers with a maximum heat input capacity of 100 MMBtu/hr or less. The Subpart Dc emission limitations are summarized in the following table.

<b>Table 17</b>			
<b>Summary of NSPS Requirements for Wood-fired Boilers With Heat Input &lt; 100 MMBtu/hr</b>			
Fuel	Emission Limitation, lb/MMBtu		
	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>
Wood	No limit	No limit	0.03

## C. RBLC Listings

The RBLC database contains four relevant listings for wood-fired boilers with a heat input of less than 100 lb/MMBtu.

### 1. Louisiana-Pacific Hayward (Wisconsin)

Four new wood-burning boilers were permitted as thermal oil heaters in 2004. The boilers have a BACT/PSD emission limit of 16.2 lb/hr of NO<sub>x</sub> for two 23.8 MMBtu/hr boilers, for an effective limit of 0.34 lb/MMBtu, and 8.2 lb/hr for two 19.4 MMBtu/hr boilers, for an effective limit of 0.23 lb/MMBtu. The RBLC listing states that these lb/MMBtu emission rates are not permit limits. No add-on controls are utilized for NO<sub>x</sub> control, and the lower of the two effective NO<sub>x</sub> limits is comparable to the limit proposed for the boilers.

### 2. Deltic Timber Corporation (Arkansas)

This new 64.3 MMBtu/hr wood waste and bark-fired boiler was permitted in 2003 with a NO<sub>x</sub> limit of 0.30 MMBtu/hr. The project was subject to BACT/PSD review for NO<sub>x</sub>, so the determination for NO<sub>x</sub> is relevant here. No add-on controls are utilized for NO<sub>x</sub> control, and the NO<sub>x</sub> limit is well in excess of the limit proposed for the boilers.

### 3. Wellborn Cabinets, Inc. (Alabama)

These 29.5 MMBtu/hr wood waste-fired boilers were permitted in 2003. The permitted emission limit for NO<sub>x</sub> is 0.50 lb/MMBtu, which is met using boiler design and good combustion practices. This project was also subject to BACT/PSD review for NO<sub>x</sub>. The NO<sub>x</sub> limit is twice the limit proposed for the boilers.

4. Duke Solutions Evendale LLC (Ohio)

A new 28.7 MMBtu/hr wood waste boiler was permitted in 1999. The permitted emission limit for NOx is 0.604 lb/MMBtu, which is met without add-on controls. The RBLC listing for this facility indicates that the NOx emission rate from a performance test of the boiler was 0.45 lb/MMBtu. Both the permitted and tested emission rates are significantly higher than the NOx limit proposed for this project.

**D. Potential for Use of Add-On Emission Controls**

Potential post-combustion controls for NOx emissions from the boilers are selective catalytic reduction (SCR) and selective noncatalytic reduction (NSCR). SCR systems generally cannot be used in exhaust streams with relatively high particulate concentrations, and they are only effective across a relatively small temperature window. In the proposed project configuration, the particulate concentration in exhaust stream between the multiclones and the ESP is expected to be approximately 0.20 lb/MMBtu, or approximately 0.11 gr/dscf. This concentration is relatively high compared to the particulate grain loading in oil-fired exhaust streams where SCR systems are now being used. In addition, by the time the exhaust gas passes through the multiclones and enters the ESP, the temperature has been reduced to only about 340°F while SCR technology is effective at exhaust gas temperatures above around 550°F. The optimal temperature for an SCR system occurs upstream of the multiclones, where the particulate concentration would be too high for effective operation of the control system.

Selective noncatalytic reduction, or ammonia injection, can be used in a high-dust environment because no catalyst is required. However, the key to effective NOx control using SNCR is residence time. The dimensions of the boilers do not provide adequate residence time for the NOx reduction reactions to take place. Therefore, the use of SNCR is not feasible for this application.

**E. Conclusions**

The NOx emissions limitations proposed for the project utilize the maximum degree of reduction achievable through available emissions control methods for this class and category of source. Therefore, the NOx emissions limit shown in Table 18 is proposed as BACT for the project.

<b>Table 18</b>	
<b>Controlled NOx Emissions Limit Proposed as BACT</b>	
<b>Pollutant</b>	<b>Proposed Control Level, lb/MMBtu</b>
NOx	0.25

Compliance with the proposed NOx limit will be determined on a three-hour average basis, using a continuous emissions monitor located in the common exhaust stack downstream of the ESP.

## PART V. AMBIENT AIR QUALITY ANALYSIS

### A. Air Quality Setting

#### 1. Geography/Topography

The proposed biomass-to-energy facility will be located north of the town of Koloa, in the Knudsen Gap area of the island of Kauai (see Figure 1). The UTM coordinates of the site are approximately 452744 meters Easting and 2428375.5 meters Northing (zone 4, NAD 27). The nominal site elevation is approximately 510 feet above mean sea level. For the purposes of atmospheric dispersion, the project site and its immediate vicinity can be characterized as rural.

The nearest area designated as a Class I area for PSD purposes is Haleakala National Park, located over 200 miles southeast of the project site.

#### 2. Climatology

The Hawaiian Island chain is situated south of the large Eastern Pacific semipermanent high-pressure cell, the dominant atmospheric feature affecting air circulation in the region. Over the Hawaiian Islands, this high-pressure cell produces very persistent winds called the northeast trades, which blow from the northeast. 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 also contribute to annual precipitation.

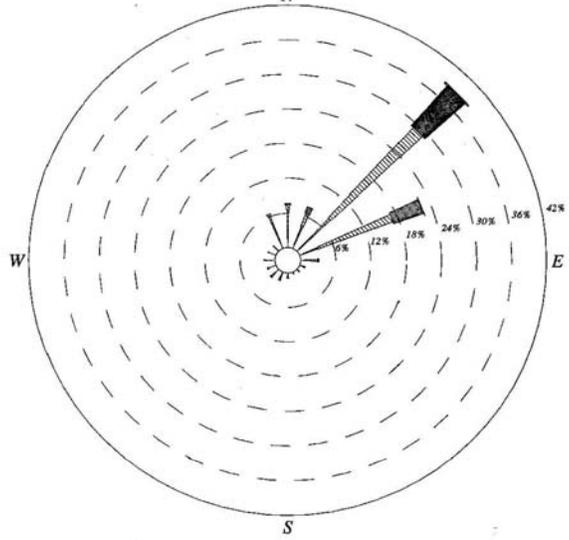
Due to the tempering influence of the Pacific Ocean and the low-latitude location, the Hawaiian Islands experience extremely small diurnal and seasonal variations in ambient temperature. Average temperatures range from about 74-75°F in March to 79-80°F in July. These temperature variations are quite modest compared to those experienced at inland continental locations.

Surface wind patterns on Kauai result from a combination of synoptic (large-scale), mesoscale (regional), and small-scale circulations. The Hawaiian Islands lie at a tropical latitude where northeasterly trade winds prevail. This circulation is extremely persistent. Occasional hurricanes disrupt wind and rain patterns in the Hawaiian Islands. Superimposed on the large-scale flow in and around Koloa are so-called “mountain and valley” circulations. Mountain and valley winds result from differential heating or cooling between the slope and adjacent free air. Upslope, or up-valley, flow occurs during the day as air is warmed. Downslope, or down-valley, flow occurs at night due to radiational cooling. Figure 5 shows the wind direction and speed frequency distributions

(“wind roses”) for wind data collected at two elevations at the nearby Puhi meteorological

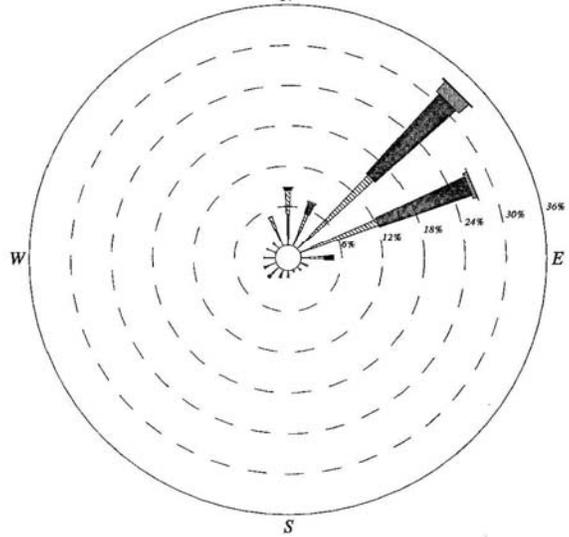
# Figure 5 Puhi Wind Roses

*Puhi 93/94 - 33 ft*  
January 1-December 31; Midnight-11 PM  
N



Calm Winds 1.54%

*Puhi 93/94 - 70 ft*  
January 1-December 31; Midnight-11 PM  
N



Calm Winds 0.48%



Wind Speed (knots)

monitoring site.\* The persistence of the trade wind circulation is illustrated in these wind frequency distributions.

### 3. Existing Air Quality

The federal NAAQS have been established to protect public health and welfare. The federal Clean Air Act provides that NAAQS can be exceeded no more than once each year. Areas that exceed the standard twice or more a year can be considered “nonattainment areas” subject to more stringent planning and pollution control requirements. Once an area has been declared nonattainment for a particular pollutant, the area must show 12 consecutive calendar quarters without any exceedances in order to be redesignated as an “attainment” area.

The State of Hawaii has established its own ambient air quality standards, which in some cases are more stringent than the national standards. Hawaii state ambient air quality standards, which are administered by the state Department of Health, seek to protect public health and welfare and to prevent the significant deterioration of air quality. Both state and federal air quality standards consist of two parts: an allowable concentration of a pollutant, and an averaging time over which the concentrations are to be measured. Allowable concentrations are based on the results of studies of how the pollutants affect human health, crops, and vegetation, and on potential 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 exposures to a high concentration for a short period of time (e.g., one hour), or to a relatively lower average concentration over a much longer period (one month or one year). Sometimes there are several air quality standards for a particular pollutant that reflect both its short-term and long-term effects.

State and federal air quality standards have been set for ozone, NO<sub>2</sub>, CO, SO<sub>2</sub>, PM<sub>10</sub>, and PM<sub>2.5</sub>.

The Hawaiian Islands generally have good air quality. The available data throughout the Islands generally show no exceedances of the federal standards and only occasional exceedances of the more stringent Hawaii state standards for all criteria pollutants listed above. Monitoring for PM<sub>10</sub> is carried out on the island of Kauai by HDOH on an ongoing basis, and current data are available for the area. The most recent data available for CO, NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>2.5</sub> and ozone were obtained for Honolulu County (Oahu). Data from Oahu are expected to overstate concentrations on Kauai, which has a smaller population and industrial base. Data for each pollutant are presented in the following sections.

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\* The Puhi wind roses are shown here as representative of wind conditions in the project area.

a. Ozone

Photochemical oxidants such as ozone are formed in the air by chemical reactions between hydrocarbons (like unburned gasoline) and NO<sub>x</sub> (a product of combustion) in the presence of sunlight.

Table 19 shows the state and federal air quality standards for ozone and recent ozone levels measured at Sand Island (Oahu). The data show that no exceedances of the state or national standards have occurred during the monitoring period. The Hawaiian Islands are considered an attainment area for ozone for purposes of federal requirements.

<b>Table 19</b>		
<b>Ozone Levels Representative of the Project Area</b>		
	<b>1-hour average</b>	<b>8-hour average</b>
State Ambient Air Quality Standard	n/a	0.08 ppm
National Ambient Air Quality Standard	0.12 ppm	0.08 ppm
Current background concentrations <sup>a</sup>		
2004	0.060 ppm	0.056 ppm
2005	0.059 ppm	0.046 ppm
2006	0.0644 ppm	0.042 ppm
Notes:		
<sup>a</sup> Measured by HDOH at Sand Island.		

b. Nitrogen Dioxide

Nitrogen dioxide is primarily formed in the atmosphere from a reaction between nitric oxide (NO) and oxygen or ozone. Nitric oxide is formed during high-temperature combustion processes when the nitrogen and oxygen in the combustion air combine. Although NO is much less harmful than NO<sub>x</sub>, NO can be converted to NO<sub>2</sub> in the atmosphere within a matter of hours, or even minutes, under certain conditions.

Table 20 shows the state and federal air quality standards for nitrogen dioxide and recent levels monitored at Ko’Olina Golf Course on Oahu.

<b>Table 20</b>	
<b>Nitrogen Dioxide Levels Representative of the Project Area</b>	
	<b>Annual Average</b>
State Ambient Air Quality Standard	70 $\mu\text{g}/\text{m}^3$ (0.04 ppm)
Federal Ambient Air Quality Standard	0.05 ppm (100 $\mu\text{g}/\text{m}^3$ )
Current background concentrations <sup>a</sup>	
2004	5.7 $\mu\text{g}/\text{m}^3$ (0.003 ppm)
2005	5.7 $\mu\text{g}/\text{m}^3$ (0.003 ppm)
2006	5.7 $\mu\text{g}/\text{m}^3$ (0.003 ppm)
Notes: <sup>a</sup> Measured by HDOH at Ko'Olina Golf Course, Oahu.	

The data show that nitrogen dioxide concentrations are well below the state and federal standards. Hawaii is considered an attainment area for this pollutant for purposes of federal requirements.

#### c. Sulfur Dioxide

Sulfur dioxide is produced when any fuel that contains sulfur is burned. Sulfur dioxide is also emitted by chemical plants that treat or refine sulfur or sulfur-containing chemicals. Because the chemical reactions that change  $\text{SO}_2$  to sulfates are complex, peak concentrations of  $\text{SO}_2$  occur at different times of the year in different areas, depending on local fuel characteristics, weather, and topography.

Table 21 shows the state and federal air quality standards for  $\text{SO}_2$  and current background data from Oahu.  $\text{SO}_2$  concentrations monitored at Ko'Olina Golf Course are well below the ambient standards. Hawaii is designated an attainment area for  $\text{SO}_2$  for purposes of federal standards.

<b>Table 21</b>			
<b>Sulfur Dioxide Levels Representative of the Project Area</b>			
	<b>3-hour average</b>	<b>24-hour average</b>	<b>annual average</b>
State Ambient Air Quality Standards	1300 µg/m <sup>3</sup> (0.5 ppm)	365 µg/m <sup>3</sup> (0.14 ppm)	80 µg/m <sup>3</sup> (0.03 ppm)
Federal Ambient Air Quality Standards	--	0.14 ppm (365 µg/m <sup>3</sup> )	0.03 ppm (80 µg/m <sup>3</sup> )
Current background concentrations <sup>a</sup>			
2004	10.4 µg/m <sup>3</sup> (0.004 ppm)	5.3 µg/m <sup>3</sup> (0.002 ppm)	2.7 µg/m <sup>3</sup> (0.001 ppm)
2005	39.0 µg/m <sup>3</sup> (0.015 ppm)	10.5 µg/m <sup>3</sup> (0.004 ppm)	2.7 µg/m <sup>3</sup> (0.001 ppm)
2006	23.4 µg/m <sup>3</sup> (0.009 ppm)	7.9 µg/m <sup>3</sup> (0.003 ppm)	2.7 µg/m <sup>3</sup> (0.001 ppm)
Notes: <sup>a</sup> Measured by HDOH at Ko'Olina Golf Course, Oahu.			

d. Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>)

Particulate matter in the air is caused by a combination of wind-blown fugitive dust; particles emitted from combustion sources (usually carbon particles); and organic, sulfate, and nitrate aerosols formed in the air from emitted hydrocarbons, SO<sub>2</sub>, and NO<sub>x</sub>.

In 1987, EPA adopted a federal PM<sub>10</sub> standard in place of the federal TSP standard because PM<sub>10</sub> corresponds to the range of inhalable particulate related to human health. Fine particulates are those particulates less than 2.5 microns in size. A PM<sub>2.5</sub>-based standard was adopted in 1997 and revised in 2006.

The Department of Health monitors PM<sub>10</sub> at Lihue, Kauai, and PM<sub>2.5</sub> at Ewa Beach, Oahu. The highest concentrations monitored during the past three years are shown in Tables 22 and 23.

<b>Table 22</b>		
<b>Respirable Particulate (PM<sub>10</sub>) Levels on Kauai, 2004-2006</b>		
	<b>24-hour average</b>	<b>annual average</b>
State Ambient Air Quality Standards	150 µg/m <sup>3</sup>	50 µg/m <sup>3</sup>
Federal Ambient Air Quality Standards	150 µg/m <sup>3</sup>	50 µg/m <sup>3</sup>
Current background concentrations <sup>a</sup>		
2004	28 µg/m <sup>3</sup>	16 µg/m <sup>3</sup>
2005	30 µg/m <sup>3</sup>	16 µg/m <sup>3</sup>
2006	34 µg/m <sup>3</sup>	12 µg/m <sup>3</sup>
Note: <sup>a</sup> Hawaii Air Quality Data for the Hale Piilani Park monitoring station; EPA AirData.		

<b>Table 23</b>		
<b>Fine Particulate (PM<sub>2.5</sub>) Levels Representative of the Project Area</b>		
	<b>24-hour average<sup>a</sup></b>	<b>annual average</b>
Federal Ambient Air Quality Standards	35 µg/m <sup>3</sup>	15 µg/m <sup>3</sup>
Current background concentrations <sup>b</sup>		
2004	7	3.2
2005	11	4.2
2006	7	3.8
Notes: <sup>a</sup> 98 <sup>th</sup> percentile value shown. <sup>b</sup> Hawaii Air Quality Data for the Ewa Beach, Oahu, monitoring station; EPA AirData.		

e. Carbon Monoxide

Carbon monoxide is a product of inefficient combustion, principally from automobiles and other mobile sources of pollution. In urban areas, industrial sources of pollution typically contribute less than 10% of ambient CO levels. Peak CO levels are generally very localized near areas of high motor vehicle traffic.

Carbon monoxide is not monitored on the island of Kauai. Table 24 shows the state and federal ambient air quality standards for CO, as well as measured levels at Ko'Olina Golf Course, Oahu. The data indicate that CO levels have not exceeded the federal or state standards for either the 1-hour or the 8-hour averaging periods during the period in which concentrations were monitored. Hawaii has been designated as an attainment area for CO for purposes of federal requirements.

<b>Table 24 Carbon Monoxide Levels Representative of the Project Area</b>		
	<b>1-hour average</b>	<b>8-hour average</b>
State Ambient Air Quality Standards	10,000 $\mu\text{g}/\text{m}^3$ (9 ppm)	5,000 $\mu\text{g}/\text{m}^3$ (4.4 ppm)
Federal Ambient Air Quality Standard	35 ppm (40,000 $\mu\text{g}/\text{m}^3$ )	9 ppm (10,000 $\mu\text{g}/\text{m}^3$ )
Current background concentrations <sup>a</sup>		
2004	2,625 $\mu\text{g}/\text{m}^3$ (2.1 ppm)	889 $\mu\text{g}/\text{m}^3$ (0.8 ppm)
2005	1,875 $\mu\text{g}/\text{m}^3$ (1.5 ppm)	1,00 $\mu\text{g}/\text{m}^3$ (0.9 ppm)
2006	1,750 $\mu\text{g}/\text{m}^3$ (1.4 ppm)	1,222 $\mu\text{g}/\text{m}^3$ (1.1 ppm)
Note: <sup>a</sup> Measured by HDOH at Ko'Olina Golf Course, Oahu.		

## **B. Air Quality Impact Analysis**

### **1. Summary and Conclusions**

The air quality impact analysis described in detail in the following sections demonstrates that the proposed project will not cause or contribute to any exceedances of existing federal or state ambient air quality standards for NO<sub>2</sub>, SO<sub>2</sub>, CO, PM<sub>10</sub> or PM<sub>2.5</sub>. These modeling results are based on worst-case project impacts, and, therefore, very conservatively estimate project air quality impacts.

The following sections present detailed descriptions of the data and methodology used in the air quality impacts analysis.

### **2. Air Quality Modeling Methodology**

Impacts on ambient air quality from the proposed project were assessed using the AERMOD model. This model numerically simulates the rise of pollutant emissions from sources, such as stacks, and the way in which these emissions are transported by winds and diluted by turbulence in the atmosphere.

The primary objective of this analysis is to determine the worst-case ground-level impacts for comparison with the established ambient air quality standards. If the standards are not violated under worst-case conditions, then no exceedances are expected under any conditions. Based in part on air quality impact analysis guidelines developed by EPA (Guideline on Air Quality Models, revised; 40 CFR Part 51 Appendix W

(November 2005)) and ARB (Reference Document for California Statewide Modeling Guideline, April 1989), ground-level impacts for the following worst-case dispersion conditions were determined:

- Impacts in simple terrain;
- Impaction of plume on elevated terrain; and
- Aerodynamic downwash due to nearby building(s).

Simple terrain impacts were assessed for looping, coning, and fanning plumes. Looping plumes occur when the atmosphere is very unstable, such as on a bright sunny afternoon when vigorous convective mixing of the air can transport the entire plume to ground level in close proximity to the source. Coning plumes occur throughout the day when the atmosphere is neutral or slightly unstable. Fanning plumes are most common at night when the atmosphere is stable and vertical motions are suppressed.

Plume impaction on elevated terrain, such as on the slope of a nearby hill, can produce high ground-level concentrations, especially under stable atmospheric conditions. Plume impaction can occur under stable atmospheric conditions if plumes do not possess sufficient kinetic energy to pass over terrain obstacles.

Another dispersion condition that can cause high ground-level pollutant concentrations is referred to as building downwash. Building downwash occurs when all or part of the stack plume is drawn downward to the ground by the lower pressure region that exists in the turbulent wake on the lee side of an adjacent building.

The basic model equation used in this analysis assumes that the concentrations of emissions within a plume can be characterized by a Gaussian distribution about the centerline of the plume. Simple Gaussian-type dispersion models (approved by EPA) that contain a built-in degree of conservatism (i.e., models that tend to over-predict actual impacts) were used to determine whether ambient air quality standards may be exceeded, and whether a more accurate and sophisticated modeling procedure would be warranted.

The screening and refined air quality impact analyses were performed using the American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) model, also known as AERMOD (current version 07026). The AERMOD model is a steady-state, multiple-source, Gaussian dispersion model designed for use with stack emission sources situated in terrain where ground

elevations can exceed the stack heights of the emission sources (i.e. complex terrain).<sup>\*</sup> The model is capable of estimating concentrations for a wide range of averaging times (from one hour to one year).

Inputs required by the AERMOD model include the following:

- Model options;
- Meteorological data;
- Source data; and
- Receptor data.

Model options refer to user selections that account for conditions specific to the area being modeled or to the emissions source that needs to be examined. Examples of model options include use of site-specific vertical profiles of wind speed and temperature; consideration of stack and building wake effects; and time-dependent exponential decay of pollutants. The model supplies recommended default options for the user for some of these parameters.

AERMOD uses hourly meteorological data to characterize plume dispersion. The representativeness of the data is dependent on the proximity of the meteorological monitoring site to the area under consideration, the complexity of the terrain, the exposure of the meteorological monitoring site, and the period of time during which the data are collected. The meteorological data used in this analysis were collected at the Puhī (Field 390) monitoring station about 6 miles east-northeast of the project site. This data set was selected to be representative of meteorological conditions at the project site and to meet the requirements of the USEPA “On-Site Meteorological Program Guidance for Regulatory Model Applications” (EPA-450/4-87-013, August 1995). The analysis used surface meteorological data collected at two elevations in 1993 and 1994. Lihue Airport sounding data were used for determining mixing heights and other surface boundary layer parameters.

The AERMET meteorological preprocessor was used to prepare the meteorological data for AERMOD. AERMET requires location-specific surface characteristics to construct realistic planetary boundary layer (PBL) similarity profiles. Values for surface roughness ( $z_o$ ), Albedo ( $r$ ), and Bowen ratio ( $B_o$ ) must be selected for wind direction sectors. In

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<sup>\*</sup> AERMOD became a preferred guideline USEPA model as a replacement for ISCST3 in 2006. AERMOD incorporates an improved downwash algorithm as compared to ISCST3 (Federal Register, November 9, 2005; Volume 70, Number 216, Pages 68218-68261).

accordance with EPA guidance,\* since the proposed facility was determined to be a rural source using rural NWS data, the value of  $z_o$  for each sector was selected to reflect the meteorological station site. Source site values were used for  $B_o$  and  $r$ . The sectors and the values of  $z_o$ ,  $B_o$  and  $r$  used in creating the AERMOD meteorological data set are shown in Table 25.

Wind Direction Sector, Deg.	Land Use		Surface Roughness, $z_o^a$	Albedo, $r^b$	Bowen Ratio, $B_o^b$
	Met Station	Project Site			
340° - 55°	agricultural	grass land	0.07	0.2	0.5
55° - 125°	wooded/bldgs	grass land	0.3	0.2	0.5
125° - 200°	wooded/bldgs	forested slopes	0.3	0.16	0.3
200° - 260°	agricultural/ some bldgs	grass land	0.1	0.2	0.5
260° - 340°	wooded hillside	grass land	0.2	0.2	0.5

Notes:  
a. All values for surface roughness parameters taken from Roland B Stull, "An Introduction to Boundary Layer Meteorology," Chapter 9 (Similarity Theory), p. 380, 1988.  
b. All values for Albedo and Bowen ratio taken from USEPA, "User's Guide for the AERMOD Meteorological Preprocessor (AERMET)," EPA-454/B-03-002, November 2004.

The required emission source data inputs to AERMOD include source locations, source elevations, stack heights, stack diameters, stack exit temperatures and velocities, and emission rates. The source locations are specified for a Cartesian (x,y) coordinate system where x and y are distances east and north in meters, respectively. The Cartesian coordinate system used is the Universal Transverse Mercator Projection (UTM). The stack height that can be used in the model is limited by federal and HDOH Good Engineering Practice (GEP) stack height restrictions, discussed in more detail below. In addition, AERMOD requires nearby building dimension data to calculate the impacts of building downwash.

Good Engineering Practice Stack Height – HRS § 11-60.1-139 restricts stack heights for the purpose of modeling to the height required by good engineering practice. EPA has

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\* USEPA, "AERMOD Implementation Guide," September 27, 2005.  
<http://www.epa.gov/scram001/7thconf/aermod>.

provided guidance (“Guideline for Determination of Good Engineering Practice Stack Height,” June 1985) indicating that good engineering practice stack height (GEP) is the lesser of 65 meters or  $H_g$ , where  $H_g$  is calculated as follows:

$$H_g = H + 1.5L$$

where

$H_g$  = good engineering practice stack height, measured from the ground-level elevation at the base of the stack;

$H$  = height of nearby structure(s) measured from the ground-level elevation at the base of the stack; and

$L$  = lesser dimension, height or projected width, of nearby structure(s).

In using this equation, the guidance document indicates that both the height and width of the structure are determined from the frontal area of the structure, projected onto a plane perpendicular to the direction of the wind. If multiple or asymmetrical structures are present, the guidance document states “the GEP stack height should be based on the plane projection lying upwind from the source (stack) which results in the greatest justifiable height...Each combination of the height,  $H$ , and lesser dimension (height or width),  $L$ , should be evaluated for each segment of the structure to determine which one results in the greatest GEP stack height....”

The proposed stack height of 75 feet (22.86 m) for the boiler stack and 15 feet (4.57 m) for the emergency generator and fire pump engine stacks do not exceed the GEP stack height of 65 m. Thus, the full heights of the stacks can be used in modeling ambient impacts from the project.

Building Downwash Calculations – AERMOD permits evaluation of wind direction-specific building dimensions, according to the methods of Schulman and Scire (1980), for evaluating pollutant concentrations in the wakes of buildings. ISCST3 also provides an older, non-direction-specific procedure (Huber and Snyder, 1976) for estimating building-wake effects.

The Schulman and Scire building wake procedure is invoked when the physical stack height is less than  $h_b + 0.5*L_B$ , where  $h_b$  is the building height and  $L_B$  is the lesser of the building height or width. If that criterion is not met, the non-direction-specific building downwash procedure of Huber and Snyder (1976) is used, unless the effective plume height, given by the sum of the stack height and momentum plume rise, exceeds either  $2.5*h_b$  or  $h_b + 1.5*h_w$ , where  $h_w$  is the building width. In that case, building wakes are assumed not to affect plume dispersion. In all cases where building wake effects are

considered, gradual plume rise is considered, regardless of whether the final plume rise option was chosen in the AERMOD input, as part of the regulatory default option. Both these procedures were applied in the AERMOD model to estimate the effect of building wakes on pollutant concentrations in the vicinity of the proposed project.

For the buildings analyzed as downwash structures, the building dimensions, accurate to 1 foot, were obtained from the facility plot plan. These dimensions were analyzed using Lakes Environmental ISC-AERMOD View software package. These dimensions were processed within the software by EPA's BPIP program to derive 36 wind direction-specific building heights and projected building widths for use in building wake calculations. The building layout used for the analysis is shown in Figure 2. Building dimensions and stack heights used in the modeling analysis are shown in Appendix C, Table C-1.

Terrain Features – Terrain features were taken from USGS DEM data and 7.5-minute quadrangle maps of the area. For the screening analysis, a coarse Cartesian grid of receptors spaced at 180 meters was used with a finer grid, spaced at 25 meters, around the facility fenceline. Fine grids spaced at 30 meters were placed around the coarse grid maxima to locate maximum modeled impacts. The results of the refined air quality analysis are discussed in the following section.

### 3. Results of Ambient Air Quality Modeling

#### a. Criteria Pollutant Impacts from the New Facility

The maximum modeled impacts for the new facility are shown in combination with existing background concentrations in Table 24. Complete input and output files are provided in electronic form. Stack parameters and emission rates used in the modeling analyses are summarized in Appendix C, Table C-2.

To determine the maximum ground-level impacts on ambient air quality for comparison to the applicable standards, monitored background concentrations from Lihue (for PM<sub>10</sub>), and Oahu (NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>2.5</sub> and CO) were added to the modeled concentrations from the new facility. These maximum combined impacts are also shown together with the ambient air quality standards in Table 26. This analysis demonstrates that the proposed project will not cause or contribute to the violations of any state or federal ambient air quality standards.

#### b. CO and PM<sub>10</sub> Impacts During Startup

As shown in Tables 7, 8 and 9, CO and PM<sub>10</sub> emissions may be higher during the periods when the gasifiers and boilers are starting up than during normal, controlled boiler operations. To evaluate the potential air quality impacts of startup operations, a unit

impact modeling analysis was performed for a single boiler. Since the boiler exhaust stack is designed for the exhaust flow from two boilers, the modeling analysis for a single boiler results in lower exhaust flow rates and therefore lower plume rise and potentially higher ground-level impacts than an analysis that includes exhaust from both boilers.

The results of the startup impacts analysis are shown in Table 27. A more detailed description of the startup impacts analysis is provided in Appendix B.

<b>Table 26</b>					
<b>Modeled Maximum Project Impacts</b>					
<b>Pollutant/ Averaging Time</b>	<b>Biomass-to-Energy Facility Sources (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Background (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Total Impact (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>State Standard (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Federal Standard (<math>\mu\text{g}/\text{m}^3</math>)</b>
NO <sub>2</sub> -- annual <sup>b</sup>	19.2	5.7	25	70	100
SO <sub>2</sub> -- 3-hour	95.1	39.0	134	1300	1300
-- 24-hour	54.9	10.5	65	365	365
-- annual	9.9	2.7	13	80	80
CO -- 1-hour	239.7	2,625	2,865	10,000	40,000
-- 8-hour	134.0	1,222	1,356	5,000	10,000
PM <sub>10</sub> <sup>b</sup> -- 24-hour	17.2	34	51	150	150
-- annual	3.8	16	20	50	50
PM <sub>2.5</sub> <sup>b, c</sup> -- 24-hour	17.2	11	28	--	35
-- annual	3.8	4.2	8	--	15
<p>Note: a. Ozone limited using ARM method and default value of 0.75.  b. All combustion PM<sub>10</sub> is assumed to be in the PM<sub>2.5</sub> size range so PM<sub>10</sub> and PM<sub>2.5</sub> impacts are equal.  c. In a 1997 memo to the USEPA Regional Directors, John Seitz, Director of USEPA Office of Air Quality Planning and Standards, indicated that compliance with the federal PM<sub>2.5</sub> NAAQS for both NSR and PSD purposes is established through compliance with the PM<sub>10</sub> NAAQS, rather than through direct permitting for PM<sub>2.5</sub>. The applicability of this guidance was reaffirmed in the February 9, 2006, ANPRM for transition to the new 24-hour PM<sub>2.5</sub> standard. Therefore, the comparison with the PM<sub>2.5</sub> standards is shown here for information only.</p>					

**Table 27**  
**Modeled Maximum CO and PM<sub>10</sub> Impacts During Boiler Startup**

<b>Pollutant/ Averaging Time</b>	<b>Impact from Boilers During Startup (µg/m<sup>3</sup>)</b>	<b>Background (µg/m<sup>3</sup>)</b>	<b>Total Impact (µg/m<sup>3</sup>)</b>	<b>State Standard (µg/m<sup>3</sup>)</b>	<b>Federal Standard (µg/m<sup>3</sup>)</b>
CO					
-- 1-hour	5,474	2,625	8,099	10,000	40,000
-- 8-hour	756	1,222	1,978	5,000	10,000
PM <sub>10</sub>					
-- 24-hour	15.4	34	49	150	150
PM <sub>2.5</sub> <sup>a, b</sup>					
-- 24-hour	15.4	11	26	--	35

Note: a. All combustion PM<sub>10</sub> is assumed to be in the PM<sub>2.5</sub> size range so PM<sub>10</sub> and PM<sub>2.5</sub> impacts are equal.  
b. In a 1997 memo to the USEPA Regional Directors, John Seitz, Director of USEPA Office of Air Quality Planning and Standards, indicated that compliance with the federal PM<sub>2.5</sub> NAAQS for both NSR and PSD purposes is established through compliance with the PM<sub>10</sub> NAAQS, rather than through direct permitting for PM<sub>2.5</sub>. The applicability of this guidance was reaffirmed in the February 9, 2006, ANPRM for transition to the new 24-hour PM<sub>2.5</sub> standard. Therefore, the comparison with the PM<sub>2.5</sub> standards is shown here for information only.

APPENDIX A  
Engineering Specifications

## Typical Gasifier and Boiler Literature

# CHIPTEC®

## WOOD ENERGY SYSTEMS

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### Technical Discussion

#### CHIPTEC PATENTED GASIFICATION SYSTEM

Our patented gasifier is close-coupled to a boiler. Biomass fuel enters a hot refractory lined chamber where it is roasted to the point where the volatile pyrolysis gas (wood gas) is released into an oxygen-deprived environment. Once released, these gases then travel through the burner nozzle where they are superheated and mixed with air for complete combustion leaving little or no waste such as ash, creosote or stack effluent. The average flame temperature in the furnace of the boiler is 2,100F to 2,300F in all-firing modes except pilot. At these elevated temperatures a greater amount of the volatile organic compounds are destroyed. The end result is more complete combustion and lower system emissions. The increased efficiency, safety and cleanliness of this advanced two stage process produces tremendous economical and environmental benefits.

High temperature combustion, a 10:1 (or better) turn down ratio, refractory heat storage and controlled air allows the CHIPTEC gasifier to respond quickly to boiler demand, and also idle efficiently for economic operation during low load conditions.

Over the years this technology has demonstrated the following:

- 10:1 or better turn down capability
- Ability to burn green and dry fuels
- Easy ash removal system.
- High combustion temperature (cleanliness and efficiency)
- Ability to meet the most stringent emission regulations
- High fuel efficiency
- Ability to idle cleanly & efficiently in low load periods
- Minimal daily maintenance
- Operate efficiently through out the entire year
- Save customers thousands of dollars per year.

The gasifier Chiptec is proposing is capable of using green mill residue chip or screened whole tree chips with the occasional oversize piece up to 12". Larger pieces may activate the safety jam switches located in the augers and turn those components off to prevent damage.

What alternate biomass fuels will the proposed system handle and burn without major modification? (Such as: dry hardwood or softwood chips, green softwood chips, etc.)

The gasifier being proposed can use wood chips with a moisture content of 10% to 45% calculated on a wet basis without any major modifications to the system. Chiptec systems are operating on a wide variety of wood fuel including, green hardwood chips, wood pellets, dry hardwood hogged fuel, dry hogged pallet, dry sawdust & shavings from secondary wood manufactures.



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## WOOD ENERGY SYSTEMS

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The following improvements have been made over the past five years.

- Integration of an oxygen sensor into the system controls. The sensor provides real time feedback to the systems controls. The result is excellent combustion, improved efficiency, reduce excess air and lower reduce fuel cost.
- The burner nozzle has been redesign to provide more complete combustion.
- Airflow through the system also has been improved to provide better control.
- The fuel level arm has been upgraded from a castable stainless steel to a high temperature stainless steel alloy that improves the service life of the part.
- The grates have been redesign to improve airflow and minimize plugging of the air holes. Replacement costs of the new grates are much lower than previous design.
- The air distribution system has been simplified, thus eliminating several electrically controlled dampers.
- The PLC control program is continuously being improved to provide better, more precise control of all of the system operations.

The Chiptec gasifier incorporates a number of fire suppression devices into the overall system design. First item is the air lock located on the end of the feed screw. Provides a physical barrier to the fuel. Second is a heat-sensing device located on the feed screw. If excessive heat is sensed, a solenoid will activate a water valve that will introduce sufficient water in the metering auger(before and just above the air lock). The third device is the draft safety switch. This device continuously monitors the system draft, if draft is lost, the system will stop the fuel feed and send out an alarm.



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## WOOD ENERGY SYSTEMS

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### CHIPTEC AIR CONTROL STRATEGY

#### **General Description:**

The gasifier is the burner for the boiler. The PLC in the main Chiptec control panel shall store the burner management program which controls the operation of the gasifier, the fuel storage and delivery system and related equipment.

#### **Basic description of the air flow through the gasifier and boiler system.**

All primary & secondary air (combustion air) for the entire gasification process is provided by an induce draft fan (ID fan) located in the flue gas breeching of the system. The ID fan is controlled by the boiler set point. When in automatic operation, the PLC receives a signal from the boiler pressure or temperature sensor and signals the ID fan to increase or decreases as required to maintain the desire boiler set point. As the boiler set point decreases, the plc signals the ID fan to increase. The reverse occurs when boiler set point increases. The gasifier and boiler system both operate under negative draft.

The ID fan draws combustion air in through a duct that directs the air to either the primary air zone or the secondary air zone of the gasifier. The primary air is directed to and introduced into a chamber below the internal grates of the gasifier. It is the primary air that travels through the fuel pile and creates the gas for the process. The secondary air is directed through a second duct to the burner nozzle located on the gasifier. The secondary air completes the combustion process. A balancing valve located in the main air duct is controlled by the oxygen sensor located in the flue gas breeching. The oxygen sensor provides information to the plc and adjusts the balancing valve as required to maintain the desired oxygen set point. The result is clean combustion through out the entire range of operation.

The amount of oxygen in the flue gas has a direct relationship to excess air, fuel consumption and ultimately operating cost. The higher the oxygen levels in the flue gas, the higher the excess air. With high excess air, combustion efficiency is reduced and fuel consumption is increased. The use of an oxygen sensor to maintain a desired O2 level in the flue gas, allows the system to continuously adjust the combustion process, to maintaining the proper level of O2 and excess air. The end result is increased combustion efficiency, a decrease in fuel consumption and a decrease in operating cost.



# CHIPTEC®

## WOOD ENERGY SYSTEMS

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**Benefits of “True Gasification”:** Chiptec “True Gasifiers” have a distinctly separate gas producing, and gas oxidation zone. The low temperatures (1000F) in the gas producing zone allow for the use of higher ash content fuel material. It also has a very high temperature combustion zone (2200F) which leads to very complete oxidation of the combustible hydrocarbons, and therefore, better fuel efficiency, cleaner boiler operation, lower particulate emissions, and better air quality. Stack gas treatment is therefore less expensive.

**Low boiler deposits:** Many systems with tube cleaning devices are only cleaned a few times a year. This leads to longer, uninterrupted run times than usually possible. You save the cost of load interruptions, and the labor costs of frequent tube cleaning.

**Extremely fuel-efficient combustion:** The carbon is more fully converted and very little carbon residue comes out in the ash or the stack compared to other types of combustion equipment. For example, Dutch ovens and stokers may have 20 to 25 % ash, in their combined bottom ash, fly ash, and stack gasses. That means you throw away 20 % of your fuel purchases. (At \$20.00 per ton that is \$5.00 per ton wasted.) The Chiptec gasifiers have less than 2% combined ash residue. (This is forty cents per ton unused carbon.) This significantly reduces fuel usage and purchases by thousands of dollars.

**10 to 1 turn down ratio:** (Or better.) This turn down reduces fuel purchases significantly by using much less fuel during low load periods. You can also avoid using oil backup during most low load periods, again saving money in oil purchases. Systems in use for space heat, or fluctuating process heat loads will find very significant savings in fuel purchases over stoker type systems with lower setbacks. Again, saving thousands of dollars in fuel usage or purchasing, and maintaining air quality.

**Exceptional load maintenance and recovery rates:** The Chiptec gasifiers can follow boiler set points precisely, and hover right at designated output. This aspect of load maintenance can save money by running uninterrupted and controlled loads for varying processes.

**Exceptional air quality:** The combination of the combustion management strategy, a fully programmable P.L.C. control system, and motor speed controllers on all feed and fan systems creates very precise combustion of carbon in the fuel, and eases permitting time and costs, and reduces required air treatment technology and hardware costs. The Chiptec gasifiers can also create a “pollution credit” that can be used to offset increased production.

**Fuel Flexibility:** The B-Series can combust cleanly and efficiently, fuels from 6% to 60% M.C., (Wet Basis) It can even change fuels on the fly with no degradation in combustion quality or management. High moisture content fuels are very difficult to burn and maintain loads, but the B-series can operate, for example, with green pine sawdust, and maintain loads as specified, while maintaining soot free combustion. (Of course, boiler output varies according to fuel moisture content.)



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## WOOD ENERGY SYSTEMS

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### Steam Generator (i.e. boiler)

Since Chiptec manufactures the gasifier, which is a burner, we have the ability to utilize many different styles and types of boilers. From hot air furnaces to high pressure steam boilers, Chiptec has used them all. For this project, Chiptec shall utilize a shop assembled or packaged, scotch marine wet back boiler configured to work with our gasifier. Chiptec works closely with the boiler manufacture to ensure all components of the systems are integrated. All boilers are constructed to all applicable AMSE codes.

### Control System

The Chiptec control panel is built upon the PLC microprocessor, which coordinates the various functions of system with the energy needs of the facility. The ability to maintain accurate “set points” at all firing levels, change parameters via a simple touch screen, have “on line” support, interface with other building control systems and provide dial out alerts are all features that add to efficiency, cleanliness, and ease of operation to the Chiptec system. In addition, we control the induced draft fan, and fuel delivery auger with programmable Variable Frequency Drives (VFD). This feature greatly enhances the performance of the system. The high efficiency motors that we use are all “top of the line” and designed to work with VFDs. The burner management software developed by Chiptec, allows the burner to be a fully modulating firing system. All control panels supplied by Chiptec shall be UL certified.

The Chiptec control panel can be configured to integrate into a buildings’ DDC system. All digital and analog output for use by the building DDC can be pre-wired to a terminal strip located in the bottom of the control panel. Other trades will simply have to connect the appropriate wires to the thermals.

Typically provided digital and or analog I/O:

- Firing level indicator(0-100% of system output)
- Stack temperature
- Steam flow
- Wood chip handling system status
- Signal for auto dialing system
- Boiler temperature set point control
- General alarm output

A standard feature of the control panel is a modem that will allow Chiptec to provide support to the system from a remote location. Additionally, if the facility is connected to a network, the system’s HMI can be configured to be accessible from any web browser. The system can also be operated from the web browser. Supply of the network, network connection and related hardware is not provided by Chiptec.



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# CHIPTEC®

## WOOD ENERGY SYSTEMS

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### **Emission control system.**

The Chiptec gasification system is a very clean burning and efficient system. Due to our very tight air control and advance burner management software, the Chiptec gasification system typically only requires simple mechanical particulate control equipment. The utilization of the oxygen sensor to provide real time feed back to the plc, allows the system to manage the combustion process to maintain a desired flue gas oxygen level (typically 5-6%) which results in low CO, NOx and particulate emissions

### **Mechanical connections and requirements.**

Since the Chiptec gasifier and the boiler are shipped assembled, there are very few mechanical connections to be made in the field. All of the boiler piping and plant piping will be performed by others. Chiptec Wood Energy Systems is not a mechanical contractor and we do not perform piping or other mechanical work. Any interconnect piping will be minimal due to the “package” aspect of the Chiptec system. Each gasifier will require one (1) ¾” water drop, which is use to supply plant water to the gasifiers’ fire suppression system. The other mechanical connections will be on the boiler which will include piping of the supply and return lines, blow down, safety relief valves, and chemical feed.



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PRELIMINARY  
NOT FOR  
CONSTRUCTION

No.	Date	Revisions
00	3/12/07	FINAL

**Steam Plant Systems, Inc.**  
BOILER & STEAM ENGINEERS  
900 Commerce Drive • P.O. Box 897  
Chilton, NH 03035  
Phone: (603) 872-8805

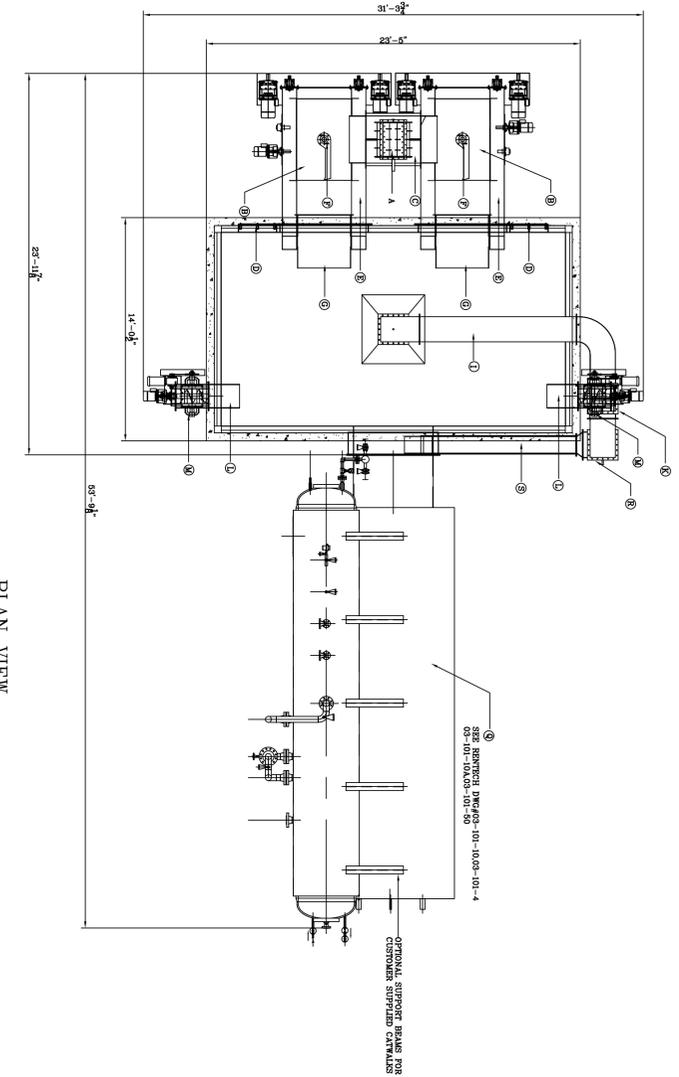
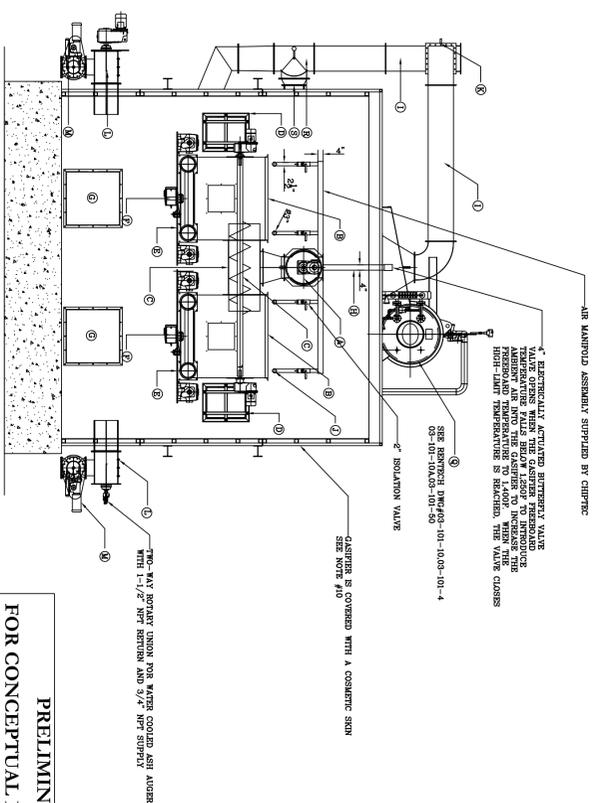
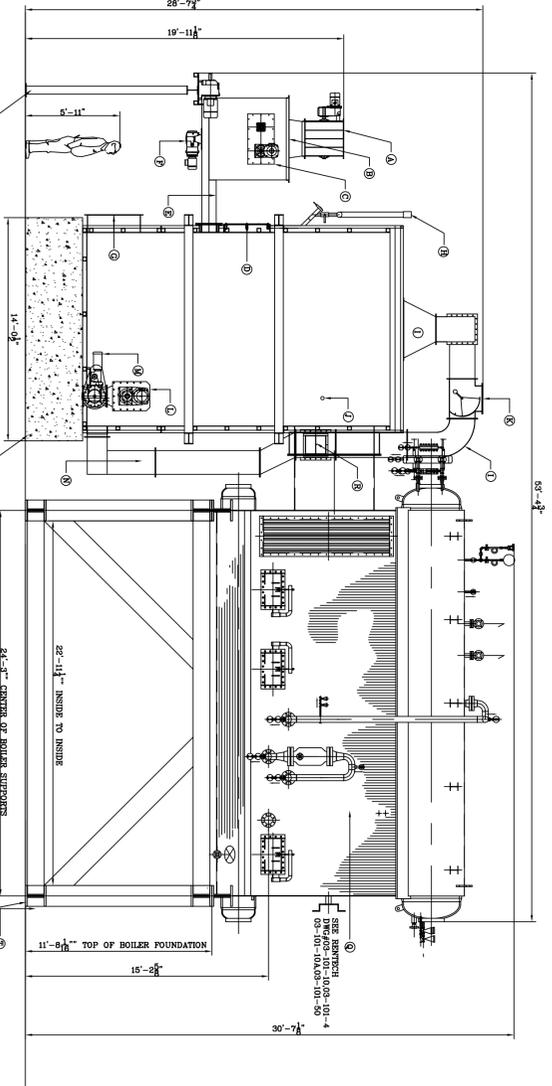
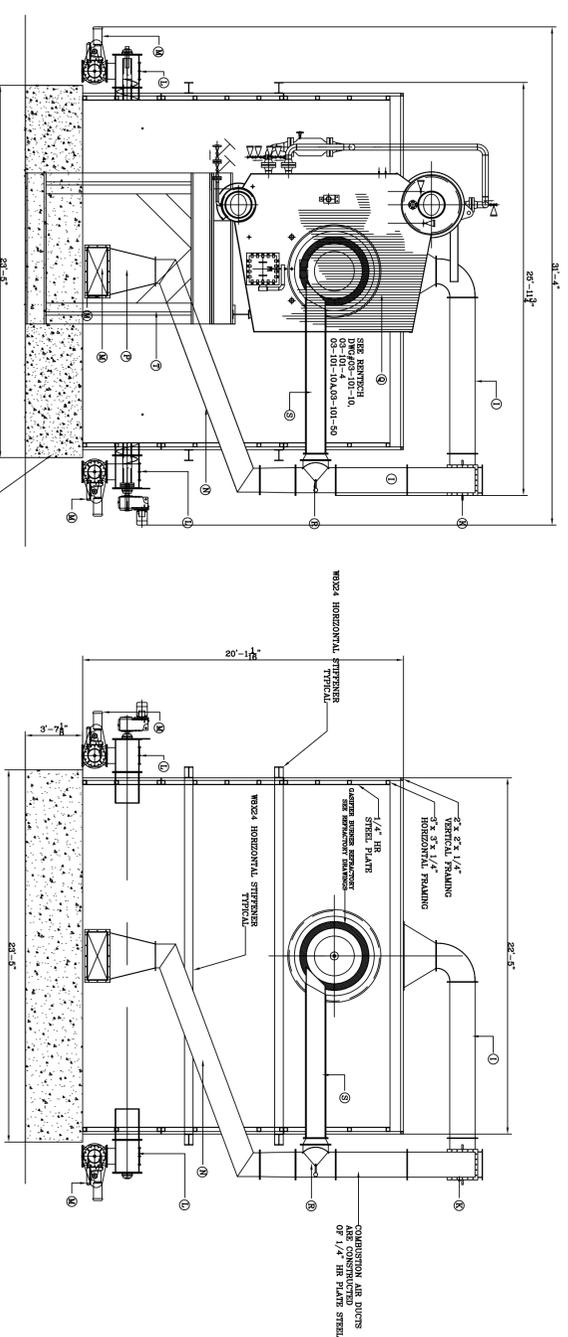


**GREEN ENERGY TEAM, LLC**  
4313 KAPUNA RD  
KILAUEA, HI

WASTE TO ENERGY PLANT  
KAUAI, HI

Drawn By / Approved By / Scale  
EO / EO / 3/16" = 1'  
Project ID  
491-0706

G-01  
SHEET 22  
OF 24

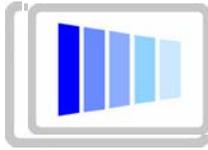


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FOR CONCEPTUAL ENGINEERING

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NO.	DESCRIPTION
1	FUEL FEED AIR LOCK
2	FUEL WEIGHING BIN
3	FUEL SPLITTER ASSEMBLY
4	GASIFIER HATCH ACCESS
5	FEED SCREW ASSEMBLY
6	BRIDGE BREAKER ASSEMBLY
7	GRATE MANWAY ACCESS
8	OVER FIRE AIR MANIFOLD
9	GASIFIER VIEW ROOF
10	TOTAL AIR BALANCING VALVE
11	GASIFIER ASH AUGER
12	ROTARY ASH VALVE
13	PRIMARY AIR DUCT
14	OPTIONAL BOILER ASH CLEAN OUT HOPPERS
15	HIGH PRESSURE STEAM BOILER
16	CONDENSATION AIR BALANCING VALVE
17	SECONDARY AIR DUCT
18	BOILER FOUNDATION

## Typical ESP Literature



# PPC Industries

3000 East Marshall Longview, TX 75601  
903-758-3395 Fax 903-758-6487

# QUOTATION

Quotation No. 07018, Rev. 0

Date: 01/31/07

## Steam Plant Systems, Inc.

900 Commerce Drive  
Clifton Park, NY 12065

Attention: Mr. Emery Otruba  
Email: [eotruba@steamplantsystems.com](mailto:eotruba@steamplantsystems.com)

Delivery: See Sect. V.

F.C.A. port of  
Los Angeles, CA USA

Page 1 of 13

Reference: Your Inquiry for Green Energy Hawaii Project

Contact: Link Landers

We are pleased to offer you the following firm quotation for one of our modular electrostatic precipitators for your wood fired boiler to be located in Hawaii.

### I. DESIGN BASIS

A. Volume (acfm) .....	2 @ 17,364 = 34,728 Total
B. Temperature (° F).....	340
C. H <sub>2</sub> O in flue gas (% by vol.) .....	17 (estimated)
D. Heat input to boiler (MMBTU/hr) .....	2 @ 46.4 = 92.8 Total
E. Inlet (lbs/MMBTU).....	2 @9.28 = 18.56 Total
F. Emission rate (lbs/MMBTU).....	0.025
G. Dust source .....	wood fired boiler
H. Fuel.....	Albizia chips
I. Power voltage/frequency.....	480 / 3 phase / 60 hz
Control voltage/frequency .....	120 / 1 phase / 60 hz

### II. SCOPE OF WORK BY PPC INDUSTRIES

A. **PRECIPITATOR:** PPC is offering one Model **XH-1212-2S** modular electrostatic precipitator including all collecting plates, rigid discharge electrodes, roof section, insulator compartments, access doors, all internal components and power supplies to make a complete air pollution control assembly.

1. The electrostatic precipitator will have the following design features:

Gas velocity (ft/sec).....	4.35
Treatment time (seconds) .....	5.5
Aspect ratio (treatment length/treatment height) .....	1.9
Treatment length (feet).....	24.0
Collecting area (square feet).....	6,666
SCA (sq. ft./1000 acfm).....	191.9
Power consumption (kw).....	12.3
Pressure drop (inches of wc) .....	0.50
Hopper capacity (cubic feet) .....	1,960
Structural design temp. (° F).....	700
Number of gas passages .....	11
Spacing of gas passages (inches) .....	11.5
Number of discharge electrodes .....	176
Lineal feet of discharge electrodes .....	2,222
Transformer output voltage(kv).....	55
Transformer output current (ma).....	400
Installed weight (excluding dust).....	81,200

## Utilities Required:

Air: 50-80 SCFM @ 70-90 psi.....	8 seconds every 2 hours
Precipitator Electrical Power (connected load) .....	480V / 3 phase / 125 amps
Conveyor Power.....	480V / 3 phase / 1 hp

2. The collecting plates will be constructed from solid rolled steel sheets not less than 16 gauge. The sheets will be adequately stiffened and baffled to give quiet gas areas at the surface of the plate to minimize re-entrainment. Both top and bottom alignment guides, stiffeners and mountings will maintain the alignment of plates while permitting thermal expansion. The plates will be designed for a maximum temperature excursion to 700° F.

3. The collecting plate cleaning equipment will be arranged to operate in an automatic manner and will clean each field independently which will minimize particulate re-entrainment. The cleaning system will be designed so that the frequency of cleaning can be adjusted.

4. The discharge electrodes will be rigid type with corona emitting pins. Electrodes will be stabilized and supported to maintain alignment at all temperature ranges of the precipitator's operation.

5. Two (2) step up transformer/rectifiers will be provided with the precipitator. Each will be an outdoor type, oil insulated, self-air cooled unit with full-wave rectifiers. The transformer and rectifiers will be in the same tank. Each transformer will be provided with a grounding switch and a key interlock. Each set will be rated for a temperature rise of 45°C (at a maximum ambient of 50°C).

6. The high tension support insulators will be of the cylindrical, compression load type. The insulators will be porcelain, glazed inside and outside and will have ground ends. The insulators will be located out of the gas treatment area, and will be kept clean by purge air.

7. The precipitator will be furnished with key type safety interlocks with a sequential key arrangement to prevent access to any high voltage equipment without locking out the power supply and grounding the high voltage equipment. The following equipment will be interlocked: all quick opening precipitator access doors, transformer/rectifier ground switches and high voltage control unit circuit breakers.

8. Welded weatherproof individual insulator compartments will be provided to house the support insulators. The insulator compartments will be accessible by access doors with safety interlocks to prevent access to all high voltage areas until the precipitator is de-energized and grounded.

9. The electrostatic precipitator shell will be fabricated from 3/16" thick ASTM A-36 steel plate with external ASTM A-36 structural stiffeners as required to support the electrostatic precipitator pressure, wind, live, and dead loads. The shell will be seal welded to form a gas tight structure.

10. The precipitator will be equipped with a longitudinal trough type hopper. The hopper will be fabricated from 3/16" ASTM A-36 steel plate, and supported with ASTM A-36 external structural shapes as required to support the hopper loads.

The hopper will be designed to support its weight when full of particulate. Particulate density is 65 lbs/cu.ft. for structural sizing and 45 lbs/cu.ft. for hopper capacity sizing. In addition, the hopper will be of sufficient capacity to store particulate collected over a minimum period of 12 operating hours. The sides will be sloped to provide a minimum hopper wall angle of 60° from the horizontal. The end angle will be adjusted to insure a minimum hopper valley angle of 55°. The discharge opening will be 18" x 20' - 0". The hopper will be equipped with the following accessories.

a. **Access and Poke Hole:** The hopper will have a quick opening, key interlocked access door and a three (3) inch diameter poke hole.

b. **Hopper Hammer Pads:** A vibrator pad will be provided on one side of the hopper. The pad will be drilled for a vibrator for future mounting by purchaser if required to enhance dust removal.

c. **Heaters:** PPC will shop install 2.5 kw, 480 volt, single phase, 60 HZ, electrical heaters on the hopper underneath the hopper insulation. The heater system will be complete with a temperature controller and

thermostat mounted in a junction box located on the side of the hopper. Field electrical wiring to the power source will be by the purchaser.

**B. PRECIPITATOR SUPPORTS:** The electrostatic precipitator will include all structural supporting steel. The height is 7'-0" clearance between the hopper discharge flange and grade. Other heights are not available without special engineering charges.

**C. NOZZLES:** The precipitator will be equipped with flanged inlet and outlet nozzles. The nozzles will be fabricated from externally stiffened 3/16" thick ASTM A-36 steel plate.

1. **Inlet:** The inlet nozzle will be a horizontal entry pyramid type with the bottom angle of the nozzle 45° from the horizontal. The inlet nozzle will include three flow distribution screens to assure uniform flow through the precipitator. No access is required.

2. **Outlet:** PPC will provide a vertical discharge "box" style outlet nozzle. The outlet nozzle will include a flow distribution device as required to assure uniform flow through the electrostatic precipitator. The nozzle will have a stub stack adapter for connection of the nozzle to the stub stack. No access is required.

3. **Stack:** A stub stack will be provided for attachment to the outlet nozzle. The stack discharge elevation will be approximately 75'-0" above the grade level. The stack will be rolled from 3/16" thick ASTM A-36 steel plate to an inside diameter of 3'-6". The stack will be stiffened as required for wind loads. The stack will include EPA test ports. A stack adapter will be provided for connecting the stack to the precipitator outlet nozzle. All external surfaces of the stack and the stack adapter will be high temperature black paint.

4. **Stack Testing Platform:** PPC will provide a permanent 180° testing platform (with hand railing) attached to the stack. Also, included is a caged ladder from the roof of the electrostatic precipitator to the platform. The platform will have galvanized grating. All access surfaces except the grating will be painted with one coat of primer and one coat of safety yellow enamel.

**D. ACCESS:** The access to be supplied will meet OSHA standards and it will be furnished as follows:

1. The precipitator will have a caged ladder from grade to the roof of the precipitator. The ladder will be on the right-hand side of the unit (gas flowing towards your face).

2. PPC will provide factory installed handrails with kick plate around the perimeter of the precipitator roof and all platforms. Handrails and vertical posts will be 2" square tubing.

3. Access openings to the hopper, roof and high voltage compartments will be 24" in diameter. All access openings will be equipped with quick opening, hinged steel doors and gas tight seals. A safety key interlock system and high voltage warning signs will be provided for all quick opening access doors. All access doors will be easily accessible from walkways except those on the hopper.

4. No access ladders will be provided to the hopper manways.

**E. INSULATION & SIDING:**

1. **Insulation:** PPC will provide factory insulation of the electrostatic precipitator (including the collecting module, hopper, inlet and outlet nozzles). The insulation will consist of 4" of 8# density mineral wool in contact with the 3/16" shell on the module, hopper, and nozzles. The precipitator roof will be insulated with 6" of 8# density mineral wool plus 2" of fiberglass insulation over the stiffeners and then covered with ¼" checkered plate.

2. **Siding:** The precipitator will be covered with galvanized architectural sheeting. The siding will run horizontally and will be overlapped one section at all seams.

The insulation on the inlet nozzle, outlet nozzle, and hopper will be covered with galvanized architectural sheeting. All flashing seams will be covered with flat material as well. All openings will be filled with EPDM synthetic rubber closure strips to match the siding contour.

The siding material will be attached with TEK #5 12-24 x 1¼" Climaseal screws with neoprene washers. The sheet to sheet connections will be with ¼ -14 x 7/8" stitching screws with neoprene washers. All siding seams that are subject to moisture infiltration will be sealed with clear silicon sealant before assembly.

F. **PAINTING:** PPC will paint the structural supports, access, insulator compartments, handrails and roof exterior with one coat of red primer and one coat of medium industrial gray enamel finish paint. All hot metal surfaces that will be exposed after the field insulation is completed will be painted with high temperature black paint. All ladders, platforms (including supports) and railings will be finish painted with safety yellow enamel.

G. **ELECTRICAL CONTROL EQUIPMENT:** The following electrical control equipment will be furnished by PPC.

1. **Precipitator Control/Distribution Panel:** A NEMA 4 precipitator control/distribution panel (PCDP), mounted on the railing of the roof will be furnished with local sonic horn timing controls and local purge air blower controls. This panel will also house the main circuit breaker, distribution bus, individual circuit breakers and the required distribution wiring.

2. **T/R Controller:** PPC will provide a NEMA 4 microprocessor type high voltage control enclosure mounted on the side of each roof mounted transformer/rectifier. All components will be accessible through a hinged front door. The voltage controls will be completely automatic with auxiliary manual control. Both manual and automatic systems will provide full range control. Arc suppression will be provided by a current limiting device to reduce the voltage when a spark over condition exists in the precipitator. The controllers will be rated for a maximum ambient of 40°C. All enclosures will be constructed of 12 gauge steel and painted with ASA 61 gray enamel.

3. **Remote Control:** PPC will provide a remote graphics voltage controller (GVC) for each transformer/rectifier. Each GVC controller will be mounted in a remote control panel. The standard size of the remote panel is 24" wide x 24" high x 8" deep. Other sizes may be required depending on the options selected.

The graphics controller provides bar graph and digital read outs of primary and secondary voltages and currents, as well as kw, spark rate, SCR conduction angle and the status of the T/R. This remote panel is to be mounted in the customers control room. Alarms will be provided on the GVC control unit for AC overcurrent, T/R over temperature, SCR high temperature, SCR imbalance, loss of memory, DC undervoltage and DC overvoltage. A main menu is provided to select functions for operation and troubleshooting. The graphics controller display is 16 lines x 40 characters wide. The unit can produce V/I curves, 24 hour trend plots, and 30 minute trend plots. The operator can remotely set all precipitator parameters such as setback, rise rate, current limit, etc. On line help text is available for making all adjustments.

Each controller will also have three indicator lights next to the GVC. These lights are for Control On, HV On, and Alarm.

#### H. **FIELD CONSTRUCTION SERVICES (NON-UNION):**

1. **Mechanical:** PPC will do the complete mechanical erection of precipitator supports, electrostatic precipitator and access. The flashing of field insulation seams and touch up finish painting will be done by PPC. PPC will do the grouting. **The customer must provide a manned and maintained crane to erect the unit.** Foundations, anchor bolts, and finish painting other than that listed elsewhere and the grounding system will be done by purchaser.

2. **Electrical:** All field electrical work is to be by the purchaser.

I. **ENGINEERING AND TECHNICAL SERVICES:** PPC will provide a complete engineering package for the above electrostatic precipitator including:

1. Foundation loading diagrams and anchor bolt patterns.
2. Erection and interface drawings.
3. Operator's manual (1 electronic copy).
4. Recommended spare parts list.
5. Complete electrical package on AutoCad

PPC can supervise the precipitator check out and will train the purchaser's personnel in the operation and maintenance of the equipment. The charge for this service will be as set forth in the attached Standard Terms and Conditions for Field Services.

J. **WORK BY OTHERS:** All work not specifically mentioned as part of PPC's scope of work will be by the purchaser or by other parties. This includes a manned crane and transportation from Los Angeles, CA dockside to jobsite.

### III. PERFORMANCE AND TESTING GUARANTEE

A. **PARTICULATE:** The proposed equipment, when operating at design conditions, is guaranteed to emit not more than 0.025 lbs. of particulate per MMBTU or to remove 87.5% by weight of the inlet particulate load. If the inlet particulate load is greater than the design conditions the efficiency of 87.5% is guaranteed; if it is equal or less than the design conditions a residual of 0.025 lbs. of particulate per MMBTU is guaranteed.

B. **OPACITY:** PPC guarantees the one hour average opacity of the flue gas when operating at design conditions to be less than 10%. The opacity shall be determined by a certified smoke reader or certified opacity monitor

C. **QUALIFICATIONS:** The particulate sampling method will be per the U.S. Environmental Protection Agency Method No. 5 as outlined in the U.S. Federal Register. Particulates are defined as solids at the precipitator operating conditions that can be collected. Condensibles are not included. A series of three consecutive tests shall be performed. If the average emissions from three acceptable tests are equal to or below the guarantee level then the unit has fulfilled the performance guarantee.

D. **TEST PERIOD:** The unit must be tested within 30 days after initial equipment operation or 90 days after the final truck shipment; whichever occurs first. If the unit is not tested within this time period, it shall be considered as accepted.

E. **INLET DUCT DESIGN:** **NOTE – 10'-0"** of straight uninterrupted duct at a velocity of not more than 3,500 fpm is required in front of the precipitator. The last elbow before the precipitator must have turning vanes with no more than 12" spacing. The leading edge should be 12" and the trailing edge 24". The inlet duct design should be approved by PPC. Failure to comply with proper duct design will void the guarantee.

### IV. PRICING AND OPTIONS

A. All prices quoted are firm for 30 days from the quotation date. No duties, brokerage fees or taxes are included. Sales tax or an equivalent amount will be charged if a sales tax exemption certificate is not sent to PPC by the purchaser. Transportation from Los Angeles, CA dockside to the jobsite is not included.

**STANDARD TERMS AND CONDITIONS OF SALE****1.0 Material Warranty**

1.1 PPC Industries (hereafter called PPC) warrants that the equipment to be delivered hereunder will be free from defects in material and workmanship under normal use and service for a period of 1 year after completion of delivery if the Purchaser installs the equipment or 1 year from completion of installation if PPC installs the equipment, whichever is the sooner. This warranty does not cover products, accessories, parts, or equipment which are not manufactured by PPC. All others shall receive such warranty, if any, as given by the manufacturer. This warranty shall not apply where the defect or damage is caused by corrosion or abrasion, careless or improper handling, internal precipitator fires, storage, transportation, or installation, or where defects are remedied by others, or where operating instructions are not adhered to, or where alteration or substitutions have been made in the equipment without PPC's prior written approval.

1.2 PPC's obligation under this warranty is limited to and shall be fully discharged by PPC when at its own expense and option, PPC repairs any defective part or supplies without charge a similar part which is shown to PPC's satisfaction to have been defective as to material or workmanship when shipped.

**2.0 No Other Warranties, Guarantees and Obligations:**

2.1 The warranties furnished by PPC are exclusive and in lieu of all other warranties (including any implied warranty of merchantability or fitness for a particular purpose), except that of title, whether written, oral or implied, in fact or in law.

2.2 Correction of non-conformities in the manner provided above shall constitute the entire liability of PPC with respect to such equipment unless otherwise expressly provided in this contract.

2.3 In no event, be it due to a breach of any warranty or guarantee hereunder or any other cause arising out of performance or non-performance of this quotation or contract, shall PPC be liable for (1) consequential or indirect loss or damage, including but not limited to, loss of profits, plant down-time or suits by third parties against the Purchaser, or (2) loss or damage arising out of the sole or contributory negligence of the Purchaser, its employees, agents, Engineers or Architects, or any third-party.

2.4 Only such safety devices as are specified in the quotation will be furnished by PPC. All other safety devices required or desirable due to the nature of the equipment or the Purchaser's operation of the equipment are the responsibility of and will be obtained by the Purchaser. The Purchaser hereby releases PPC from any and all liability arising out of the Purchaser's improper use of the equipment or from the absences of proper safety devices.

**3.0 Performance Guarantee**

3.1 PPC's guarantee is based upon data furnished to PPC concerning the conditions under which the equipment is required to perform and the Purchaser accepts responsibility for the correctness of such data.

3.2 PPC's obligation under this guarantee is limited to and shall be fully discharged by PPC, if PPC at its expense, makes changes or additions in the equipment which PPC deems necessary to enable the equipment to meet the performance guarantee and the equipment will be made available to PPC for this purpose. If PPC is unable to modify the equipment so that it meets the performance guarantee, PPC will make such adjustments in the purchase price as are fair and reasonable, but in no event will PPC's obligation, including expenditures for changes and additions hereunder, exceed the amount of the purchase price paid to PPC for the proprietary material.

3.3 PPC makes no representation that the equipment does or will comply with any code or regulation of any pollution control authority or other government body and PPC will not undertake or have any obligation to obtain permits, licenses or approval from said authority or government body concerning the equipment.

**4.0 Test of Equipment**

4.1 PPC's representative must be present at the plant site during all performance tests. The equipment shall be adjusted and operated under the direction of PPC's representative during the test period.

4.2 The Purchaser shall give PPC at least ten days notice in writing of the time and place appointed for the tests.

4.3 All test costs are to be at the Purchaser's expense including the service of PPC's service man.

4.4 PPC's representative is to have access to the test records at all times and to have the cooperation of the Purchaser in conducting preliminary tests, equipment modifications and/or adjustments as PPC's representative may deem necessary.

4.5 If the equipment is operated by the Purchaser before it is accepted, Purchaser will, if requested by Vendor, restore the equipment to good operational condition before any performance tests are conducted.

**5.0 Taxes, Duties, and Permits**

5.1 All sales, use, gross receipts or other taxes assessed to PPC on the equipment or on its sale, installation or use, and all duties, excises and other charges levied on or with respect to the equipment by any governmental body, shall be for the account of the Purchaser unless otherwise specified in the PPC's quotation. Each and every billing invoice from any resulting contract are part of any such contract.

5.2 All building permits and construction certificates required by local and state authorities will be obtained by the Purchaser.

**6.0 Force Majeure**

PPC shall not be liable for any loss or damage arising out of delay in shipment or delivery, or failure to manufacture or failure of the equipment to operate, due to causes beyond its reasonable control, such as, but not limited to, acts of God, acts of Purchaser, acts of civil or military authority, priorities, fires strikes, floods, epidemics, quarantine restrictions, war, riot, delays in transportation, car shortages, and PPC's inability to obtain necessary labor, materials, or manufacturing facilities. In the event of any such delay, the date of delivery shall be extended for a period equal to the time lost by reason of the delay.

**7.0 Shipment and Storage**

7.1 Unless otherwise specified in PPC's quotation, all freight, insurance, handling, loading and unloading, local delivery, and other costs incurred in shipping the equipment to point of installation shall be for the account of the Purchaser.

7.2 If the Purchaser for any reason is unable or unwilling to accept delivery of the equipment when it is ready for shipment, it may be stored by PPC at the Purchaser's expense and risk. At PPC's request, the Purchaser shall make arrangements for suitable storage without expense or risk to PPC.

**8.0 Payment**

8.1 PPC will retain a security interest in the equipment to secure payment in full of the equipment price pursuant to the terms herein specified, notwithstanding transfer of title and risk of loss to the Purchaser.

8.2 All invoices are payable net thirty (30) days from the date of the invoice. If the payment is not made in accordance with the terms of sale, the Purchaser agrees to reimburse PPC for all costs and expenses reasonably incurred in collecting the account including but not limited to reasonable attorney fees not to exceed 20% of the debt.

8.3 A delinquency charge will be applied to all overdue monies due the PPC at the rate of one and one-half per cent (1 ½%) per month of the total amount outstanding.

#### **9.0 Installation**

9.1 Unless otherwise specified in PPC's quotation, the Purchaser will be responsible to supply all labor, supervision, equipment, and supplies for the erection, assembly, and operation of the proposed equipment and all other related items including foundations, supports, platforms, ladders, drains, electrical equipment, piping and any and all other materials except those integral with the quoted equipment.

9.2 PPC reserves the right to subcontract any part of the installation work included in the quotation.

9.3 PPC assumes no responsibility for materials or work supplied or performed by others. Neither does PPC assume responsibility for damage to property other than that engineered and manufactured by PPC arising from or caused by defect in workmanship in any product of, or by actions of, any third party.

#### **10.0 Services in Connection with Equipment Sold**

Unless the purchaser requires otherwise, all conferences between the Purchaser's representative and PPC's representative, whether they pertain to engineering, contractual matters or other items, will take place at Longview, TX. If the Purchaser requires any conferences to take place other than in Longview, then each of PPC's representatives attending the conference will be provided in accordance with PPC's Standard Conditions of Sale for Field Services.

#### **11.0 Equipment, Contract Changes and Contract Extras**

11.1 PPC reserves the right to make changes in the design or arrangement of the equipment at any time prior to delivery, which in PPC's judgment will improve the equipment or its installation or performance.

11.2 Any changes requested by the Purchaser in the plans, specification or contract, any delay to PPC's performance caused by the Purchaser or its subcontractors or any unknown physical conditions at the site of an unusual nature differing materially from those ordinarily encountered in work of the character provided in the quotation or contract which result in additional expenses, (including overhead) to PPC shall be for the Purchaser's account and are in addition to the contract price.

11.3 PPC makes no claims on the ability of equipment not manufactured by PPC to satisfy national, state and local building, health or safety codes. PPC will be absolved of liabilities or any expenses in making alterations or damages arising out of failure of the equipment not manufactured by PPC to meet these regulations.

11.4 PPC requires detailed physical locations of existing Purchaser equipment. The Purchaser will supply the required drawings, sketches or data at the Purchaser's expense. The Purchaser will be responsible for reimbursing PPC for any additional engineering, fabrication or erection costs incurred because of incomplete data or errors in the information provided by the Purchaser.

#### **12.0 Confidential Material**

All drawings, specifications and information included in PPC's quotation or contract, and all information otherwise supplied by PPC relating to the erection, operation and maintenance of the equipment, is the confidential property of PPC. The Purchaser shall not disclose such confidential property to others including affiliate operations of the Purchaser, or allow others to use such property except as required for the Purchaser to obtain service for the equipment purchased from PPC.

#### **13.0 Arbitration**

Any arbitration required pursuant to this quotation shall be in accordance with the Rules of the American Arbitration Association, provided that notwithstanding anything to the contrary contained in such Rules, (1) the substantive law to be applied shall be as specified in paragraph 22, (2) no substantive provision of this quotation shall be abrogated, (3) the issue submitted to arbitration shall be limited to that specified in the Guarantee, and (4) the place of arbitration shall be Longview, TX.

#### **14.0 Assignment**

A contract or purchaser order shall not be subject to assignment by either party without the prior written consent of the other party.

#### **15.0 Cancellation**

The purchaser's cancellation of a contract is subject to a cancellation charge of (1) the actual expenses and expenses to which PPC has become committed for fulfillment of the contract before notice of cancellation is received plus (2) the larger of sixty five percent of item (1) expenses or twenty percent of the contract price.

#### **16.0 Contract Interpretation**

16.1 If any of the provisions of these Standard Terms and Conditions of Sale including statements made in the quotation conflict with any provisions in the Purchaser's documents, the former shall govern unless PPC expressly agrees to the contrary in writing. Any contract resulting from this quotation shall be construed, and the legal relations of PPC and the Purchaser shall be determined, in accordance with the laws of the State of Texas, U.S.A.

16.2 All communications, written and verbal, between the parties hereto with reference to the subject of this quotation prior to the date of its acceptance are merged herein and this quotation, when duly accepted and approved, shall constitute the sole and entire agreement and contract between the parties as to the subject matter thereof. No changes in or modifications of said agreement shall be binding upon the parties or either of them, unless they shall be in writing duly accepted by the Purchaser and approved in writing by PPC.

#### **17.0 Acceptance**

Unless otherwise specified in PPC's quotation, this quotation is subject to acceptance by the Purchaser within thirty (30) days. Purchaser's acceptance of this quotation by purchase order or letter of intent to purchase shall constitute a binding agreement with PPC unless the quotation is withdrawn by PPC within ten days immediately following the Purchaser's acceptance.

#### **18.0 Erection Delays**

If PPC's quotation includes equipment field erection, the quoted price is based on a continuity of erection work that is not impaired by completion of work by the Purchaser or his subcontractors (such as foundations), Purchaser's plant operation scheduling, Purchaser's tie-in scheduling, Purchaser's work or

safety permits or similar delays. If through no fault of the PPC, the erection is delayed or postponed the Purchaser shall reimburse PPC for all additional costs, including overhead and profit, incurred from such delays or postponements.

**19.0 Offsite Facilities**

19.1 If required, the Purchaser shall be responsible for supplying general utilities to PPC's usage point.

19.2 Unless specified otherwise in PPC's quotation, foundations and any required subterranean grounding with the associated grounding tie-in shall be supplied by the Purchaser.

**20.0 Receiving Equipment**

20.1 The Purchaser agrees that prior to arrival of PPC's erection crew to receive and unload without charge to PPC all equipment that is shipped direct to jobsite which is supplied by PPC but manufactured by others. When receiving equipment, Purchaser shall be responsible for inspecting equipment before unloading and shall immediately notify PPC of any damage or shortage. The unloading of equipment by the Purchaser without proper inspection and PPC notification will be construed as the Purchaser's acceptance of the equipment and he shall assume the responsibility of making good any damages that later may be discovered. The Purchaser shall be responsible for any damage occurred during the unloading and any erection delay caused by the damage.

20.2 If material manufactured by PPC is ready for shipment in accordance with the contract shipping schedule and the Purchaser delays erection schedule, the Purchaser has the option of receiving the material at the jobsite, unloading and rehandling to the site at no cost to PPC or the assumption of costs of extra handling and storage at a place other than the jobsite. Materials manufactured by PPC that are in transit at the time of the erection schedule delay must be unloaded, stored and rehandled by the Purchaser at the Purchaser's expense.

**21.0 Patent Warranty**

PPC shall defend at its expense any suit brought against the Purchaser based upon any claim that the equipment covered herein infringes any USA patent providing PPC is promptly notified by the Purchaser in writing of such claim.

**22.0 Foreign Shipments**

22.1 The Purchaser shall obtain all necessary export licenses and permits required to clear the shipment for entry into the foreign country.

22.2 Unless otherwise specified in the quotation, no special export packing is included.

**STANDARD CONDITIONS OF SALE FOR FIELD SERVICES**

All field services shall be furnished by PPC Industries (hereinafter referred to as PPC) to act in an advisory capacity in accordance with the following terms and conditions of sale.

**1.0 RATES**

1.1 From the day the PPC representative leaves his basing point up to and including the day of his return to his basing point, payment shall be made at the rate of \$1,050.00 for each regular work day, regardless of whether actual work is performed or not.

1.2 In the event PPC must furnish their own gas detection equipment, an additional charge of \$100.00 per day will be billed for each day the detection equipment is used.

1.3 The regular work day is to be eight hours, Monday through Friday (except holidays).

1.4 Time and a half shall be paid for all hours actually worked in excess of the original eight on Monday - Friday, and for the initial eight hours worked on Saturdays. Double time shall be paid for all hours actually worked on Sundays or holidays, and for all after the initial eight on Saturdays. If work is not performed, and/or the PPC representative is traveling, laying over, or otherwise away from his basing point for whatever reason, the regular work day rate shall apply.

**2.0 EXPENSES**

2.1 The daily rate specified in 1.1 includes all living expenses, except lodging, for the PPC representative. Administrative and overhead charges (clerical), telephone, telegraph, reproduction facilities, etc. are included.

2.2 The daily rate does not include written reports. If Purchaser requires a written report from the PPC representative, the time he spends in preparing it shall be invoiced at a rate of \$50.00 per hour.

2.3 The daily rate does not include any transportation or travel related expenses. Transportation and travel related expenses are for Purchaser's account, and will be invoiced at actual cost. In addition, should a vehicle belonging to either PPC or the PPC representative be used for part or all of the required travel, Purchaser will be invoiced \$0.95 per mile traveled.

**3.0 GENERAL**

Long periods away from home can create domestic problems. Personnel in the field will be allowed a trip home every three weeks -- the daily rate shall not apply, but all transportation expenses shall be for Purchaser's account.

**4.0 CANCELLATION**

In the event a service requirement is cancelled less than three working days before a previously agreed upon start date, a cancellation fee of one day's service will be charged.

**5.0 INDEPENDENT CONTRACTOR**

5.1 PPC shall be considered an independent contractor in respect to all work herein provided for and the representative furnished by PPC under this agreement will not in any sense be considered an employee of the Purchaser.

5.2 The representative shall be utilized in an advisory capacity and PPC will not be liable for any damage to equipment, loss of time or product, for production rates of workmen, and quality of field workmanship. The Purchaser will have the direct responsibility for planning, supervising and executing the work; under such circumstances, neither PPC nor the representative will be responsible for the progress or cost of the work.

5.3 All personnel required to meet OSHA standards for confined space entry shall be provided by Purchaser. Safety equipment, hole watches and testing equipment shall also be provided by customer.

**6.0 INTERLOCK INDEMNITY**

6.1 If PPC previously provided a key interlock system with the original electrostatic precipitator(s) or are furnishing additions or alterations to the original system or are providing the initial key interlock system under this contract, the following shall apply:

6.2 For said interlock systems to be an effective means of protecting persons involved in precipitator operation and maintenance, said system must be maintained in an as new condition and there should not exist extra or additional keys for the system. Should the interlock system be tampered with, compromised or otherwise not maintained in its proper operating conditions or should the purchaser, its employees, agents, engineers or anyone else acting on behalf of the purchaser obtain by any means whatsoever extra or additional keys for said interlock system, the purchaser agrees to indemnify and hold harmless PPC, its officers, employees, and agents from any and all liability arising therefrom.

**STANDARD CONDITIONS OF SALE FOR ERECTION SUPERVISOR**

All field services shall be furnished by PPC Industries (hereinafter referred to as PPC) to act in an advisory capacity in accordance with the following terms and conditions of sale.

**1.0 RATES**

1.1 From the day the PPC representative leaves his basing point up to and including the day of his return to his basing point, payment shall be made at the rate of \$800.00 (plus any Canadian tax) for each regular work day or travel day, regardless of whether actual work is performed or not.

1.2 The regular work week is to be 40 hours for a rate of \$4,000.00 and can be comprised of four 10 hour days or five 8 hour days.

1.3 Time and a half shall be paid for all hours actually worked in excess of 40 hours per week. If work is not performed, and/or the PPC representative is traveling, laying over, or otherwise away from his basing point for whatever reason, the regular work day rates shall apply.

**2.0 EXPENSES**

2.1 The daily rate does not include any expenses. All expenses (including travel, rental vehicle, lodging, meals, etc.) are for Purchaser's account, and will be invoiced at actual cost. In addition, should a vehicle belonging to either PPC or the PPC representative be used for part or all of the required travel, Purchaser will be invoiced \$0.95 per mile traveled.

**3.0 CANCELLATION**

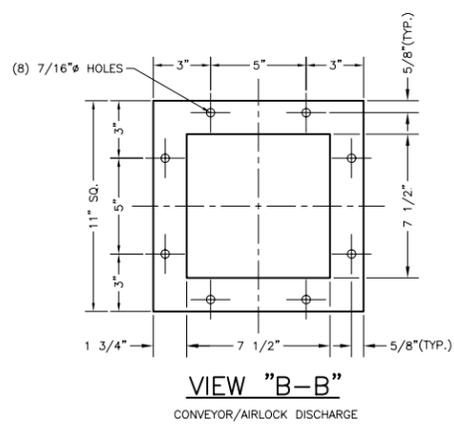
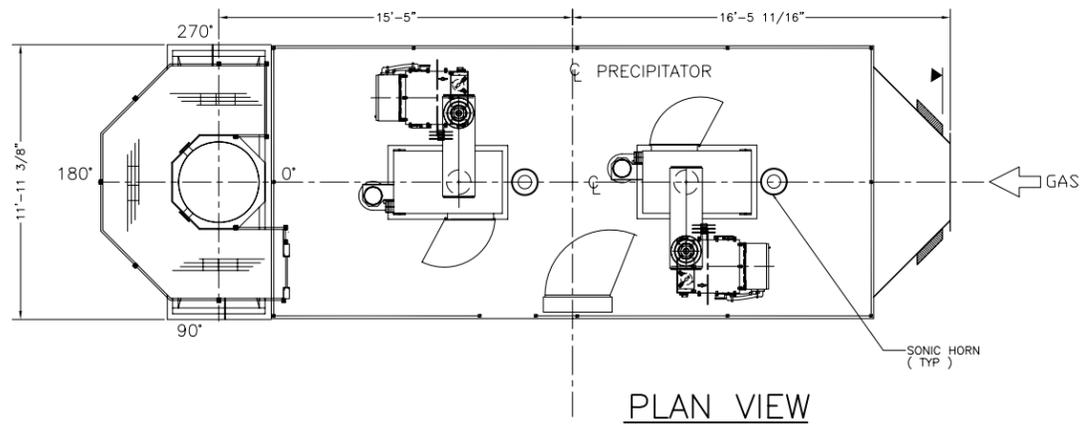
In the event a service requirement is cancelled less than three working days before a previously agreed upon start date, a cancellation fee of one day's service will be charged.

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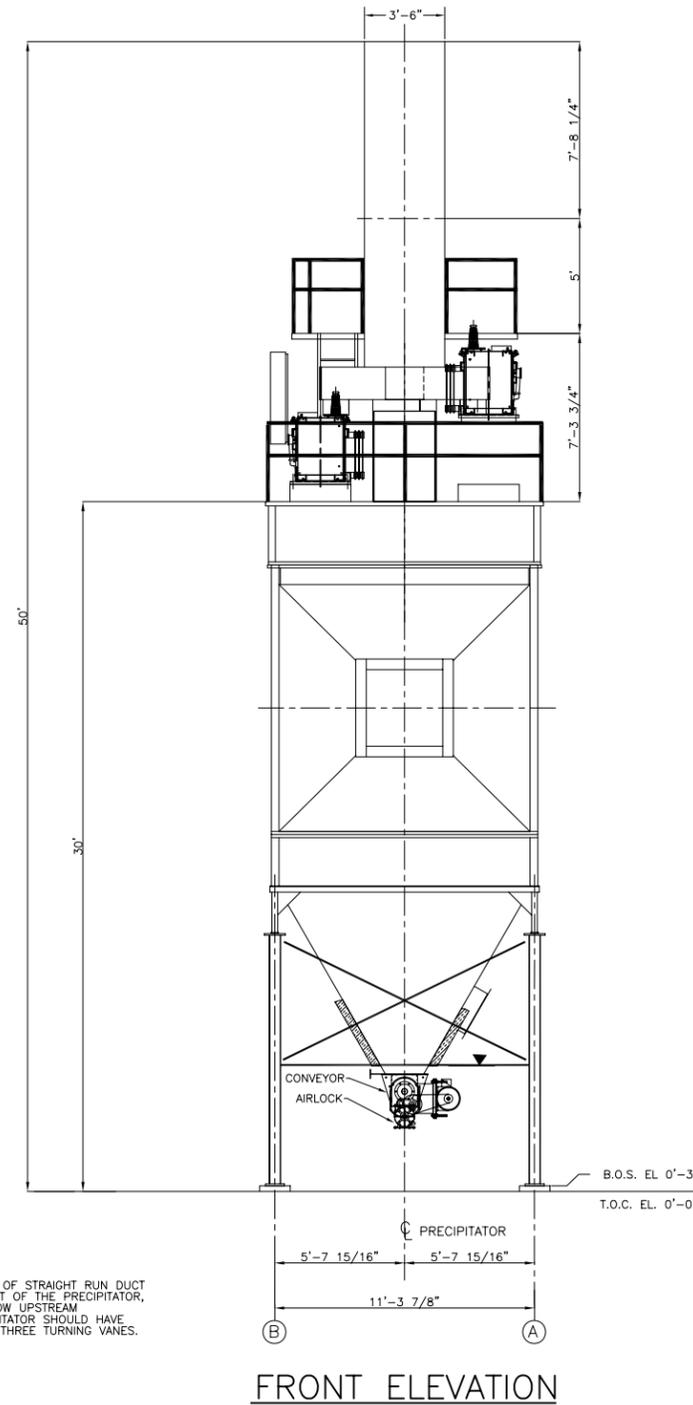
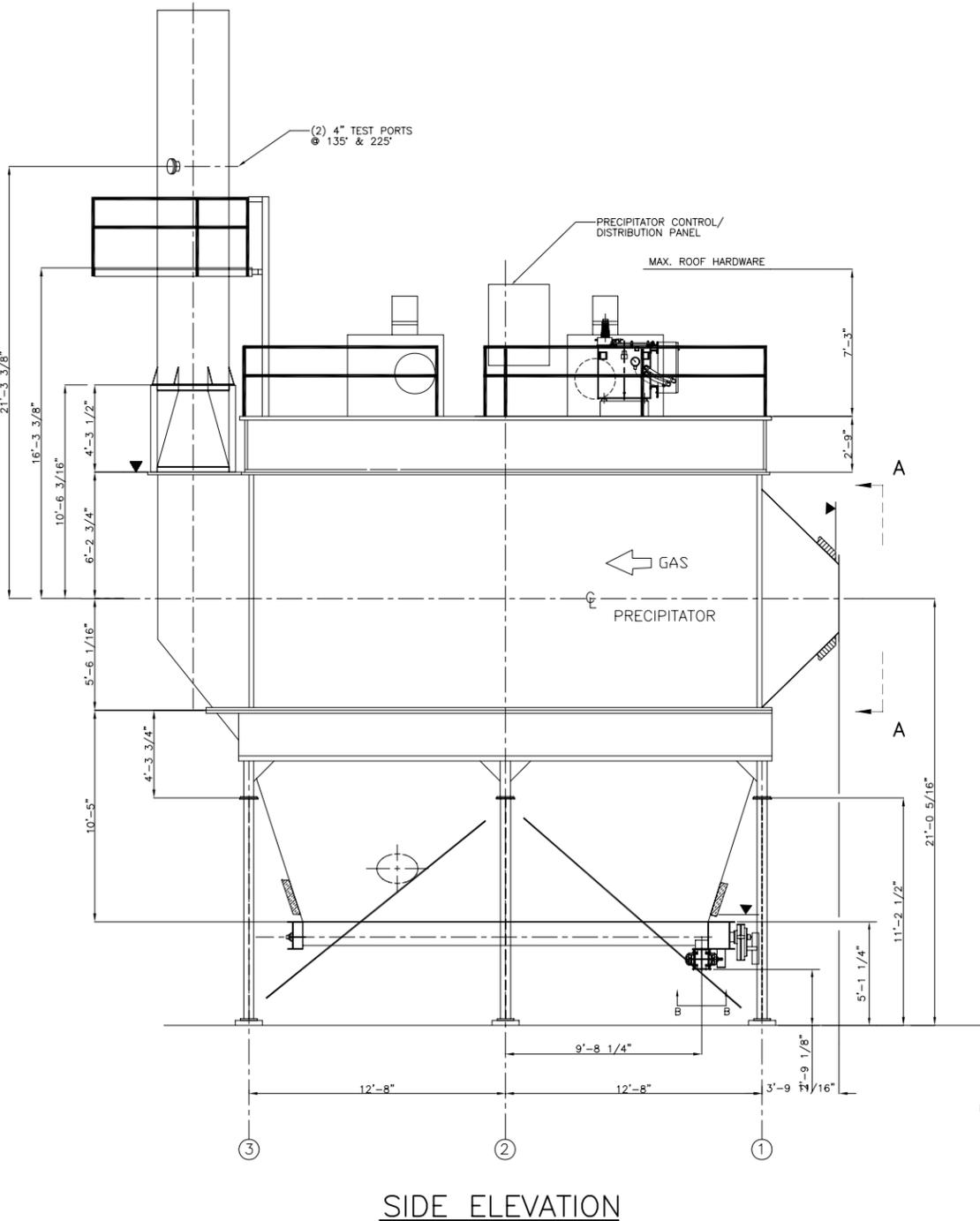
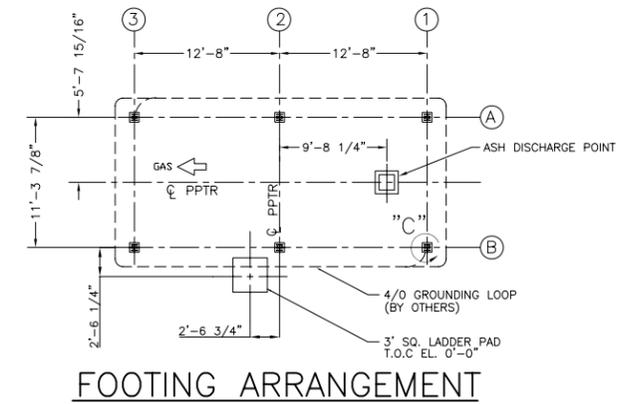
4.2 The representative shall be utilized in an advisory capacity and PPC will not be liable for any damage to equipment, loss of time or product, for production rates of workmen, and quality of field workmanship. The Purchaser will have the direct responsibility for planning, supervising and executing the work; under such circumstances, neither PPC nor the representative will be responsible for the progress or cost of the work.

4.3 All personnel required to meet OSHA standards for confined space entry shall be provided by Purchaser. Safety equipment shall also be provided by Purchaser.



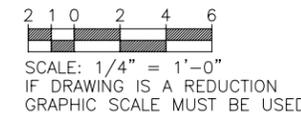
FOUNDATION LOADS (KIPS)  
AT ELEV. 0'-6"

ITEM	COL A1	COL A2	COL A3	COL B1	COL B2	COL B3
TOTAL DEAD LOAD	9.0	15.3	14.1	9.5	16.3	14.6
TOTAL LIVE LOAD	5.4	10.8	5.4	5.4	10.8	5.4
WIND LOADS (REVERSIBLE)						
VERTICAL PERP.	3.8	7.6	3.8	-3.8	-7.6	-3.8
VERTICAL PARA.	2.3	-2.3	2.3	-2.3	2.3	-2.3
HORIZ. PERP.	2.6	5.1	2.6	2.6	5.1	2.6
HORIZ. PARA.	2.8	2.8	2.8	2.8	2.8	2.8
SEISMIC LOADS (REVERSIBLE)						
VERTICAL PERP.	2.6	5.1	2.9	-2.6	-5.1	-2.6
VERTICAL PARA.	2.1	-2.1	2.1	-2.1	2.1	-2.1
HORIZ. PERP.	1.4	2.8	1.9	1.4	2.8	1.9
HORIZ. PARA.	2.8	2.8	2.8	2.8	2.8	2.8
DESIGN V=DL+LL+MAX(W,E/1.4)	18.2	45.4	23.3	18.7	34.7	23.8
DESIGN H=DL+LL+MAX(W,E/1.4)	3.8	5.1	3.8	3.8	5.1	3.8

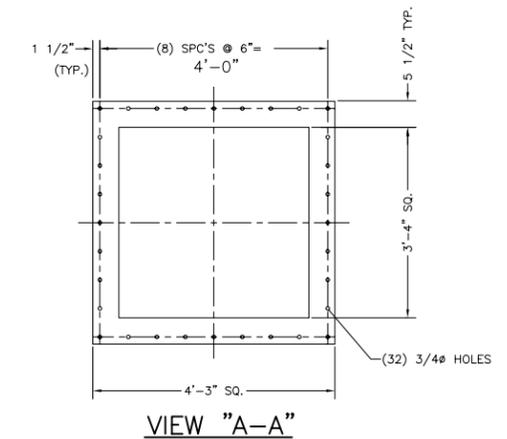
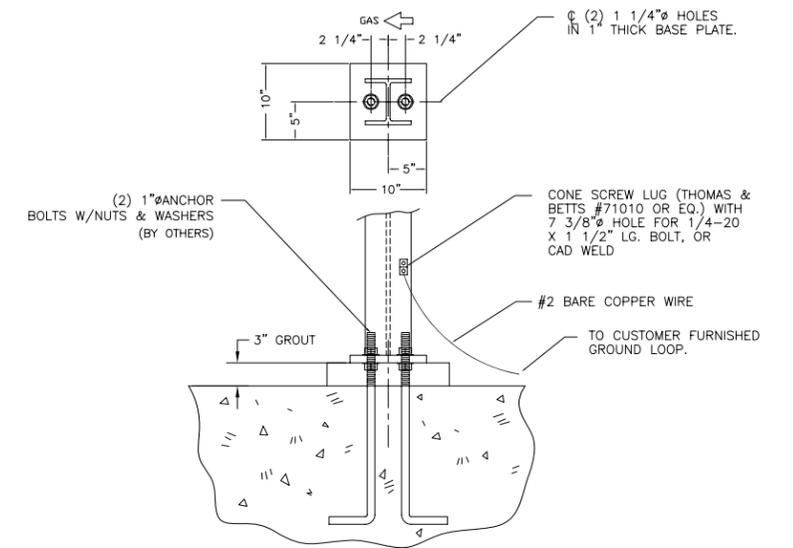


NOTE: MINIMUM OF 6' OF STRAIGHT RUN DUCT REQ'D IN FRONT OF THE PRECIPITATOR, THE FIRST ELBOW UPSTREAM OF THE PRECIPITATOR SHOULD HAVE A MINIMUM OF THREE TURNING VANES.

LEGEND  
▼ LIMITS OF INSULATION



LAST PLOT DATE: 6/29/00  
CAD FILENAME: XH1212-2S



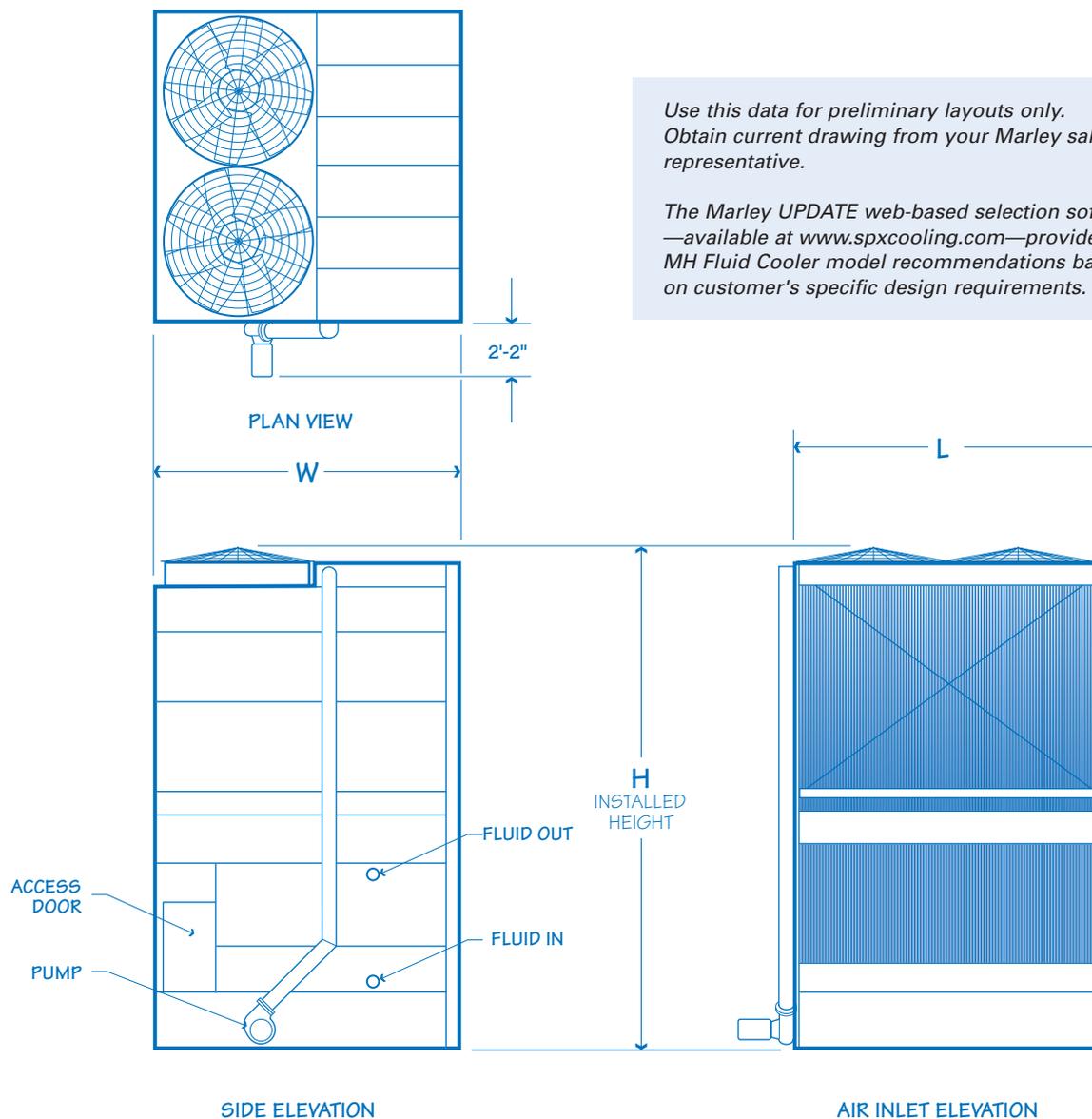
NO.	REVISION	DATE	BY

**PPC INDUSTRIES**  
A DIVISION OF ADVANCE ROSS ELECTRONICS CORP.

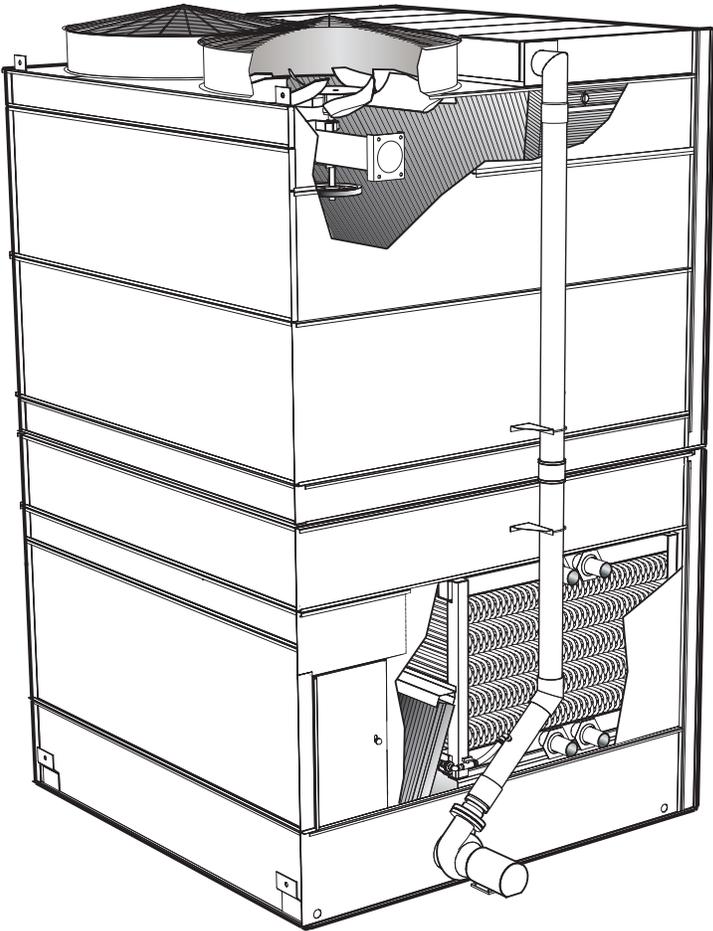
SCALE: 1/4"=1'-0"	DATE: 6/29/00	DWG. NO.: XH1212-2S	REV.
DRAWN BY: H. NOBLES		SHT. NO.: 1 OF 1	
CHECKED:			
APPROVED:			

PRECIPITATOR  
GENERAL ARRANGEMENT  
MODEL: XH1212-2S

## Typical Evaporative Cooler Literature



Model	Dimensions			Shipping Weight lb		Motor hp	Pump hp
	L	W	H	Weight	Heaviest Section		
MHF702	9'-1"	8'-5"	17'-0"	9,340	5,950	7.5 - 15	2
MHF703	12'-1"	8'-5"	17'-0"	11,200	7,250	10 - 20	3
MHF704	12'-1"	11'-11"	19'-1"	17,250	11,380	15 - 30	5
MHF705	18'-1"	11'-11"	19'-1"	25,975	17,070	22.5 - 45	7.5



The Marley MH Fluid Cooler is the most efficient system on the market—and your best choice for industrial and HVAC applications. By keeping the process fluid in a clean, closed loop, and combining the function of a cooling tower and heat exchanger into one system, they provide superior operational and maintenance benefits.

The specifications portion of this publication not only relates the language to use in describing an appropriate MH Fluid Cooler—but also defines why certain items and features are important enough to specify with the intention of insisting upon compliance by all bidders. The left hand column of pages 11 thru 22 provides appropriate text for the various specification paragraphs, whereas the right hand column comments on the meaning of the subject matter and explains its value.

Pages 11 thru 15 indicate those paragraphs which will result in the purchase of a basic fluid cooler—one that accomplishes the specified thermal performance, but which will lack many operation—and maintenance-enhancing accessories and features that are usually desired by those persons who are responsible for the continuing operation of the system of which the fluid cooler is part. It will also incorporate those standard materials which testing and experience has proven to provide acceptable longevity in normal operating conditions.

Pages 16 thru 22 provide paragraphs intended to add those features, components, and materials that will customize the fluid cooler to meet the user's requirements.

**Job Information**

Green Energy Hawaii  
 Sierra Research  
 Kauai, HI

**Selected By**

Marley - West  
 P.O. 4665  
 El Dorado Hills, CA 95762  
 joseph.padilla@marleyct.spx.com

Joseph Padilla  
 Tel (916) 941-1232  
 Fax (916) 941-1249

**Fluid Cooler Definition**

Manufacturer	Marley	Fan Motor Speed	1800 rpm
Product	MH Fluid Cooler	Fan Motor Capacity per cell	15.00 BHp
Model	MHF702D061G-1	Fan Motor Output per cell	15.00 BHp
Cells	1	Fan Motor Output total	15.00 BHp
CTI Certified	Yes	Air Flow per cell	60250 cfm
Coil Material	Galvanized Steel	Air Flow total	60250 cfm
Fan	4.000 ft, 6 Blades	Pump Motor Output per cell	2.00 BHp
Fan Speed	838 rpm, 10531 fpm	Pump Water Flow per cell	320.0 gpm
Fans per cell	2		
Pumps per cell	1		

Model Group Standard Single Flow, Galvanized Coil  
 Sound Pressure Level 85 dBA (Single Cell), 5.000 ft from Air Inlet Face. See sound report for details.

**Conditions**

Total Process Flow	140.0 gpm	Air Density In	0.07094 lb/ft <sup>3</sup>
Hot Water Temperature	100.00 °F	Air Density Out	0.07224 lb/ft <sup>3</sup>
Range	14.00 °F	Humidity Ratio In	0.01712
Cold Water Temperature	86.00 °F	Humidity Ratio Out	0.02366
Approach	8.00 °F	Wet-Bulb Temp. Out	81.71 °F
Wet-Bulb Temperature	78.00 °F	Estimated Evaporation	3.3 gpm
Relative Humidity	50 %	Coil Pressure Drop	1.0 psi
Additive Content	0.0 %	Total Heat Rejection	976030 Btu/h

- This selection satisfies your design conditions.

**Weights & Dimensions**

	Per Cell	Total
Shipping Weight	7720 lb	7720 lb
Heaviest Section	4330 lb	
Max Operating Weight	12700 lb	12700 lb
Width	8.417 ft	8.417 ft
Length	9.062 ft	9.062 ft
Height	16.990 ft	

**Minimum Enclosure Clearance**

Clearance required on air inlet sides of tower without altering performance. Assumes no air from below tower.

Solid Wall	8.362 ft
50 % Open Wall	7.006 ft

Weights and dimensions do not include options; refer to sales drawings.

**Cold Weather Operation**

**Heater Sizing** (to prevent freezing in the collection basin during periods of shutdown)

Heater kW/Cell	9.0	7.5	6.0	4.5	3.0
Ambient Temperature °F	-29.67	-17.48	-5.28	6.91	19.11

**Heat Loss** (50 °F inlet fluid temperature, -10 °F ambient temperature, 45 mph wind, fans and pumps off)

Standard Unit	89800 Btu/h
with Dampers	40700 Btu/h
with Dampers & Insulation	31800 Btu/h

## Typical Emergency Diesel Generator Literature



Image shown may not reflect actual package.

## STANDBY

**500 kW 625 kVA**

**60 Hz 1800 rpm 480 Volts**

Caterpillar is leading the power generation marketplace with Power Solutions engineered to deliver unmatched flexibility, expandability, reliability, and cost-effectiveness.

## FEATURES

### FUEL/EMISSIONS STRATEGY

- EPA Tier 2 and Low Emissions

### DESIGN CRITERIA

- The generator set accepts 100% rated load in one step per NFPA 110 and meets ISO 8528-5 transient response.

### UL 2200

- UL 2200 listed packages available. Certain restrictions may apply. Consult with your Caterpillar Dealer.

### FULL RANGE OF ATTACHMENTS

- Wide range of bolt-on system expansion attachments, factory designed and tested

### SINGLE-SOURCE SUPPLIER

- Fully prototype tested with certified torsional vibration analysis available

### WORLDWIDE PRODUCT SUPPORT

- Caterpillar® dealers provide extensive post sale support including maintenance and repair agreements
- Caterpillar dealers fill 99.7% of parts orders within 24 hours
- Caterpillar dealers have over 1,600 dealer branch stores operating in 200 countries
- The Cat® S•O•S<sup>SM</sup> program cost effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by-products

### CAT® C15 ATAAC DIESEL ENGINE

- Utilizes ACERT™ Technology
- Reliable, rugged, durable design
- Field-proven in thousands of applications worldwide
- Four-stroke diesel engine combines consistent performance and excellent fuel economy with minimum weight
- Electronic engine control

### CAT GENERATOR

- Matched to the performance and output characteristics of Caterpillar engines
- 2/3 pitch minimizes harmonic distortion and facilitates parallel operation
- Low adjustment module provides engine relief upon load impact and improves load acceptance and recovery time
- UL 1446 Recognized Class H insulation

### CAT EMCP 3 SERIES CONTROL PANELS

- Controls designed to meet individual customer needs.
- EMCP 3 provides the option for full-featured power metering and protective relaying
- Segregated low voltage, AC/DC accessory box provides single point access to accessory connections
- Options to meet UL/CSA/NFPA
- Power Center provides convenient location for control panel, optional power terminal strips and optional circuit breakers

# STANDBY 500 ekW 625 kVA

60 Hz 1800 rpm 480 Volts



## FACTORY INSTALLED STANDARD & OPTIONAL EQUIPMENT

System	Standard	Optional
Air Inlet	<ul style="list-style-type: none"> <li>• Light Duty Air filter</li> </ul>	<ul style="list-style-type: none"> <li>• Canister Style Air Cleaners</li> <li>• Air Cleaner - single stage</li> <li>• Dual element</li> <li>• Heavy duty</li> </ul>
Cooling	<ul style="list-style-type: none"> <li>• Radiator package mounted(50°C)</li> <li>• Coolant drain line with valve terminated at edge of base</li> <li>• Fan and belt guards</li> <li>• Coolant level sight gauge</li> <li>• Caterpillar Extended Life Coolant</li> </ul>	<ul style="list-style-type: none"> <li>• Radiator removal</li> <li>• Radiator duct flange &amp; guard</li> </ul>
Exhaust	<ul style="list-style-type: none"> <li>• Dry exhaust manifold</li> <li>• Flanged faced outlets</li> <li>• Stainless Steel Flex with split-cuff connection</li> </ul>	<ul style="list-style-type: none"> <li>• Mufflers</li> <li>• Manifold &amp; Turbocharger guards</li> <li>• Elbows</li> </ul>
Fuel	<ul style="list-style-type: none"> <li>• Primary fuel filter with integral water separator</li> <li>• Secondary fuel filters</li> <li>• Fuel priming pump</li> <li>• Engine fuel transfer pump</li> <li>• Flex fuel lines</li> <li>• Engine fuel transfer pump</li> <li>• Fuel cooler*</li> <li>*Not included with packages without radiators</li> </ul>	<ul style="list-style-type: none"> <li>• Integral UL listed fuel tank base</li> <li>• Manual transfer pump</li> <li>• Fuel level switch</li> </ul>
Generator	<ul style="list-style-type: none"> <li>• Self excited</li> <li>• Class H insulation</li> <li>• Random Wound</li> <li>• 2/3 pitch</li> <li>• R448 voltage regulator with load adjustment module</li> <li>• IP23 Protection</li> </ul>	<ul style="list-style-type: none"> <li>• Permanent magnet excitation</li> <li>• CDVR with KVAR/PF control</li> <li>• Internal Excitation</li> <li>• Oversize and premium generators</li> <li>• Bearing/Stator temperature detection (premium generator)</li> <li>• 3 phase sensing</li> <li>• Anti-condensation space heaters</li> <li>• Cable access box</li> <li>• Reactive droop</li> </ul>
Power Termination	<ul style="list-style-type: none"> <li>• Power Terminator Strips Mounted inside Power Center</li> <li>• Segregated low voltage wiring panel</li> </ul>	<ul style="list-style-type: none"> <li>• Circuit breakers, UL listed, 3 pole</li> <li>• Circuit breakers, IEC compliant, 3 pole</li> <li>• Circuit breaker Shunt trip</li> <li>• Circuit breaker Auxillary contact</li> <li>• Top &amp; bottom power cable entry</li> <li>• Floor standing UL breakers</li> </ul>
Governor	<ul style="list-style-type: none"> <li>• ADEM™A4</li> </ul>	<ul style="list-style-type: none"> <li>• Load share module</li> </ul>
Control Panels	<ul style="list-style-type: none"> <li>• EMCP 3.1 (rear mounted)</li> <li>• Speed adjust</li> <li>• Emergency stop pushbutton</li> <li>• Voltage adjust</li> </ul>	<ul style="list-style-type: none"> <li>• EMCP 3.2 &amp; EMCP 3.3 (can be RH mounted)</li> <li>• Local annunciator modules (NFPA 99/110)</li> <li>• Remote annunciator modules (NFPA 99/110)</li> <li>• Discrete I/O module</li> </ul>
Lube	<ul style="list-style-type: none"> <li>• Lubricating oil and filter</li> <li>• Oil drain line with valves</li> <li>• Fumes disposal</li> <li>• Gear type lube oil pump</li> </ul>	<ul style="list-style-type: none"> <li>• Manual sump pump</li> </ul>
Mounting	<ul style="list-style-type: none"> <li>• Formed steel wide base frame</li> <li>• Linear vibration isolation-seismic zone 4</li> </ul>	<ul style="list-style-type: none"> <li>• Formed steel wide base frame</li> </ul>
Starting/Charging	<ul style="list-style-type: none"> <li>• 24 volt starting motor</li> <li>• Battery with rack and cables</li> </ul>	<ul style="list-style-type: none"> <li>• Jacket water heater with shut off valves</li> <li>• Block heater</li> <li>• Ether starting aids</li> <li>• Battery disconnect switch</li> <li>• Battery charger(5A,10A)</li> <li>• Oversize batteries</li> <li>• 45 amp charging alternator</li> </ul>
General	<ul style="list-style-type: none"> <li>• Paint - Caterpillar yellow except rails and radiators gloss black</li> <li>• Flywheel and flywheel housing - SAE No.1</li> </ul>	

# STANDBY 500 ekW 625 kVA

60 Hz 1800 rpm 480 Volts



## SPECIFICATIONS

### CAT GENERATOR

Frame size.....LC6114F  
Excitation..... Self Excitation  
Pitch..... 0.6667  
Number of poles..... 4  
Number of bearings..... Single Bearing  
Number of Leads..... 12  
Insulation..... UL 1446 Recognized Class H with tropicalization and antiabrasion  
- Consult your Caterpillar dealer for available voltages  
IP Rating..... IP23  
Alignment..... Pilot Shaft  
Overspeed capability..... 125% of rated  
Wave form Deviation (Line to Line)..... 2%  
Voltage regulator..... 3 Phase sensing with selectable volts/Hz  
Voltage regulation..... Less than +/- 1/2% (steady state)  
Less than +/- 1/2% (w/ 3% speed change)  
Telephone influence factor..... Less than 50  
Harmonic Distortion..... Less than 5%

### CAT DIESEL ENGINE

C15 ATTAC, L-6, 4-stroke water-cooled diesel  
Bore..... 137.20 mm (5.4 in)  
Stroke..... 171.40 mm (6.75 in)  
Displacement..... 15.20 L (927.56 in<sup>3</sup>)  
Compression Ratio..... 16.1:1  
Aspiration..... ATAAC  
Fuel System..... MEUI  
Governor Type..... Caterpillar ADEM control system

### CAT EMCP 3 CONTROL PANELS

- EMCP 3.1 (Standard)
- UL/CSA/CE
- NEMA 1, IP22 enclosure
- Run/Auto/Stop control
- True RMS metering, 3-phase
- Speed Adjust
- Vandal cover (option)
- Voltage adjust
- Digital Indication for:
  - RPM
  - Operating hours
  - Oil Pressure
  - Coolant temperature
  - System DC volts
  - L-L volts, L-N volts, phase amps, Hz
  - ekW, kVA, kVAR, kW-hr, %kW, PF, (EMCP3.2/3.3)
- Shutdowns with common indicating light for:
  - Low oil pressure
  - High coolant temperature
  - Low coolant level
  - Overspeed
  - Emergency stop
  - Failure to start (overcrank)
- Programmable protective relaying functions: (EMCP 3.2 & 3.3)
  - Under and over voltage
  - Under and over frequency
  - Reverse power
  - Overcurrent
- MODBUS isolated data link (RS-485 half-duplex EMCP 3.2 & 3.3)

# STANDBY 500 ekW 625 kVA

60 Hz 1800 rpm 480 Volts



## TECHNICAL DATA

Open Generator Set - - 1800 rpm/60 Hz/480 Volts	DM8155	
<b>Tier 2 and Low Emissions</b>		
<b>Generator Set Package Performance</b>		
Genset Power rating @ 0.8 pf	625 kVA	
Genset Power rating with fan	500 ekW	
<b>Fuel Consumption</b>		
100% load with fan	141.6 L/hr	37.4 Gal/hr
75% load with fan	107.9 L/hr	28.5 Gal/hr
50% load with fan	89.9 L/hr	23.7 Gal/hr
<b>Cooling System<sup>1</sup></b>		
Ambient air temperature	51 ° C	124 ° F
Air flow restriction (system)	0.12 kPa	0.48 in. water
Air flow (max @ rated speed for radiator arrangement)	822 m <sup>3</sup> /min	29029 cfm
Engine Coolant capacity with radiator/exp. tank	57.8 L	15.3 gal
Engine coolant capacity	20.8 L	5.5 gal
Radiator coolant capacity	37.0 L	9.8 gal
<b>Inlet Air</b>		
Combustion air inlet flow rate	40.2 m <sup>3</sup> /min	1419.7 cfm
<b>Exhaust System</b>		
Exhaust stack gas temperature	509.1 ° C	948.4 ° F
Exhaust gas flow rate	111.2 m <sup>3</sup> /min	3927.0 cfm
Exhaust flange size (internal diameter)	152.4 mm	6.0 in
Exhaust system backpressure (maximum allowable)	6.8 kPa	27.3 in. water
<b>Heat Rejection</b>		
Heat rejection to coolant (total)	192 kW	10919 Btu/min
Heat rejection to exhaust (total)	497 kW	28264 Btu/min
Heat rejection to atmosphere from engine	120 kW	6824 Btu/min
Heat rejection to atmosphere from generator	29.1 kW	1654.9 Btu/min
<b>Alternator<sup>2</sup></b>		
Motor starting capability @ 30% voltage dip	1428 skVA	
Frame	LC6114F	
Temperature Rise	130 ° C	234 ° F
<b>Emissions (Nominal)<sup>3</sup></b>		
NOx g/hp-hr	5.78 g/hp-hr	
CO g/hp-hr	.39 g/hp-hr	
HC g/hp-hr	.01 g/hp-hr	
PM g/hp-hr	.017 g/hp-hr	

<sup>1</sup> Ambient capability at 300m (984 ft) above sea level. For ambient capability at other altitudes, consult your Caterpillar dealer. Air flow restriction (system) is added to existing restriction from factory. Generator temperature rise is based on a 40 C (104 F) ambient per NEMA MG1-32

<sup>2</sup> Generator temperature rise is based on a 40° C (104° F) ambient per NEMA MG1-32.

<sup>3</sup> Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1 for measuring HC, CO, PM, NOx. Data shown is based on steady state operating conditions of 77°F, 28.42 in HG and number 2 diesel fuel with 35° API and LHV of 18,390 btu/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% load and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle.

# STANDBY 500 ekW 625 kVA

60 Hz 1800 rpm 480 Volts



## RATING DEFINITIONS AND CONDITIONS

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**Meets or Exceeds International Specifications:** AS1359, AS2789, CSA, EGSA101P, IEC60034, ISO3046, ISO8528, NEMA MG 1-32, UL508, 72/23/EEC, 89/336/EEC, 98/37/EEC.

**Standby** - Output available with varying load for the duration of the interruption of the normal source power. Standby power in accordance with ISO8528. Fuel stop power in accordance with ISO3046, AS2789, and BS5514. Standby ambient temperatures shown indicate a coolant top tank temperature just below shutdown at 100 percent load.

**Prime** - Output available with varying load for an unlimited time. Prime power in accordance with ISO8528. 10% overload power in accordance with ISO3046, AS2789, and BS5514. Prime ambient temperatures shown indicate a coolant top tank temperature just below shutdown at 100 percent load.

**Ratings** are based on SAE J1995 standard conditions. These ratings also apply at ISO3046 standard conditions.

**Fuel rates** are based on fuel oil of 35° API [16° C (60° F)] gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29° C (85° F) and weighing 838.9 g/liter (7.001 lbs/U.S. gal.). Additional ratings may be available for specific customer requirements. Consult your Caterpillar representative for details.

# STANDBY 500 ekW 625 kVA

60 Hz 1800 rpm 480 Volts



## DIMENSIONS

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Package Dimensions		
Length	3775.1 mm	148.63 in
Width	1110.0 mm	43.7 in
Height	2091.0 mm	82.32 in
Weight	3881 kg	8,556 lb

Note: Do not use for installation design.  
See general dimension drawings for detail (Drawing #2781049).

Performance No.: DM8155

Feature Code:: C15DE6Y

Source:: U.S. Sourced

18 October 2006

8222669

[www.CAT-ElectricPower.com](http://www.CAT-ElectricPower.com)

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Materials and specifications are subject to change without notice.  
The International System of Units (SI) is used in this publication.

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## Typical Diesel Fire Pump Engine Literature

# CLARKE

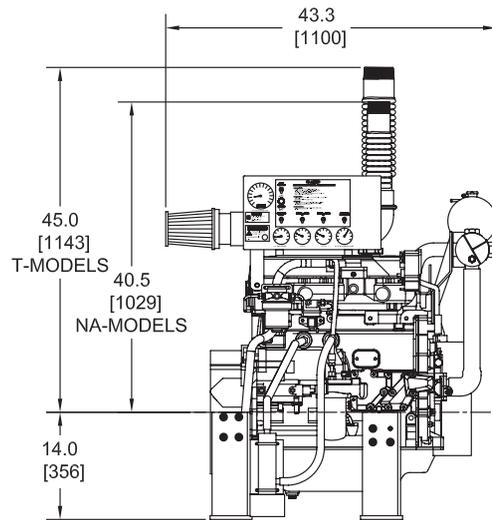
## FIRE PUMP DRIVERS

### MODELS

JU4H-UF10	JU4H-UF22	JU4H-UFH8	JU4H-UF42
JU4H-UF12	JU4H-UF30	JU4H-UFH0	JU4H-UF58
JU4H-UF20	JU4H-UF32	JU4H-UFH2	JU4H-UF50
		JU4H-UF40	JU4H-UF52

FM-UL-cUL Approved Ratings BHP/kW								
JU4H MODEL	OPERATING SPEED							
	1470	1760	2100	2350	2600			
UF10		41	31	51	38	55	41	
UF12						55	41	44
UF20		60	45	67	50	72	54	
UF22						72	54	56
UF30		64	48	79	59	85	63	
UF32						85	63	63
UFH8	63	47	73	54				
UFH0		73	54	88	66	98	73	
UFH2						98	73	74
UF40		94	70	105	78	106	79	
UF42						106	79	79
UF58	79	59	110	82				
UF50		110	82	130	97	127	95	
UF52						127	95	95

All engine models and ratings are USA EPA emissions compliant per NSPS (40 CFR Part 60 Sub Part III)



JU4H-UF50  
OVERALL WIDTH  
29.0  
[735]

## Engine Equipment

Equipment	Standard	Optional
<b>Air Cleaner</b>	Direct Mounted, Washable, Indoor Service	Disposable, Drip proof, Indoor Service Outdoor Type
<b>Alternator</b>	12V-DC, 42 Amps; w/Belt Guard	24V-DC, 40 Amps; w/Belt Guard
<b>Exhaust Protection</b>	Blankets on UF10/12, UF20/22 Metal Guards on Manifolds & Turbo on UF30/32, UFH8/H0/H2, UF40/42, UF50/52/58	
<b>Coupling</b>	Falk Coupling, Engine Half UF10/12, UF20/21/28, UF30/43, UFH8/H0/H2, UF40/42 & UF50/52/58 - 1070T10 Coupling	Drive Shaft & Guard, Drive Shaft System UF10/12, UF20/22/28 - SC41 Series; UF30/32, UFH8/H0/H2, UF40/42, UF50/52/58 -SC55 Series Bare Flywheel
<b>Exhaust Flex Connection</b>	SS Flex, NPT, 3" NA SS Flex, NPT, 4" T	SS Flex, 150# Flange, 4" & 5"
<b>Flywheel Housing</b>	S.A.E. #3	
<b>Flywheel Power Take Off</b>	11.5" S.A.E. Industrial Flywheel Connection	
<b>Fuel Connections</b>	Fire Resistant Flexible Supply & Return Lines	
<b>Fuel Filter</b>	Primary Filter w/priming pump	
<b>Fuel Injection System</b>	Stanadyne Direct Injection	
<b>Engine Heater</b>	120V-AC, 1500 Watt	240V-AC, 1500 Watt
<b>Governor, Speed</b>	Constant Speed, Mechanical	

Equipment	Standard	Optional
<b>Heat Exchanger</b>	Tube & Shell Type, 60 PSI w/NPTF Connections	
<b>Instrument Panel</b>	English & Metric, Tachometer, Hourmeter, Water Temperature, Oil Pressure & Two (2) Voltmeters	
<b>Junction Box</b>	Integral with Instrument Panel; For DC Wiring Interconnection to Engine Controller	
<b>Lube Oil Cooler</b>	Engine Water Cooled, Plate Type	
<b>Lube Oil Filter</b>	Full Flow w/By-Pass Valve	
<b>Lube Oil Pump</b>	Gear Driven, Gear Type	
<b>Manual Start Controls</b>	On Instrument Panel	
<b>Overspeed Control</b>	Electronic w/Reset & Test on Instrument Panel	
<b>Raw Water Solenoid Operation</b>	Automatic from Engine Controller & from Instrument Panel	
<b>Run-Stop Control</b>	On Instrument Panel With Control Position Warning Light	
<b>Run Solenoid</b>	12V-DC Energized to Run	24V-DC Energized to Run 12V-DC Energized to Stop 24V-DC Energized to Stop
<b>Starters</b>	Two (2) 12V-DC	Two (2) 24V-DC
<b>Throttle Control</b>	Adjustable Speed Control, Tamper Proof	
<b>Water Pump</b>	Poly-Vee Belt Drive w/Guard	



LISTED  
513Y



approved  
1333

JU4H-UF10	JU4H-UF22	JU4H-UFH8	JU4H-UF42
JU4H-UF12	JU4H-UF30	JU4H-UFH0	JU4H-UF58
JU4H-UF20	JU4H-UF32	JU4H-UFH2	JU4H-UF50
		JU4H-UF40	JU4H-UF52

## Specifications

Item	JU4H Models					
	UF10/12	UF20/22	UF30/32	UFH8/H0/H2	UF40/42	UF58/50/52
Number of Cylinders	4					
Aspiration	NA			T		
Rotation*	Clockwise (CW)					
Weight - lb (kg)	910 (413)			935 (424)		
Compression Ratio	17.6:1			17.0:1		
Displacement - cu. in. (l)	275 (4.5)					
Engine Type	4 Stroke Cycle - Inline Construction					
Bore & Stroke - in. (mm)	4.19 x 5.00 (106 x 127)					
Installation Drawing	D - 534 - US			D - 545 - UK		
Wiring Diagram	C07575 (DC Engine Wiring)			C07651 (AC Heater Wiring)		
Engine Series	John Deere 4045 Series					

**Abbreviations:** CW – Clockwise NA – Naturally Aspirated T – Turbocharged

\*Rotation viewed from Heat Exchanger / Front of engine

Engine intended for Indoor use or inside weatherproof enclosure only

### † ENGINE RATINGS BASELINES

Engines are rated at standard SAE conditions of 29.61 in. (7521 mm) Hg barometer and 77°F (25°C) inlet air temperature [approximates 300 ft. (91.4 m) above sea level] by the testing laboratory (see SAE Standard J 1349).

A deduction of 3 percent from engine horsepower rating at standard SAE conditions shall be made for diesel engines for each 1000 ft. (305 m) altitude above 300 ft. (91.4 m).

A deduction of 1 percent from engine horsepower rating as corrected to standard SAE conditions shall be made for diesel engines for every 10°F (5.6°C) above 77°F (25°C) ambient temperature.

Note: Engines certified at any speed between 1760 & 2600 RPM.

### CERTIFIED POWER AT ANY SPEED

Although FM-UL Certified BHP ratings are shown at specific speeds, Clarke engines can be applied at any intermediate speed. To determine the intermediate certified power, make a linear interpolation from the Clarke FM-UL certified power curve. Contact Clarke or your Pump OEM representative to obtain details.

# CLARKE

[www.clarkefire.com](http://www.clarkefire.com)

**CLARKE** Fire Protection Products, Inc.

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Cincinnati, Ohio 45241  
United States of America

Tel +1-513-771-2200 Fax +1-513-771-0726

C13600 2/07

## Fire Protection Products

**CLARKE**UK, Ltd.

Grange Works, Lomond Rd.  
Coatbridge, ML5-2NN  
United Kingdom

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Specifications and information contained in this brochure subject to change without notice.

Printed in U.S.A.

**JU4H-UF12**  
 FIRE PUMP DRIVER  
**EMISSION DATA**  
 FOR  
**EPA NSPS**

*4 Cylinders*  
**Four Cycle**  
**Lean Burn**  
**Naturally Aspirated**

<b>500 PPM SULFUR #2 DIESEL FUEL</b>							
RPM	BHP <sup>(1)</sup>	FUEL GAL/HR (L/HR)	GRAMS / HP / HR			EXHAUST	
			NMHC+NOx	CO	PM <sup>(2)</sup>	°F (°C)	CFM (m <sup>3</sup> /min)
2350	55	3.1 (11.7)	5.59	1.85	0.40	1083 (584)	469 (13)
2600	59	3.4 (12.9)	5.25	2.30	0.40	1055 (568)	531 (15)

*4045D Base Model Engine Manufactured by John Deere Co.*

*Notes:*

- 1) Engines are rated at standard conditions of 29.61in. (7521 mm) Hg barometer and 77°F (25° C) inlet air temperature. (SAE J1349)*
- 2) PM is a measure of total particulate matter, including PM<sub>10</sub>.*
- 3) These emissions values have been determined using engine test data with 500 parts per million (PPM) Sulfur content fuel.*

**CLARKE**

**FIRE PROTECTION PRODUCTS**

3133 EAST KEMPER ROAD  
 CINCINNATI, OH 45241

APPENDIX B  
Emissions Calculations

**Green Energy Hawaii  
Calculation of Boiler Emissions**

Pollutant	Emission Factor, lb/MMBtu	Source of Factor	Emissions			
			lb/hr per unit	lb/day per unit	tpy, each unit	tpy, two units
Oxides of Nitrogen	0.250	2	12.50	300.03	52.51	105.0
Sulfur oxides	0.100	4	5.00	120.02	21.00	42.0
Carbon Monoxide	0.200	2	10.00	239.96	41.99	84.0
Nonmethane Organic Compounds	0.0255	3	1.28	30.65	5.36	10.7
Particulates	0.0256	1	1.28	30.70	5.37	10.7

Emission Factor Sources:

1. Manufacturer guaranteed emission rate for ESP
2. Manufacturer guaranteed emission rates for gasifiers/boilers
3. Emission factor taken from AP-42, 5th edition updated 2003; 50% compliance margin.
4. Calculated from sulfur content of fuel (12/8/2005 Hazen analysis)

Equipment:

Two gasifiers, two boilers

Rated Gasifier Heat Input:	50.00	MMBtu/hr (each)
Hours of Operation:	24	per day
	8,400	per year
Annual Gasifier Heat Input:	420,000	MMBtu/yr (each)

**Green Energy Hawaii**  
**Calculation of Boiler Startup Emissions**

Assume that average load over startup period is 50%, or 25 MMBtu/hr  
Assume boiler in startup for 6 hours

Emissions During Startup:

Pollutant	NOx	SOx	CO	VOC	PM10
Em Factor, lb/MMBtu (1)	0.22	0.1	0.6	0.026	0.307
Emissions, lb/hr	5.5	2.5	15.0	0.638	7.7

Assume 50 startups per year (approx. one per week):

Emissions, tons (2 boilers)	1.65	0.75	4.50	0.19	2.30
-----------------------------	------	------	------	------	------

Note 1: All emission factors except SOx from AP-42, Tables 1.6-2 and 1.6-3  
(wood-fired boilers; factors for wet wood).  
SOx calculated stoichiometrically from expected maximum sulfur content  
of wood.

**Green Energy Hawaii**  
**Calculation of Gasifier Startup Emissions**

Gasifier Volume: 4320 ft<sup>3</sup>  
 Fuel Density: 25 lb/ft<sup>3</sup>  
 Fuel HHV: 4195 Btu/lb  
 Quantity of Fuel Burned During Startup Procedure (assume gasifier 2/3 full):  
 302 MMBtu  
 36.0 tons  
 Duration of Startup: 2.0 hrs

Emissions During Startup:

Pollutant	NOx	SOx	CO	VOC	PM10
Em Factor, lb/ton (1)	1	0.839	26	1.1	1.1
Emissions, total lb	36.0	30.2	936	39.6	39.6
Emissions, lb/hr	18.0	15.1	468	19.8	19.8

Assume 50 startups per year (approx. one per week) per gasifier:

Emissions, tons (2 gasifiers)	1.8	1.51	46.8	1.98	1.98
----------------------------------	-----	------	------	------	------

Note 1: Emission factors for CO, NMHC and PM10 from USDA Forest Service, Rocky Mountain Research Station, "Reducing PM2.5 Emissions Through Technology: Results from a Recent Study Evaluating the Effectiveness of an Air Curtain Incinerator," downloaded from <http://www.airburners.com/ab-tdownloads.htm>  
 Emission factor for SOx is same as for normal boiler operation as SO2 emissions are calculated stoichiometrically. Sulfur from Diesel fuel adds only 0.035 lb of SO2 for the approximately 5 gallons of fuel used per start. Emission factor for NOx is taken from AP-42, Table 2.7-1 (Conical Burners), factor for wood refuse combustion.

**Green Energy Hawaii**  
**Evaporative Cooler Performance and Emissions**

Design Parameters	
Water Flow Rate, 10E6 lbm/hr	2.00
Water Flow Rate, gal/min	4,000
Drift Rate, %	0.0050
Drift, lbm water/hr	99.96
PM10 Emissions based on TDS Level	
TDS level, ppm	1500
PM10, lb/hr	0.15
PM10, lb/day	3.6
PM10, tpy	0.66

Based on 8760 hrs/yr

**Green Energy Hawaii**  
**Typical Emergency Generator Performance and Emissions**

<b>Engine</b>		
Manufacturer		Caterpillar C15 ATAAC
Model		Tier 2
Gross Engine Power	kW	500
Capacity	kW	500
	bhp	670
Fuel		Diesel
Fuel Consumption (HHV)	Btu/bhp-hr	7,756
Fuel Consumption	gal/hr	37.4
Exhaust Flow	acfm	3,927
Stack Velocity	ft/sec	83.33
Exhaust Temperature	deg. F	948.4
Exhaust Pipe Diameter	in	12
Number of Exhaust Pipes		1
Exhaust Stack Height	ft	15.00
<b>Operating Profile</b>		
Annual operation	hrs	200
<b>Emissions</b>		
NOx	g/bhp-hr	5.78
CO	g/bhp-hr	0.39
ROC (non-methane HC)	g/bhp-hr	0.01
PM10	g/bhp-hr	0.017
NOx	lb/hr	8.54
CO	lb/hr	0.58
ROC	lb/hr	0.01
PM10	lb/hr	0.03
	gr/scf	0.00183
SO2	lb/hr	0.2618

Diesel fuel

7.00 lb/gal  
139,000 Btu/gal



**Green Energy Hawaii  
Criteria Pollutant Emissions**

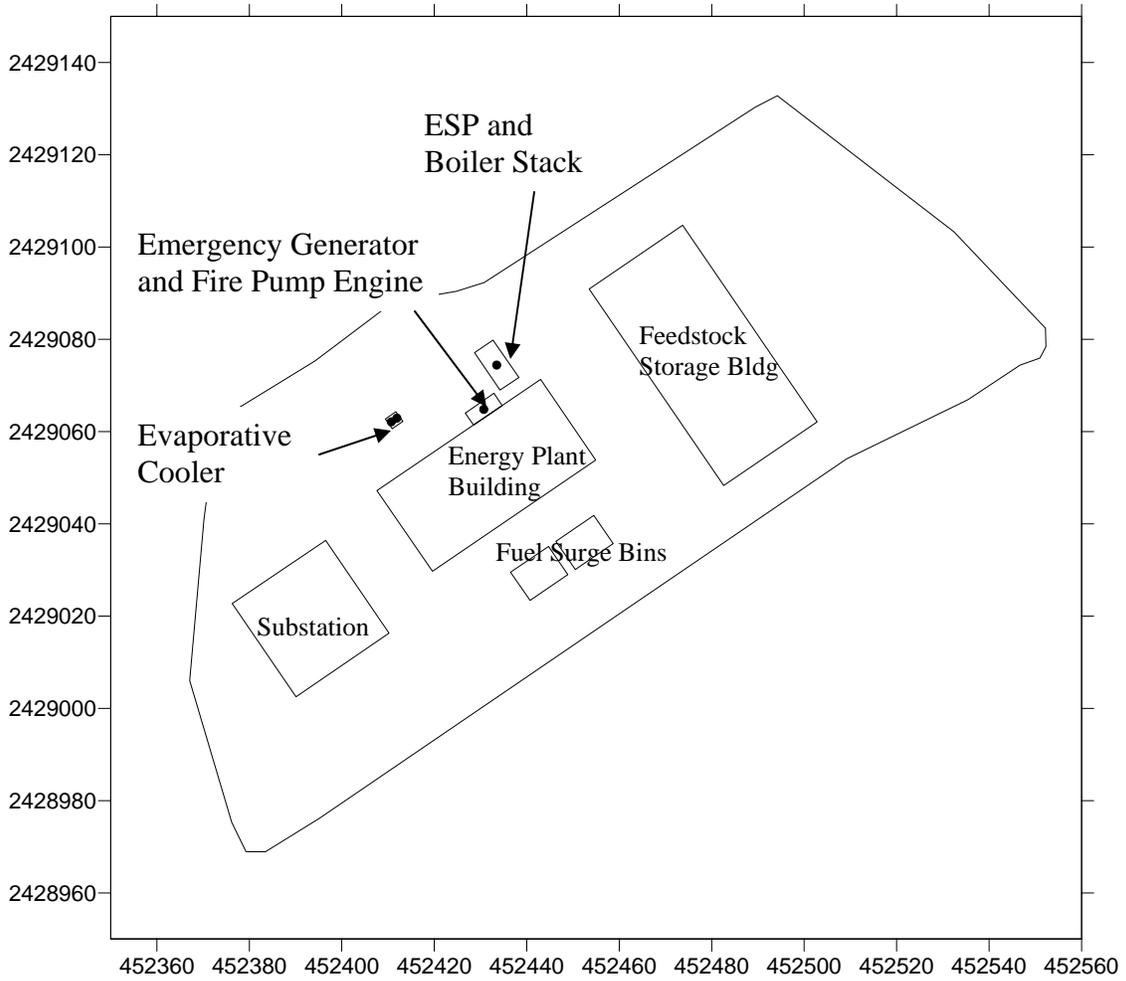
Equipment	NOx			SOx			CO			VOC			PM10/PM2.5		
	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy
Gasifiers/Boilers (normal operations)	25.0	600.1	105.0	10.00	240.0	42.0	20.0	479.9	84.0	2.55	61.29	10.7	2.56	61.39	10.74
Gasifier Startup	--	--	1.8	--	--	1.5	--	--	46.8	--	--	2.0	--	--	1.98
Boiler Startup	--	--	1.7	--	--	0.8	--	--	4.5	--	--	0.2	--	--	2.30
Evap. Cooler	--	--	--	--	--	--	--	--	--	--	--	--	0.15	3.60	0.66
Emergency Gen.	8.54	68.32	0.85	0.26	2.09	0.026	0.58	4.61	0.058	0.01	0.12	0.0015	0.03	0.20	0.003
Fire Pump Engine	0.74	5.92	0.037	0.024	0.19	0.0012	0.30	2.43	0.015	0.01	0.11	0.0007	0.05	0.42	0.003
<b>Total</b>	<b>34.3</b>	<b>674.3</b>	<b>109.4</b>	<b>10.3</b>	<b>242.3</b>	<b>44.3</b>	<b>20.9</b>	<b>487.0</b>	<b>135.4</b>	<b>2.6</b>	<b>61.5</b>	<b>12.9</b>	<b>2.8</b>	<b>65.6</b>	<b>15.7</b>

Note: Pound per day emissions calculations are based on 8 hours/day of operation for the emergency engines and 24 hours/day of operation for the gasifiers/boilers and WSAC.

## APPENDIX C

### Ambient Air Quality Modeling Analysis

Figure C-1  
Building Layout Used for Modeling



**Table C-1**  
**Emission Rates and Stack Parameters for Modeling**  
**Green Energy Hawaii**

	Stack Diam, m	Stack Height, m	Exh Temp, Deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rate, g/s			
						NOx	SO2	CO	PM10
Averaging Period: 1 hour									
Gasifiers/Boilers	1.372	22.860	444.11	8.942	6.052	n/a	n/a	2.520	n/a
Emergency Diesel Engine	0.305	4.572	782.11	1.853	25.400	n/a	n/a	7.261E-02	n/a
Fire Pump Engine	0.152	4.572	841.33	0.251	13.738	n/a	n/a	3.833E-02	n/a
WSAC (each, 2 cells)	0.914	5.182	303.00	28.179	42.911	n/a	n/a	n/a	n/a
Averaging Period: 3 hours									
Gasifiers/Boilers	1.372	22.860	444.11	8.942	6.052	n/a	1.260	n/a	n/a
Emergency Diesel Engine	0.305	4.572	782.11	1.853	25.400	n/a	3.299E-02	n/a	n/a
Fire Pump Engine	0.152	4.572	841.33	0.251	13.738	n/a	2.999E-03	n/a	n/a
WSAC (each, 2 cells)	0.914	5.182	303.00	28.179	42.911	n/a	n/a	n/a	n/a
Averaging Period: 8 hours									
Gasifiers/Boilers	1.372	22.860	444.11	8.942	6.052	n/a	n/a	2.520	n/a
Emergency Diesel Engine	0.305	4.572	782.11	1.853	25.400	n/a	n/a	7.26E-02	n/a
Fire Pump Engine	0.152	4.572	841.33	0.251	13.738	n/a	n/a	3.83E-02	n/a
WSAC (each, 2 cells)	0.914	5.182	303.00	28.179	42.911	n/a	n/a	n/a	n/a
Averaging Period: 24 hours									
Gasifiers/Boilers	1.372	22.860	444.11	8.942	6.052	n/a	1.260	n/a	3.223E-01
Emergency Diesel Engine	0.305	4.572	782.11	1.853	25.400	n/a	1.100E-02	n/a	1.055E-03
Fire Pump Engine	0.152	4.572	841.33	0.251	13.738	n/a	9.997E-04	n/a	2.222E-03
WSAC (each, 2 cells)	0.914	5.182	303.00	28.179	42.911	n/a	n/a	n/a	1.889E-02
Averaging Period: Annual									
Gasifiers/Boilers	1.372	22.860	444.11	8.942	6.052	3.120	1.273	n/a	4.323E-01
Emergency Diesel Engine	0.305	4.572	782.11	1.853	25.400	2.457E-02	7.532E-04	n/a	7.226E-05
Fire Pump Engine	0.152	4.572	841.33	0.251	13.738	1.064E-03	3.424E-05	n/a	7.610E-05
WSAC (each, 2 cells)	0.914	5.182	303.00	28.179	42.911	n/a	n/a	n/a	1.889E-02

## Evaluation of Gasifier/Boiler Startup Impacts

The calculation of hourly emissions during startup of the gasifier and boiler were calculated in Appendix B. Startup impacts were modeled for one-hour and eight-hour average CO and 24-hour average PM<sub>10</sub> impacts, as those are the only pollutants and averaging periods for which short-term emissions could be elevated over emissions during normal boiler operation. Emissions during each averaging period were calculated as follows:

- One-hour average CO: equal to hourly CO emissions from the gasifier during startup (468 lb/hr)
- Eight-hour average CO: calculated from two hours of gasifier startup and six hours of boiler startup  
$$[(468 \text{ lb/hr} * 2 \text{ hrs}) + (15 \text{ lb/hr} * 6 \text{ hrs})] \div 8 \text{ hrs} = 128.3 \text{ lb/hr}$$
- 24-hour average PM<sub>10</sub>: calculated from two hours of gasifier startup, six hours of boiler startup, and 16 hours of normal boiler operation  
$$[(19.8 \text{ lb/hr} * 2 \text{ hrs}) + (7.7 \text{ lb/hr} * 6 \text{ hrs}) + 2.56 \text{ lb/hr} * 16 \text{ hrs}] \div 24 \text{ hrs} = 4.4 \text{ lb/hr}$$

AERMOD was used to model the impacts from a single boiler emitting 1.0 g/s, and the modeling results for each averaging period were scaled to the appropriate emission rate to determine the modeled startup impacts. The results of the unit impact modeling analysis are shown in Table C-2.

**Table C-2**  
**Results of the Startup Impacts Analysis**  
**Green Energy Hawaii**

No of Boilers	Max. Impact, ug/m3 per 1.0 g/s				
	1-hr	3-hr	8-hr	24-hr	annual
1	92.83	68.80	46.75	42.39	7.73

Impacts During Startup			
	CO		PM10
	1-hr	8-hr	24-hr
Emissions, lb/hr	468	128.3	4.4
Emissions, g/s	58.97	16.16	0.56
Modeled Impacts, ug/m3	5473.8	755.5	23.6





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August 16, 2007

Wilfred K. Nagamine  
Manager, Clean Air Branch  
State of Hawaii Department of Health  
P.O. Box 3378  
Honolulu, HI 96801-3378

Re: Application for a Covered Source Permit No. 0650-01  
Green Energy Team, LLC

Dear Mr. Nagamine:

This is in response to your letter dated July 19, 2007, in which you request additional information regarding the Green Energy Hawaii biomass gasification project proposed for construction near Koloa, HI. For ease of review, we repeat each question below prior to providing the requested responses:

- 1. 8,400 hours per year is identified as the maximum operating hours for the gasifiers/boilers. What is the 8,400 hours of operation per year based on and is this a proposed operating limit?***

8,400 hours per year is the number of hours the gasifiers/boilers are expected to operate, accounting for downtime for maintenance. This figure was used as the basis for calculating maximum annual emissions from the project but is not a proposed operating limit. Please see response 2 below for additional information regarding proposed operational and emissions limits.

- 2. If the 8,400 hours of operation per year is not a proposed operating limit, the ton per year emissions for both criteria and hazardous air pollutants should reflect 8,760 hours of operation per year, including emissions during startup, shutdown and normal operation of the gasifiers/boilers.***

Green Energy Team is proposing several permit conditions that will effectively limit annual emissions of criteria and noncriteria air pollutants from the project. One is an annual NO<sub>x</sub> cap, to be enforced through the continuous emissions monitoring system that was described in the application. The second is an annual heat input limit, which will limit emissions of criteria pollutants (other than NO<sub>x</sub>) and noncriteria pollutants during normal project operation. The third is a limit on both the number and duration of startups and shutdowns allowed for the gasifiers/boilers on an annual basis. Together, these limits will ensure that emissions from the proposed project do not exceed the annual emissions shown in the application.

3. ***What is the maximum duration of gasifier shutdown, when wood gas is no longer being generated in the gasifier and the fuel pile is allowed to burn down. Does the multicyclone and electrostatic precipitator (ESP) continue to clean the exhaust gas during this burn down? Does the 8400 hours include shutdown hours? This is unclear since the application describes an 8-hour startup period and approximately 50 startups per year (400 hours of startup).***

The maximum time to completely burn down the fuel pile in the gasifier will vary based on factors such as fuel moisture content, fuel pile height, and the ability or capacity to dissipate the thermal energy produced during this process. Chiptec estimates that it can take 6-8 hrs to completely burn down the fuel in the gasifier. Once the fuel pile is completely burned down, the gasifier refractory is still extremely hot; therefore, the induced draft fan will continue to operate to vent the hot gases through the boiler. During the burn down process and/or cool down process, the gases will pass through the multi-cyclone and ESP. The gasifier, boiler multi-cyclone, induced draft fan, ESP, economizer, and stack are all connected together via duct work. All the gases produced from the gasifier will travel through all of the above-mentioned equipment before they exit the stack. The proposed maximum annual emission and heat input limits reflect operations during startups and shutdowns, as does the 8,400 hour per year value used to calculate these proposed limits.

4. ***When do the multicyclone and ESP begin and end operating relative to startup and shutdown of the gasifier and boiler?***

In the application support document (p. 16), it was indicated that during the gasifier startup process, "until the access doors are closed, the gasifier emissions will exit through the access doors." This is not correct. The induced draft (I.D.) fan will be operated throughout the startup (and shutdown) process, so the combustion products generated during gasifier startup will be drawn through the boiler, multicyclone, and ESP. Therefore, the multicyclone and ESP will be operational immediately upon gasifier startup.

5. ***Compliance Assurance Monitoring (CAM) applicability determination. According to CAM regulations (40 CFR Part 64), the requirements of Part 64 shall apply to a pollutant-specific emissions unit at a major source that is required to obtain a part 70 or 71 permit if it meets the general applicability requirements of Part 64 and is not determined exempt. The Department believes that the gasifiers/boilers meet the general applicability requirements of 40 CFR §64.2(a)(1) and (2) and is not exempt from CAM, but is unable to determine whether the units meet the general applicability criteria of 40 CFR §64.2(a)(3). Please provide the pre-multicyclone PM emission rate to determine whether the ton per year emissions before the controls (multicyclone and ESP) exceed 100 tons per year. If the gasifiers/boilers are subject to CAM, please submit the information as required by 40 CFR Part 64.***

We believe that the gasifiers/boilers are exempt from CAM requirements under 40 CFR §64.2(b)(1)(i):

(b) *Exemptions*—(1) *Exempt emission limitations or standards*. The requirements of this part shall not apply to any of the following emission limitations or standards:

(i) Emission limitations or standards proposed by the Administrator after November 15, 1990 pursuant to section 111 or 112 of the Act.

The PM<sub>10</sub> emission limitation applicable to the gasifiers/boilers derives from 40 CFR Part 60, Subpart Dc (small industrial, commercial and institutional steam generators), which was revised by EPA on February 27, 2006, and includes requirements for emission monitoring for particulate matter in §60.47c.

6. ***In addition to firing eucalyptus and albizia wood in the gasifier, the application identifies other fuels described as “other agricultural waste products, such as bushes and other woody plant material, and clean wood waste (dunnage).” What does “other agricultural material” consist of? Who would generate all of the other listed wastes? Provide an estimated quantity of the other wastes to be combusted.***

The “other agricultural material” is expected to consist mainly of bushes and other woody plant material that is collected by Hawaiian Mahogany as a by-product of the harvesting of timber (eucalyptus and albizia wood). The other agricultural material is expected to come principally, but not exclusively, from Hawaiian Mahogany, supplier of the primary wood fuels. The eucalyptus and albizia wood will make up the overwhelming majority of fuel to the gasifiers/boilers: Green Energy Team LLC expects that the wood will comprise approximately 95% of the heat input to the gasifiers/boilers, with the other agricultural material and clean (untreated) wood waste comprising only about 5%.

7. ***Best Available Control Technology (BACT)***

- a. ***The BACT analysis is the application includes a discussion of wood-fired boilers. The Department believes that wood-fired boilers may not accurately describe the operating conditions that exist in the gasifiers/boilers (i.e., pyrolysis). Please revise the BACT analysis to include a review of gas fired boilers or provide an explanation as to why gas fired boilers are not considered in the BACT analysis.***

As we discussed in our meeting on July 18, the Chiptec close-coupled gasifier/boiler differs from conventional boilers because the gasifier is also a burner. That is, the gasifier both generates and burns the wood gas; there are no separate burners in the boiler (see attached boiler general arrangement drawing). Therefore, it is not appropriate to consider gas-fired boilers as the same class or category of source for purposes of establishing BACT.

- b. ***The BACT analysis should be based on a comparison of ton per year emissions from the facility (including startup, shutdown and normal***

*operation) to significant levels. Based on ton per year emissions from the facility, a BACT analysis should be performed for SO<sub>2</sub>, PM/PM<sub>10</sub> and CO.*

Please see the revised BACT analysis, included as Attachment 2.

***c. BACT for NOx. Please address the application of dry low-NOx burners, overfire air, and flue gas recirculation to the gasifiers/boilers?***

Dry low-NOx burners: As discussed in response 7a above, the gasifiers are also the burners for this close-coupled gasifier/boiler configuration. Because the burners are an integral part of the gasifiers, separate low-NOx burners are not an option.

Overfire air: NOx emissions are controlled by controlling the secondary air available to the combustion process at the burner nozzle. The optimal oxygen level in the combustion chamber is maintained by balancing the combustion air to the primary air zone and the secondary air zone of the gasifier. Again, the design of the secondary air system is integral to the gasifier and the use of overfire air is not feasible with this gasifier design.

Flue gas recirculation (FGR): FGR is commonly used in fossil fuel fired boilers and in some reciprocating engines to recirculate exhaust gas to the combustion zone, reducing peak flame temperatures and thus reducing thermal NOx formation in the combustion chamber. FGR is not being proposed for this gasifier/boiler design for several reasons. The gasifier manufacturer, Chiptec, informs us that the wood gas that is generated in the gasifier and burned in the gasifier combustion zone is a low-Btu gas, with a heat content of between 250 to 375 Btu/ft<sup>3</sup> (compared with natural gas heat content, which is generally around 1000 Btu/ft<sup>3</sup>). Because of the low heat content, the wood gas has an inherently lower flame temperature than conventional gas, so FGR is not needed to reduce flame temperatures. Finally, FGR would cause flame instability in this low-Btu gas design. For all of these reasons, FGR is not feasible for use with this gasifier/boiler technology.

**8. Provide the source of the following fuel parameters used in the application:**

***a. Page 9, Table 1: the nominal fuel feed rate of 4.3 tph. Is this feed rate based on a wood moisture content of 30%?***

Yes, the feed rate is based on a wood moisture content of 30%. As indicated in Note 1 to Table 1, fuel feed rate will vary depending upon moisture content. The maximum heat input to each gasifier/boiler will not exceed 50 MMBtu/hr. Since the emission limits for NOx, CO, and PM<sub>10</sub> are expressed in lb/MMBtu, the variation in moisture content and thus in the weight of fuel used per hour will not affect the maximum allowable emissions from the units.

***b. Page 10, Table 2: the wood moisture content of 30%.***

The moisture content of 30% is Green Energy's design moisture content and is expected to be the typical moisture content of the wood when it reaches the gasifier. However, there are various factors that affect the wood moisture content, such as rainy weather, which would increase the moisture content, or a particularly long drying time, which would decrease it. The gasifier is designed to handle wood with a range of moisture content.

**c. Page 10, Table 2: the wood sulfur content of 0.05% maximum.**

The sulfur content shown in the December 8, 2005, Hazen analysis for albizia wood (attached) is 0.04% on a dry basis. This was rounded up to 0.05% to provide a compliance margin and a conservatively high estimate of potential SO<sub>2</sub> emissions from the project.

**d. Emissions Calculations section: the wood density of 25 lbs/ft<sup>3</sup> used in the startup calculations.**

The estimated wood density of 25 lbs/ft<sup>3</sup> was provided by Chiptec as a design value.

**9. Emission factors:**

**a. The Emissions Calculations section, Calculation of Boiler Emissions, Emission Factor Sources no. 3 shows the application of a 50% compliance margin for nonmethane organic compounds. Please discuss the reason for applying the 50% compliance margin.**

The AP-42 emission factor was multiplied by 1.5 to ensure that the estimated emissions from the unit were conservatively high and would not be underestimated.

**b. The Emissions Calculations section, Calculation of Boiler Emissions, Emission Factor Sources no 4: Please provide the referenced 12/8/05 Hazen analysis.**

The 12/8/05 Hazen analysis is attached (see Attachment 3, Response 8c).

**c. Emissions Calculations section for gasifier startup, boiler startup, normal gasifier/boiler operation. Provide the stoichiometric calculations performed to determine SO<sub>2</sub> emissions.**

SO<sub>2</sub> emissions for burning wood alone (boiler startup and normal gasifier/boiler operation) were calculated as follows:

From the 12/8/05 Hazen analysis – sulfur content of the dry wood is 0.04 wt%, heat content is 8389 Btu/lb:

$$0.04 \text{ wt\%} = 0.0004 \text{ lb S/lb wood} * 1 \text{ lb wood}/8389 \text{ Btu} = 0.048 \text{ lb S/MMBtu wood}$$

$$0.048 \text{ lb/MMBtu S} * 2 \text{ lb SO}_2/\text{lb S} = 0.096 \text{ lb/MMBtu SO}_2$$

SO<sub>2</sub> emissions on a lb/ton of wood as fired basis were calculated as follows:

$$0.10 \text{ lb/MMBtu} * 4195 \text{ Btu/lb}^1 * 2000 \text{ lb/ton} * 1 \text{ MMBtu}/1\text{E}6 \text{ Btu} = 0.839 \text{ lb/ton}$$

SO<sub>2</sub> emissions from 5 gallons of Diesel fuel used during gasifier startup were calculated as follows:

$$5 \text{ gallons} * 7.0 \text{ lb/gal} * 0.05\% \text{ S} * 2 \text{ lb SO}_2/\text{lb S} = 0.035 \text{ lb SO}_2 \text{ per startup}$$

---

<sup>1</sup> Based on typical 30% moisture content of as-fired wood.

Based on 36 tons of wood per startup, the Diesel fuel adds

$$0.035 \text{ lb SO}_2/36 \text{ tons} = 0.0010 \text{ lb/ton}$$

***d. Emissions Calculations section, Calculation of Boiler Startup Emissions: Is the PM<sub>10</sub> emission factor based on filterable PM<sub>10</sub> for uncontrolled wet wood combustion and the condensable PM emission factor for all fuels?***

Yes. However, as discussed in responses 3 and 4 above, it has been clarified that the gasifier/boiler exhaust will exit through the multicyclone and ESP during startup as well as during normal operation, so the PM<sub>10</sub> emissions are expected to be lower during startup than the uncontrolled emissions calculated using these emission factors.

***e. The use of air curtain incinerator emission factors for gasifier startup emissions is not justified in [the] application. If the use of air curtain incinerator emission factors cannot be justified, other more representative emission factors for CO, PM and VOC should be used (e.g., prescribed fire [piled fuels], conical burners [wood refuse]). Unlike the description provided in the application for gasifier startup, air curtain incinerators have high velocity air blown across the top (creating a rotational air current within the box and high oxygenation of the fire) and airflow over the box that reduces the escape of particulate emissions. Please submit revised emissions that better reflect the operating conditions of the gasifiers during startup.***

Air curtain destructor (ACD) combustion is described as follows: “The circulation ... in general provides circulation of air into the combustion zone and recirculates at least a portion of combustion byproducts back into the high temperature combustion region surrounding the debris. This combination of high airflow into the combustion zone and recirculation of the combustion products is designed to reduce visible particulate matter (PM) emissions and provide increased gas-phase residence times compared with open pile burning... The initial charge of debris is loaded into the unit and ignited, usually with diesel fuel or kerosene. Once the debris has ignited, the blower is started and additional debris is loaded into the unit as needed to maintain combustion.”<sup>2</sup>

The ignition process described for the ACD is very similar to the process that is used to start up the gasifier (p. 16 of the application and Response 4 above). As discussed in Response 4 above, the I.D. fan will be operational inside the gasifier as soon as the wood pile is lighted off to create high oxygenation of the fire and high temperatures. In open burning, there are relatively low temperatures (“In general, the relatively low temperatures associated with open burning increase emissions of particulate matter, carbon monoxide, and hydrocarbons...” AP-42 Section 2.5.1, Open Burning) and no forced air circulation to improve combustion.

As discussed in Response 3 above, the exhaust generated during gasifier startup will exhaust through the multiclone and ESP, so there will be no “escape” of particulate emissions.

---

<sup>2</sup> Miller, C. Andrew, and Paul Lemieux, U.S. EPA, “Emissions from the Burning of Vegetative Debris in Air Curtain Destructors,” JAWMA Volume 57, August 2007.

In summary, we believe the physical characteristics of air curtain destructors are much more similar to those of the gasifier during startup than characteristics, and thus CO, particulate and VOC emission rates, from open burning or conical burners.

**10. *Provide the manufacturer's literature for normal operation of the gasifiers/boilers with emission guarantees and stack parameters (or derivation of stack parameters).***

The manufacturer's emission guarantee letter is attached, along with a calculation showing how the stack parameters were derived. Note that the fuel analysis shown in the boiler combustion performance analysis was back-calculated for a typical 30% moisture content using the "dry" fuel analysis from the December 8, 2005 analysis of albizia wood.

**11. *The ambient air quality model performed for the gasifier and boiler startup should be redone. The analysis should reflect actual gasifier and boiler startup conditions (exhaust parameters) and more suitable emission factors, as discussed in question 9.e. above. The analysis should include all short-term averaging periods for PM<sub>10</sub>, CO and SO<sub>2</sub>.***

In our meeting last month, we discussed the gasifier and boiler startup procedures and the physical operation of the gasifier during startup. We agreed that if the exhaust during gasifier startup actually vented through the access doors rather than the boiler exhaust stack, the ambient air quality analysis presented in the application for startup impacts might not be appropriate. However, as discussed in the previous responses, the induced draft fan is in operation during the gasifier startup period and the exhaust gases are drawn through and exit from the boiler stack. Therefore, we believe that the ambient air quality modeling performed for the startup conditions correctly represents startup conditions and conservatively overestimates emission factors, and we do not believe the modeling analysis needs to be revised.

**12. *Page 3 of 13 of the electrostatic precipitator literature identifies a stack inside diameter of 3.5 feet. The application provides a stack inside diameter of 4.49 feet. Please identify the correct stack diameter.***

The ESP stack diameter of 4.5 feet was taken from the attached air pollution control equipment performance specification document for the project. This March 2007 specification supersedes the January 2007 ESP literature provided with the application.

**13. *Please provide the following analysis for hazardous air pollutants from the gasifiers/boilers:***

- a. *Hawaii Administrative Rules §11.60.1-179(c)(1) and (2), for noncarcinogenic pollutants with a TLV-TWA:***
  - i. *Compare each pollutant's 8-hour average concentration to 1/100 of TLV/TWA;***
  - ii. *Compare each pollutant's annual average concentration to 1/420 of TLV-TWA.***

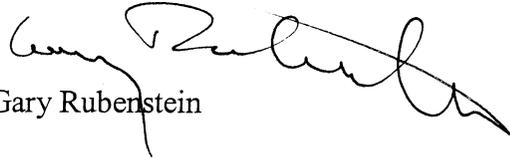
- b. Hawaii Administrative Rules §11.60.1-179(c)(3) for carcinogenic pollutants, a screening analysis utilizing the annual ambient air concentrations for each pollutant and Region 9 Preliminary Remediation Goal values.***

The requested analyses/comparisons are attached (Attachments 6 and 7).

Thank you for taking the time to meet with us last month. We hope that the information provided at that meeting, along with the responses provided in this letter, will allow you to complete your review and issue the covered source permit for this project by the end of the year.

If you have any questions or require additional information, please do not hesitate to call.

Sincerely,



Gary Rubenstein

attachments

cc: Eric Knutzen, Green Energy Team, LLC  
Brad Noviski, Chiptec  
Al Kurzenhauser  
Joseph Kulak, HRH

**Attachment for Response 7a:  
Boiler General Arrangement Drawing**

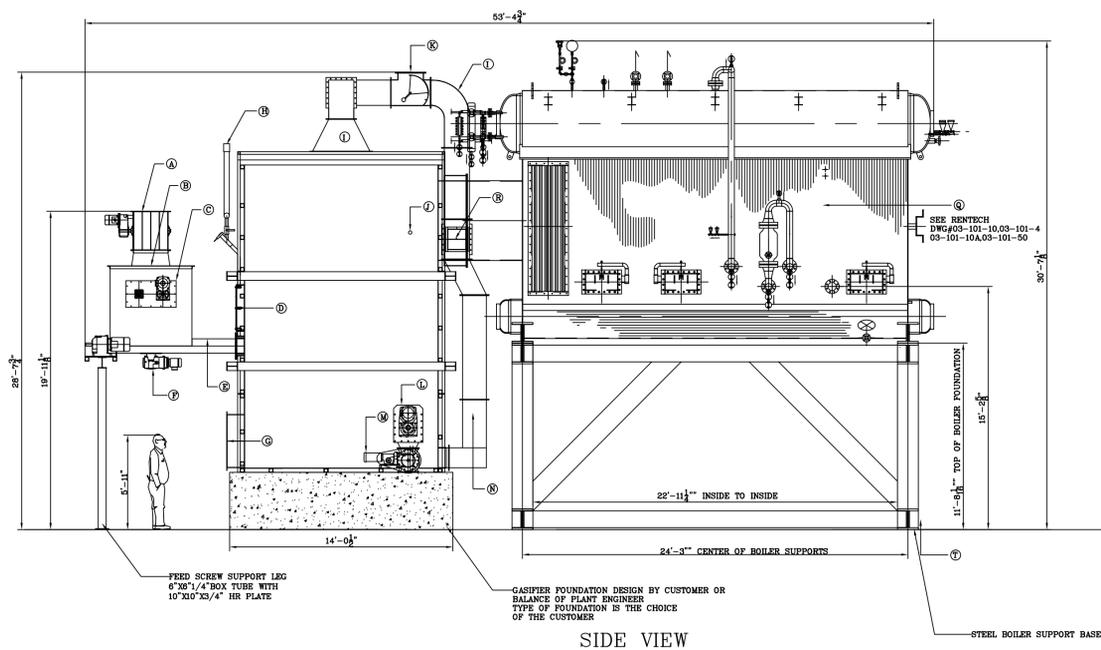
Tel: 802-658-0956

Fax: 802-660-8904

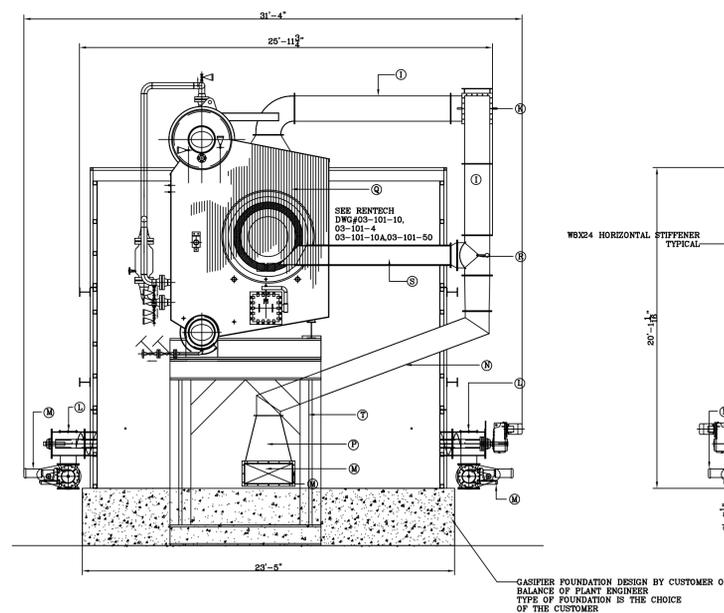
WWW.CHIPTEC.COM



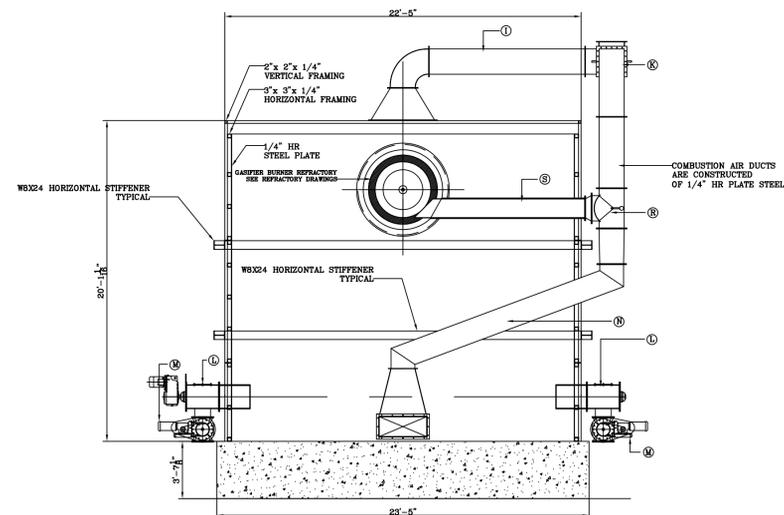
**CHIPTEC**  
WOOD ENERGY SYSTEMS  
54 Echo Place, Unit #1  
Williston, Vermont 05495



SIDE VIEW

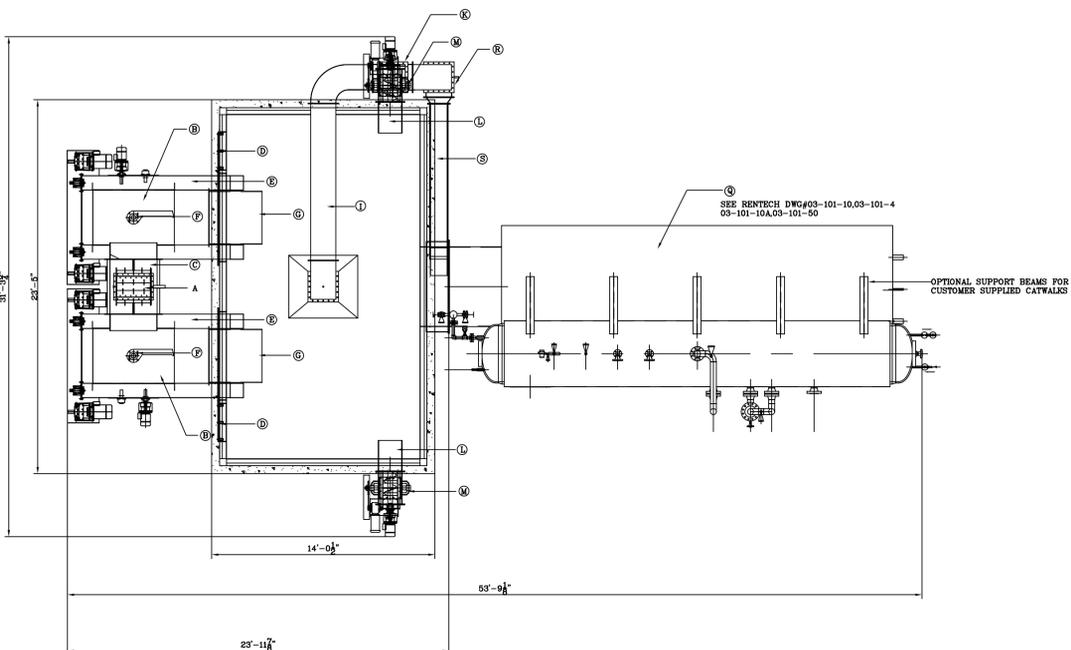


REAR VIEW

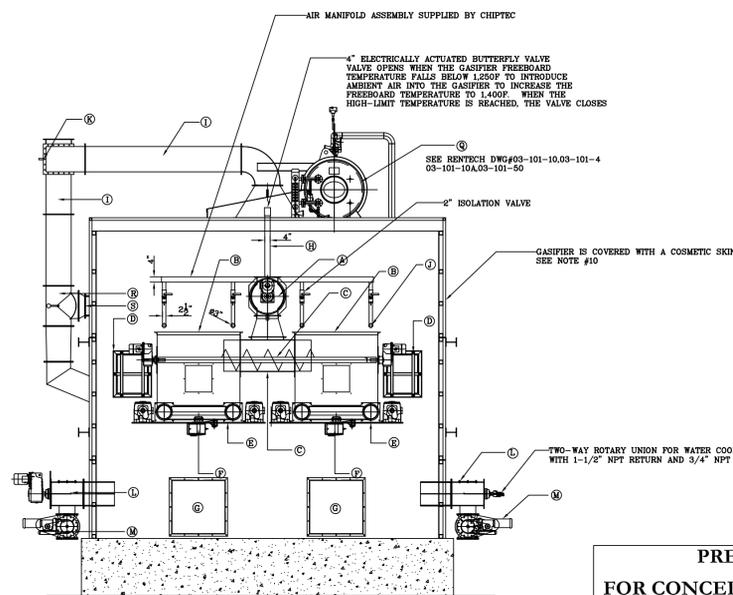


REAR VIEW (GASIFIER ONLY)

- DESIGN NOTES**
- 1) GASIFIER IS DESIGNED FOR 50%MC(wet basis) OR LESS FUEL
  - 2) OPERATING WEIGHT OF THE GASIFIER WITH FUEL EQUALS 435,365 LB.
  - 3) THE FUEL PARTICLE SIZE SHALL BE 2.5 x 2.5" OR LESS WITH NO MORE THAN 10% (OF WEIGHT) LESS THAN 1/16" PARTICLE DIMENSION OVERALL SIZE
  - 4) THE GASIFIER DESIGN IS BASED UPON AN FUEL ANALYSIS FOR ALBERTA WOOD CHIPS THAT CONTAINS 49.63% CARBON, 5.14 % HYDROGEN, 0.04 %SULFUR, LESS THAN 0.01% NITROGEN AND AN ASH CONTENT OF 1.25% OR LESS. ALL VALVES ARE CALCULATED ON AN ASH FREE BASIS
  - 5) GASIFIER FUEL FEED RATE WITH 50%MC CHIPS IS 11,943 (+/-10%) LBS/HR WITH A FUEL HIGHER HEATING VALUE OF 4,195 BTU/LB OF FUEL BURNER OUTPUT SHALL BE 50,158,840 BTU/HR AT THE ABOVE CONDITIONS
  - 6) REFER TO RENTECH DRAWINGS FOR BOILER & BOILER PIPING DETAILS



PLAN VIEW



FRONT VIEW

**PRELIMINARY  
FOR CONCEPTUAL ENGINEERING**

COMPONENT SCHEDULE	
MARK	DESCRIPTION
(A)	FUEL FEED AIR LOCK
(B)	FUEL METERING BIN
(C)	FUEL SPLITTER ASSEMBLY
(D)	GASIFIER HATCH ACCESS
(E)	FEED SCREW ASSEMBLY
(F)	BRIDGE BREAKER ASSEMBLY
(G)	GRATE MANWAY ACCESS
(H)	OVER FIRE AIR MANIFOLD
(I)	TOTAL AIR DUCT
(J)	GASIFIER VIEW PORT
(K)	TOTAL AIR BALANCING VALVE
(L)	GASIFIER ASH AUGER
(M)	ROTARY ASH VALVE
(N)	PRIMARY AIR DUCT
(O)	NA
(P)	OPTIONAL BOILER ASH CLEAN OUT HOPPERS
(Q)	HIGH PRESSURE STEAM BOILER
(R)	COMBUSTION AIR BALANCING VALVE
(S)	SECONDARY AIR DUCT
(T)	BOILER FOUNDATION

THIS DRAWING AND DESIGN ARE THE PROPERTY OF CHIPTEC WOOD ENERGY SYSTEMS. THEY ARE SUBMITTED ON THE CONDITION THAT THEY ARE NOT TO BE COPIED IN PART, IN WHOLE, OR FOR ANY PURPOSE DETRIMENTAL TO CHIPTEC WOOD ENERGY SYSTEMS. ANY UNAUTHORIZED USE OR DISCLOSURE OF ANY CONFIDENTIAL OR PROPERTY INFORMATION DISCOVERED FROM THE DRAWINGS WITH OUT PRIOR WRITTEN CONSENT FROM CHIPTEC WOOD ENERGY SYSTEMS, MAY BE SUBJECT TO A RESTRAINING ORDER AND TRIPLE DAMAGES

Revisions		
No.	Date	Remarks
A	2/23/07	FOR REVIEW

**Steam Plant Systems, Inc.**  
BOILER & STEAM ENGINEERS  
900 Commerce Drive - P.O. Box 897  
Clifton Park, New York 12065  
Phone: (518) 877-8805



**GREEN ENERGY TEAM, LLC**  
4313 KAPUNA RD  
KILAUEA, HI

GREEN ENERGY HAWAII  
ENERGY PLANT  
KAUAI, HI

Drawn By EO	Approved By EO	Scale 3/16" = 1'	Project ID 491-0706
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GASIFIER/BOILER  
GENERAL  
ARRANGEMENT

G-01  
SHEET 20  
OF 22

**Attachment 2: Response 7b**  
**Revised BACT Analysis**

## **REVISED BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS**

Under the requirements of Subchapter 5, Covered Sources, best available control technology (BACT) must be applied to any source that has the potential to emit criteria pollutants in significant amounts. The steam boiler has the potential to emit pollutants in excess of the significance thresholds, so BACT must be applied for NO<sub>x</sub>, SO<sub>2</sub>, CO and PM<sub>10</sub> emissions from the boiler. This chapter presents the results of the BACT determination for the boiler.

HDOH regulations define BACT as the following:

*...an emissions limitation...based on the maximum degree of reduction for each pollutant subject to regulation approved pursuant to the Act which would be emitted from any proposed stationary source or modification which the director, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through the application of production techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant.*

The following tasks were performed for the BACT analysis for each pollutant:

- Reviewed published BACT guidelines;
- Reviewed federal NSPS;
- Reviewed EPA's RBLC database; and
- Reviewed permits issued by other agencies for similar biomass gasifier/boiler systems.

As summarized in the following sections, these BACT analyses conclude the following for wood-fired boilers, with a maximum heat input capacity of less than 100 MMBtu/hr:

- NO<sub>x</sub> emission limit of 0.25 lb/MMBtu, using good combustion practices;
- Use of low sulfur fuels for SO<sub>2</sub> emissions;
- CO emission limit of 0.20 lb/MMBtu, using good combustion practices; and
- PM<sub>10</sub> emission limit of 0.025 lb/MMBtu, using multiclones and an ESP.

### **A. Published BACT Guidelines**

Published BACT determinations from air quality agencies in California were reviewed. The San Joaquin Valley Air Pollution Control District has published a 2004 CO BACT determination for a 259 MMBtu/hr biomass boiler of 400 ppmvd @3% O<sub>2</sub>; the CO emission limit of 0.20 lb/MMBtu proposed for this project is equivalent to 266.6 ppmvd @3% O<sub>2</sub>, well below the CO level determined to be BACT. BACT was not triggered for this boiler for NO<sub>x</sub>, SO<sub>2</sub> or PM<sub>10</sub>. BACT determinations were also made for biomass boilers utilizing fluidized bed technology, which is a fundamentally different combustion technology than the gasifier technology to be utilized by the Green Energy Hawaii steam boilers. Therefore, the BACT determinations for fluidized bed units are not applicable to the proposed project.

**B. Federal NSPS**

Title 40 CFR Part 60 Subpart Dc contains the applicable NSPS for boilers with a maximum heat input capacity of 100 MMBtu/hr or less. The Subpart Dc emission limitations are summarized in the following table.

<b>Table 15</b>				
<b>Summary of NSPS Requirements for Wood-fired Boilers With Heat Input &lt; 100 MMBtu/hr</b>				
Fuel	Emission Limitation, lb/MMBtu			
	NO <sub>x</sub>	SO <sub>2</sub>	CO	PM <sub>10</sub>
Wood	No limit	No limit	No limit	0.03

**C. RBLC Listings**

The RBLC database contains four relevant listings for wood-fired boilers with a heat input of less than 100 lb/MMBtu.

1. Louisiana-Pacific Hayward (Wisconsin)

Four new wood-burning boilers were permitted as thermal oil heaters in 2004. The boilers have a BACT/PSD emission limit of 16.2 lb/hr of NO<sub>x</sub> for two 23.8 MMBtu/hr boilers, for an effective limit of 0.34 lb/MMBtu, and 8.2 lb/hr for two 19.4 MMBtu/hr boilers, for an effective limit of 0.23 lb/MMBtu. The RBLC listing states that these lb/MMBtu emission rates are not permit limits. No add-on controls are utilized for NO<sub>x</sub> control, and the lower of the two effective NO<sub>x</sub> limits is comparable to the limit proposed for the gasifiers/boilers.

The CO BACT determination for these boilers was 52.5 lb/hr, which is equivalent to 1.1 lb/MMBtu. The RBLC listing states that these lb/MMBtu emission rates are not permit limits. No add-on controls are utilized for CO control. The proposed CO limit for the Green Energy gasifiers of 0.20 lb/MMBtu is well below this BACT limit.

The PM<sub>10</sub> BACT determination for these boilers was 15.0 lb/hr or 0.50 lb/MMBtu. PM<sub>10</sub> emissions are controlled using an electrified filter bed. The proposed PM<sub>10</sub> emission limit for the Green Energy gasifiers of 0.025 lb/MMBtu is well below this BACT limit.

No BACT determination was made for SO<sub>2</sub> for this project.

2. Deltic Timber Corporation (Arkansas)

This new 64.3 MMBtu/hr wood waste and bark-fired boiler was permitted in 2003 with a NO<sub>x</sub> limit of 0.30 MMBtu/hr. The project was subject to BACT/PSD review for NO<sub>x</sub>, so the determination for NO<sub>x</sub> is relevant here. No add-on controls are utilized for NO<sub>x</sub> control, and the NO<sub>x</sub> limit is well in excess of the limit proposed for the gasifiers/boilers.

The CO BACT determination for this boiler was 0.475 lb/MMBtu, achieved using good combustion practices. No add-on controls are utilized for CO control. The proposed CO limit for the Green Energy gasifiers of 0.20 lb/MMBtu is well below this BACT limit.

The PM<sub>10</sub> BACT determination for this boiler was 0.08 lb/MMBtu. PM<sub>10</sub> emissions are controlled using an ESP. The proposed PM<sub>10</sub> emission limit for the Green Energy

gasifiers of 0.025 lb/MMBtu, achieved using the same control technology, is well below this BACT limit.

No BACT determination is listed for SO<sub>2</sub> for this project.

3. Wellborn Cabinets, Inc. (Alabama)

These 29.5 MMBtu/hr wood waste-fired boilers were permitted in 2003. The permitted emission limit for NO<sub>x</sub> is 0.50 lb/MMBtu, which is met using boiler design and good combustion practices. This project was also subject to BACT/PSD review for NO<sub>x</sub>. The NO<sub>x</sub> limit is twice the limit proposed for the gasifiers/boilers. No BACT determinations are listed for SO<sub>2</sub>, CO or PM<sub>10</sub> for this project.

4. Duke Solutions Evendale LLC (Ohio)

A new 28.7 MMBtu/hr wood waste boiler was permitted in 1999. The permitted emission limit for NO<sub>x</sub> is 0.604 lb/MMBtu, which is met without add-on controls. The RBLC listing for this facility indicates that the NO<sub>x</sub> emission rate from a performance test of the boiler was 0.45 lb/MMBtu. Both the permitted and tested emission rates are significantly higher than the NO<sub>x</sub> limit proposed for this project.

The RBLC listing for this project shows a SO<sub>2</sub> limit of 0.01 lb/MMBtu, with no add-on controls. There is no information in the listing to indicate whether the emission limit has been achieved in practice.

The CO BACT determination for this boiler was 0.30 lb/MMBtu, achieved using good combustion practices. No add-on controls are utilized for CO control. The proposed CO limit for the Green Energy gasifiers of 0.20 lb/MMBtu is well below this BACT limit.

The PM<sub>10</sub> BACT determination for this boiler was 0.20 lb/MMBtu. PM<sub>10</sub> emissions are controlled using a multiclone. The proposed PM<sub>10</sub> emission limit for the Green Energy gasifiers of 0.025 lb/MMBtu is well below this BACT limit.

#### **D. Permits for Similar Equipment**

Several other biomass gasifier/boiler permits were reviewed to determine control technologies and emission requirements for similar facilities that were not listed in the RBLC.

1. Riceland Foods, Inc.—Jonesboro Rice Division

Riceland Foods in Arkansas has a Riviana gasification unit that converts rice hulls to pyrolysis gas and ash. The pyrolysis gas is discharged from the top of the gasification unit to a thermal energy combustion system.<sup>1</sup> The gasification system is designed to consume 15,000 pounds per hour of rice hulls. The gasifier uses a multicyclone and good combustion efficiency to achieve its permitted emission rates. The permit limits are expressed in units of pounds per hour and tons per year. Based on an assumed heat content of 6575 Btu/lb for the rice hulls,<sup>2</sup> the permitted emission limits for the project can

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<sup>1</sup> This gasifier technology differs from the Chiptec gasifier technology proposed for the Green Energy project because it employs a separate thermal energy combustion system. In the Chiptec system, the combustor is integrated with the gasifier.

<sup>2</sup> Source of rice hull heating value: Animal Waste Screening Study, Electrotek Concepts, Inc., Arlington, VA. June 2001, referenced at [http://cta.ornl.gov/bedb/appendix\\_a/Approximate\\_Heat\\_Content\\_of\\_Selected\\_Fuels\\_for\\_Electric\\_Power\\_Generation.xls](http://cta.ornl.gov/bedb/appendix_a/Approximate_Heat_Content_of_Selected_Fuels_for_Electric_Power_Generation.xls). 15,000 lb/hr at 6575 Btu/lb is approximately equal to 98.6 MMBtu/hr.

be expressed as lb/MMBtu. Both pound per hour and lb/MMBtu limits are shown in the following table:

<b>Table 15.1 Emission Limits for Rice Hull Gasifier</b>		
Pollutant	Permit Limit, lb/hr	Equivalent Limit, lb/MMBtu
NO <sub>x</sub>	35.0	0.355
SO <sub>2</sub>	15.0	0.15
CO	5.0	0.05
PM <sub>10</sub>	15.0	0.15

The lb/MMBtu emission limits for this gasification unit are higher than those proposed for the Green Energy gasifiers for all pollutants except CO. Since no post-combustion controls are being used to achieve this CO emission rate, we conclude that good combustion practices are BACT for this pollutant.

2. Anthony-Higgs Lumber Company, Inc.

The Arkansas Department of Environmental Quality issued a Minor Source Air Permit to the Anthony-Higgs Lumber Company, Inc., for construction and operation of a wood gasifier/boiler system with multiclone. The specific rating of the gasifier/boiler is not given in the permit, although the discussion of regulatory applicability indicates that the unit is not subject to 40 CFR Part 60, Subpart Dc, because its capacity is less than 10 MMBtu/hr. The permit limits are expressed in units of pounds per hour and tons per year. Assuming as a worst case that the capacity is 10 MMBtu/hr (because the highest capacity will yield the lowest, most stringent lb/MMBtu limit), the permitted emission limits for the project can be expressed as lb/MMBtu. Both pound per hour and lb/MMBtu limits are shown in the following table:

<b>Table 15.2 Emission Limits for Wood Gasifier/Boiler</b>		
Pollutant	Permit Limit, lb/hr	Equivalent Limit, lb/MMBtu (based on 10 MMBtu/hr)
NO <sub>x</sub>	2.5	0.25
SO <sub>2</sub>	0.1	0.01
CO	3.1	0.31
PM <sub>10</sub>	1.4	0.14

The lb/MMBtu emission limits for this gasification unit are the same as (NO<sub>x</sub>) or higher than (CO and PM<sub>10</sub>) those proposed for the Green Energy gasifiers for all pollutants except SO<sub>2</sub>. SO<sub>2</sub> emission rates are completely dependent upon the sulfur content of the

wood being used in the gasifier. Since no post-combustion controls are being used to achieve this SO<sub>2</sub> emission rate, we conclude that good combustion practices are BACT for this pollutant.

## **E. Potential for Use of Add-On Emission Controls**

### **1. NO<sub>x</sub>**

Potential post-combustion controls for NO<sub>x</sub> emissions from the gasifiers/boilers are selective catalytic reduction (SCR) and selective noncatalytic reduction (NSCR). SCR systems are not generally used in exhaust streams with relatively high particulate concentrations, and they are effective only across a relatively small temperature window. In the proposed project configuration, the particulate concentration in exhaust stream between the multiclones and the ESP is expected to be approximately 0.20 lb/MMBtu, or approximately 0.11 gr/dscf. This concentration is relatively high compared to the particulate grain loading in oil-fired exhaust streams where SCR systems are now being used. In addition, by the time the exhaust gas passes through the multiclones and enters the ESP, the temperature has been reduced to only about 340°F, while SCR technology is effective at exhaust gas temperatures above around 550°F. The optimal temperature for an SCR system occurs upstream of the multiclones, where the particulate concentration would be too high for effective operation of the control system.

A “high-dust” SCR system could theoretically be placed upstream of the multiclone and ESP, where the flue gas temperature is in the appropriate range. A “low-dust” SCR unit could theoretically be placed between the multiclones and the ESP, although the flue gas temperature would be lower. A third option would be a “cold-side” SCR unit, which would be located in the relatively clean exhaust stream downstream of the particulate matter control equipment, where flue gas reheat would be required. In any of these locations, however, there are significant potential operational problems: 1) catalyst deactivation and fouling, and 2) ammonia slip and the resulting effects on downstream equipment. These problems and the design requirements necessary to minimize them are, to some extent, interrelated.

Catalyst deactivation and fouling occur due to attrition, cracking, and wear; flue gas particulate matter and thermal stresses; solid particle deposition in the catalyst pores and on the catalyst surface; and poisoning by compounds such as arsenic, lead, and alkali oxides, which react with the active sites on the catalyst. Decreased catalyst activity leads to unacceptable impacts on boiler operation, including excessively frequent shutdowns for catalyst replacement and excessive catalyst replacement costs and, most importantly, reduced NO<sub>x</sub> control capability and increased ammonia slip (discussed further below). These problems are most likely in either of the locations upstream of the ESP because of the relatively high dust loadings.

Ammonia slip has several possible causes and numerous potential effects. While some amount of ammonia slip is inherent in the SCR process, excessive ammonia slip causes excessively high operating costs (due to the wasted ammonia reagent) and may cause odor problems in the surrounding area if slip levels are too high. Excessive ammonia slip can result from excessive ammonia injection rates, flue gas temperature in the SCR reactor that are too low, catalyst deactivation and fouling, and inadequate mixing of flue gases with ammonia. To maintain acceptable ammonia slip levels, the catalyst selected for use in a specific SCR installation must be compatible with the combustion

characteristics, flue gas composition, and fly ash composition that are characteristic of the particular boiler and the fuels that may be combusted. In addition, the design of an SCR system for a specific installation must include a reactor location, economizer bypass capability, and an ammonia injection system that will maintain ammonia slip within acceptable levels. The SCR system must be designed to ensure that the flue gases entering the SCR reactor are within the appropriate temperature range and are completely mixed with ammonia. Again, these design requirements must be met under all boiler operating loads, so must accommodate the variations in flue gas flow rates, temperature profiles, and NO<sub>x</sub> levels associated with different boiler loads. If flue gas temperatures characteristic of low-load operations are too low, the NO<sub>x</sub> reduction reaction will not proceed to completion, even in the presence of the catalyst. If the ammonia and the flue gases are not adequately mixed, excessive ammonia slip will occur and unreacted (uncontrolled) NO<sub>x</sub> may pass through the SCR reactor. Because of the small size of the gasifier/boilers and the variation in flue gas flow rates that would be experienced in either of the lower-dust locations (because one SCR system would control both boilers), the mixing of the flue gas with ammonia would be especially problematic. For all of these reasons, the use of SCR is not considered feasible for this application.

Selective noncatalytic reduction, or ammonia injection, can be used in a high-dust environment because no catalyst is required. However, the key to effective NO<sub>x</sub> control using SNCR is residence time. The dimensions of the gasifiers do not provide adequate residence time for the NO<sub>x</sub> reduction reactions to take place. Therefore, the use of SNCR is not feasible for this application.

## 2. SO<sub>2</sub>

The SO<sub>2</sub> emission rate proposed for the project is based on analyses of samples of the albizia and eucalyptus fuels that will be used to fuel the gasifiers/boilers. The calculation of potential SO<sub>2</sub> emissions assumes that all of the sulfur in the fuel is emitted as SO<sub>2</sub>. The actual SO<sub>2</sub> emissions from the gasifiers/boilers are expected to be somewhat lower than the stoichiometric calculations would indicate, because some of the SO<sub>2</sub> will convert to sulfate and will be removed by the ESP. However, because the amount of conversion and control cannot be accurately determined, no control efficiency is assumed in the calculation of SO<sub>2</sub> emissions.

## 3. CO

The available post-combustion control for CO emissions from the gasifiers/boilers is an oxidation catalyst. Oxidation catalysts generally cannot be used in exhaust streams with relatively high particulate concentrations, and they require a minimum temperature to be effective. In the proposed project configuration, the particulate concentration in the exhaust stream between the multiclones and the ESP is expected to be approximately 0.20 lb/MMBtu, or approximately 0.11 gr/dscf. This concentration is relatively high compared to the particulate grain loading in Diesel-fired exhaust streams where Diesel oxidation catalyst systems are now being used. In addition, by the time the exhaust gas passes through the multiclones and enters the ESP, the temperature has been reduced to only about 340°F, while oxidation catalysts are effective at exhaust gas temperatures above around 400°F. The optimal temperature for an oxidation catalyst occurs upstream of the multiclones, where the particulate concentration would be too high for effective operation of the control system.

#### 4. PM<sub>10</sub>

The potential post-combustion control technologies for PM<sub>10</sub> control include multiclones, ESPs, wet scrubbers and baghouses. Multiclones and an ESP have been proposed for use on the project.

Wet scrubbers are generally not as effective as ESPs in controlling fine particulate matter. In addition, wet scrubbers create wastewater disposal issues. Therefore, the use of a wet scrubber would not be considered BACT for this project.

Baghouses are generally not used for combustion devices that handle fibrous solid fuels such as wood and bagasse. This is because there is a potential for burning fuel particles from the combustion chamber to be carried in the exhaust stream and to cause a fire or an explosion in the dust-laden environment of a baghouse.

#### F. Conclusions

The NO<sub>x</sub>, SO<sub>2</sub>, CO and PM<sub>10</sub> emissions limitations proposed for the project utilize the maximum degree of reduction achievable through available emissions control methods for this class and category of source. Therefore, the emissions limits shown in Table 16 are proposed as BACT for the project.

Pollutant	Proposed Control Level, lb/MMBtu
NO <sub>x</sub>	0.25
SO <sub>2</sub>	0.10
CO	0.20
PM <sub>10</sub>	0.025

**Attachment 3: Response 8c**  
**Hazen 12/8/05 Analysis of Albizia Wood**



**Hazen Research, Inc.**  
 4601 Indiana Street  
 Golden, CO 80403 USA  
 Tel: (303) 279-4501  
 Fax: (303) 278-1528

Date December 8 2005  
 HRI Project 002-0G2  
 HRI Series No. K234/05  
 Date Rec'd. 11/22/05  
 Cust. P.O.# Pre-paid

Green Energy Hawaii  
 Eric Knutzen  
 4313 Kapuna Road  
 Kilauea, HI 96754

Sample Identification  
 Albizia Chips

Reporting Basis >	As Rec'd	Dry	Air Dry
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Proximate (%)

Moisture	62.11	0.00	4.82
Ash	0.47	1.25	1.19
Volatile	11.97	31.59	30.07
Fixed C	25.45	67.16	63.92
Total	100.00	100.00	100.00

Sulfur	0.02	0.04	0.04
Btu/lb (HHV)	3139	8284	7885
MMF Btu/lb	3155	8398	
MAF Btu/lb		8389	
Air Dry Loss (%)		60.19	

Ultimate (%)

Moisture	62.11	0.00	4.82
Carbon	18.81	49.63	47.24
Hydrogen	1.97	5.19	4.94
Nitrogen	0.10	0.25	0.24
Sulfur	0.02	0.04	0.04
Ash	0.47	1.25	1.19
Oxygen*	16.52	43.64	41.53
Total	100.00	100.00	100.00

Chlorine**	0.021	0.056	0.053
------------	-------	-------	-------

Forms of Sulfur (as S,%)

Sulfate	_____	_____
Pyritic	_____	_____
Organic	_____	_____
Total	0.02	0.04

Lb. Alkali/MM Btu= 0.21  
 Lb. Ash/MM Btu= 1.51  
 Lb. SO2/MM Btu= 0.10  
 HGI= @ % Moisture  
 As Rec'd. Sp.Gr.=  
 Free Swelling Index=  
 F-Factor(dry), DSCF/MM BTU= 9,031

Report Prepared By?

Gerard H. Cunningham  
 Fuels Laboratory Supervisor

\* Oxygen by Difference.

\*\* Not usually reported as part of the ultimate analysis.



**Hazen Research, Inc.**

4601 Indiana Street  
Golden, CO 80403 USA  
Tel: (303) 279-4501  
Fax: (303) 278-1528

Date December 8 2005  
HRI Project 002-0G2  
HRI Series No. K234/05  
Date Rec'd. 11/22/05  
Cust. P.O.# Pre-paid

Green Energy Hawaii  
Eric Knutzen  
4313 Kapuna Road  
Kilauea, HI 96754

Sample Identification:  
Albizia Chips

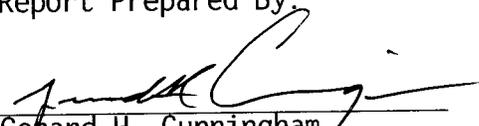
Elemental Analysis of Ash (%)

SI02	9.46
AL203	2.46
TI02	0.17
FE203	5.46
CA0	39.70
MGO	3.19
NA20	1.16
K20	12.50
P205	3.31
S03	0.23
CL	0.52
C02	<u>21.49</u>
Total	99.65

Ash Fusion Temperatures (Deg F)

	Oxidizing Atmosphere	Reducing Atmosphere
Initial	2642	2700+
Softening	2648	
Hemispherical	2650	
Fluid	2656	

Report Prepared By:

  
 Gerard H. Cunningham  
 Fuels Laboratory Supervisor

Note: The ash was calcined @ 1110 deg F (600 C) prior to analysis.

**Attachment 4: Response 10**  
**Manufacturer's Emissions Guarantees and Calculation of Stack Parameters**

# CHIPTEC®

## WOOD ENERGY SYSTEMS

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Wednesday, March 14, 2007

Eric Knutzen  
Green Energy Hawaii  
4313 Kapuna Rd  
Kilauea, Hawaii ,96754

Re: Emission Guarantee

Aloha Eric,

Thank you for you continued interest and support. Chiptec will guarantee the following emission rates for your project.

CO: Not to exceed 0.20 lbs/MMBTU  
NOx: Not to exceed 0.25 lbs/MMBTU  
Total Particulates from the multi-cyclone: 0.2 Lbs/MMBTU

These emission rates are based upon utilizing the fuel specified in Exhibit B of this document.

Please feel free to contact me if you have any questions.

Sincerely



Bradley Noviski  
Vice President



54 Echo Lane, Unit #1  
Williston VT 05495  
802-658-0956  
Fax: 802-660-8904  
[www.chiptec.com](http://www.chiptec.com)

# CHIPTEC®

## WOOD ENERGY SYSTEMS

---

Tuesday, March 13, 2007

Exhibit B

Eric Knutzen  
Green Energy Hawaii  
4313 Kapuna Rd  
Kilauea, Hawaii ,96754

Re: Fuel Specifications

Aloha Eric,

Upon careful review all of the information and comments regarding the fuel specifications for the project, the following shall be the fuel specifications that Chiptec will design the gasification system to operate with. These specifications are for the gasifier and related systems.

### **Gasifier Fuel Specification:**

1. The gasification system is designed to utilize clean Albizia & Eucalyptus wood fuel that has a moisture content of up to 50% or less (calculated on wet basis). The fuel particle size shall be in the range of 1/8" x 1/8" x 1/8" thick to a maximum size of 2-1/2" x 2-1/2" x 3/4" thick.
2. The gasifier and boiler design is based upon a fuel analysis for Albizia wood chips dated 12/8/05, 12/27/06 and Eucalyptus wood chips dated 7/7/06. The fuel may have up to 10% plus or minus variation from the values reported on the lab reports dated 12/8/05, 12/27/06 and 7/7/06. The fuel shall not contain non-combustible material such as dirt, rocks and contaminated fuel that contains, but not limited to paint, oils, salts, pressure treated material etc.
3. The gasifiers are designed with Albizia & Eucalyptus wood chips as the base fuels and therefore our performance guarantees are based upon using the Albizia & Eucalyptus feed stock. The gasifier can utilize other biomass fuel up to a certain percentage. Some of the fuels have considerably different moisture and mineral contents. Minerals are inert and will affect performance.
4. Any fuels other than Albizia or Eucalyptus proposed to be used as bio-fuel in Chiptec's equipment needs to be reviewed and agreed on in writing in advance of its introduction into the Chiptec equipment. High mineral and alkali content materials such as, but not limited to grasses, are not to be introduced into the Chiptec equipment

Please feel free to contact me if you have any questions.

Kindest regards



Bradley Noviski  
Vice President

Enclosure:

Hazen Research test for Albizia wood chips 12/8/05  
Hazen Research test for Albizia wood chips 12/27/06  
Hazen Research test for Albizia wood chips 7/7/06



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**Hazen Research, Inc.**  
 4601 Indiana Street  
 Golden, CO 80403 USA  
 Tel: (303) 279-4501  
 Fax: (303) 278-1528

Date December 8 2005  
 HRI Project 002-0G2  
 HRI Series No. K234/05  
 Date Rec'd. 11/22/05  
 Cust. P.O.# Pre-paid

Green Energy Hawaii  
 Eric Knutzen  
 4313 Kapuna Road  
 Kilauea, HI 96754

Sample Identification  
 Albizia Chips

Reporting Basis >	As Rec'd	Dry	Air Dry
-------------------	----------	-----	---------

Proximate (%)

Moisture	62.11	0.00	4.82
Ash	0.47	1.25	1.19
Volatile	11.97	31.59	30.07
Fixed C	25.45	67.16	63.92
Total	100.00	100.00	100.00

Sulfur	0.02	0.04	0.04
Btu/lb (HHV)	3139	8284	7885
MMF Btu/lb	3155	8398	
MAF Btu/lb		8389	
Air Dry Loss (%)		60.19	

Ultimate (%)

Moisture	62.11	0.00	4.82
Carbon	18.81	49.63	47.24
Hydrogen	1.97	5.19	4.94
Nitrogen	0.10	0.25	0.24
Sulfur	0.02	0.04	0.04
Ash	0.47	1.25	1.19
Oxygen*	16.52	43.64	41.53
Total	100.00	100.00	100.00

Chlorine**	0.021	0.056	0.053
------------	-------	-------	-------

Forms of Sulfur (as S,%)

Sulfate	_____	_____
Pyritic	_____	_____
Organic	_____	_____
Total	0.02	0.04

Lb. Alkali/MM Btu= 0.21  
 Lb. Ash/MM Btu= 1.51  
 Lb. SO2/MM Btu= 0.10  
 HGI= @ % Moisture  
 As Rec'd. Sp.Gr.=  
 Free Swelling Index=  
 F-Factor(dry), DSCF/MM BTU= 9,031

Report Prepared By?

Gerard H. Cunningham  
 Fuels Laboratory Supervisor

\* Oxygen by Difference.

\*\* Not usually reported as part of the ultimate analysis.



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Date December 8 2005  
HRI Project 002-0G2  
HRI Series No. K234/05  
Date Rec'd. 11/22/05  
Cust. P.O.# Pre-paid

Green Energy Hawaii  
Eric Knutzen  
4313 Kapuna Road  
Kilauea, HI 96754

Sample Identification:  
Albizia Chips

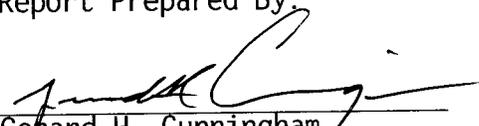
Elemental Analysis of Ash (%)

SI02	9.46
AL203	2.46
TI02	0.17
FE203	5.46
CA0	39.70
MGO	3.19
NA20	1.16
K20	12.50
P205	3.31
S03	0.23
CL	0.52
C02	<u>21.49</u>
Total	99.65

Ash Fusion Temperatures (Deg F)

	Oxidizing Atmosphere	Reducing Atmosphere
Initial	2642	2700+
Softening	2648	
Hemispherical	2650	
Fluid	2656	

Report Prepared By:

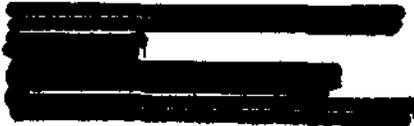
  
 Gerard H. Cunningham  
 Fuels Laboratory Supervisor

Note: The ash was calcined @ 1110 deg F (600 C) prior to analysis.



**Hazen Research, Inc.**  
 4601 Indiana Street  
 Golden, CO 80403 USA  
 Tel: (303) 279-4501  
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Date July 7 2007  
 HRI Project 002-QD8  
 HRI Series No. E430/06-2  
 Date Rec'd. 06/02/06  
 Cust. P.O.#



Sample Identification  
 Eucalyptus Gaudis  
 500' Elev. Location: O'Okala, HI

Reporting Basis >	As Rec'd	Dry	Air Dry
Proximate (%)			
Moisture	55.31	0.00	4.35
Ash	0.32	0.71	0.68
Volatile	38.14	85.35	81.64
Fixed C	6.23	13.94	13.33
Total	100.00	100.00	100.00
Sulfur	<0.01	0.01	0.01
Btu/lb (HHV)	3696	8271	7911
MMF Btu/lb	3708	8334	
MAF Btu/lb		8330	
Air Dry Loss (%)	53.28		

Ultimate (%)			
Moisture	55.31	0.00	4.35
Carbon	23.80	53.26	50.94
Hydrogen	2.67	5.98	5.72
Nitrogen	0.10	0.23	0.22
Sulfur	<0.01	0.01	0.01
Ash	0.32	0.71	0.68
Oxygen*	17.80	39.81	38.08
Total	100.00	100.00	100.00
Chlorine**	0.037	0.084	0.080

Forms of Sulfur (as S,%)		
Sulfate		
Pyritic		
Organic		
Total	<0.01	0.01

Lb. Alkali/MM Btu= 0.15  
 Lb. Ash/MM Btu= 0.86  
 Lb. SO2/MM Btu= 0.03  
 HGI= @ % Moisture  
 As Rec'd. Sp.Gr.=  
 Free Swelling Index=  
 F-Factor(dry), DSCF/MM BTU= 10,276

Water Soluble Alkalies (%)

Na2O  
 K2O

Report Prepared By:  
  
 Gerard H. Cunningham  
 Fuels Laboratory Supervisor

\* Oxygen by Difference.  
 \*\* Not usually reported as part of the ultimate analysis.



**Hazen Research, Inc.**

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Golden, CO 80403 USA  
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Date July 7 2007  
HRI Project 002-QD8  
HRI Series No. E430/06-2  
Date Rec'd. 06/02/06  
Cust. P.O.#

[REDACTED]

Sample Identification:  
Eucalyptus Graudis  
500' Elev.  
Location: O'Okala, HI

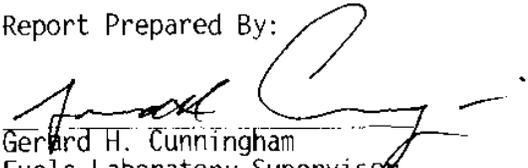
Elemental Analysis of Ash (%)

SiO2	8.88
Al2O3	1.98
TiO2	0.11
Fe2O3	1.57
CaO	31.20
MgO	4.85
Na2O	6.20
K2O	11.30
P2O5	9.42
SO3	1.50
CL	1.40
CO2	<u>14.86</u>
Total	93.27

Ash Fusion Temperatures (Deg F)

	Oxidizing Atmosphere	Reducing Atmosphere
Initial		
Softening		
Hemispherical		
Fluid		

Report Prepared By:

  
Gerald H. Cunningham  
Fuels Laboratory Supervisor

Note: The ash was calcined @ 1110 deg F (600 C) prior to analysis



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Date July 7 2007  
 HRI Project 002-QD8  
 HRI Series No. E430/06-3  
 Date Rec'd. 06/02/06  
 Cust. P.O.#

[Redacted]  
 [Redacted]  
 NW Thurman Street  
 [Redacted]

Sample Identification  
 Euc Gaudis 1500'  
 Location: O'OKala, HI

Reporting Basis >	As Rec'd	Dry	Air Dry
<b>Proximate (%)</b>			
Moisture	52.42	0.00	9.29
Ash	0.83	1.75	1.59
Volatile	39.20	82.39	74.74
Fixed C	7.55	15.86	14.38
Total	100.00	100.00	100.00
Sulfur	0.01	0.02	0.02
Btu/lb (HHV)	3906	8209	7447
MMF Btu/lb	3941	8367	
MAF Btu/lb		8356	
Air Dry Loss (%)	47.55		

<b>Ultimate (%)</b>			
Moisture	52.42	0.00	9.29
Carbon	24.14	50.74	46.03
Hydrogen	2.46	5.17	4.69
Nitrogen	0.24	0.50	0.45
Sulfur	0.01	0.02	0.02
Ash	0.83	1.75	1.59
Oxygen*	19.90	41.82	37.93
Total	100.00	100.00	100.00
Chlorine**	0.045	0.094	0.085

**Forms of Sulfur (as S,%)**

Sulfate		
Pyritic		
Organic		
Total	0.01	0.02

Lb. Alkali/MM Btu= 0.29  
 Lb. Ash/MM Btu= 2.14  
 Lb. SO2/MM Btu= 0.05  
 HGI= @ % Moisture  
 As Rec'd. Sp.Gr.=  
 Free Swelling Index=  
 F-Factor(dry), DSCF/MM BTU= 9,417

**Water Soluble Alkalies (%)**

Na2O  
 K2O

Report Prepared By:  
  
 Gerard H. Cunningham  
 Fuels Laboratory Supervisor

\* Oxygen by Difference.  
 \*\* Not usually reported as part of the ultimate analysis.



**Hazen Research, Inc.**

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Golden, CO 80403 USA  
Tel: (303) 279-4501  
Fax: (303) 278 1528

Date July 7 2007  
HRI Project 002-QD8  
HRI Series No. E430/06-3  
Date Rec'd. 06/02/06  
Cust. P.O.#



Sample Identification:  
Euc Gaudis 1500'  
Location: O'Okala, HI

Elemental Analysis of Ash (%)

SiO2	5.45
Al2O3	1.48
TiO2	0.20
Fe2O3	2.03
CaO	42.50
MgO	3.39
Na2O	3.62
K2O	9.77
P2O5	7.65
S03	1.53
CL	1.32
CO2	<u>11.70</u>
Total	90.64

Ash Fusion Temperatures (Deg F)

	Oxidizing	Reducing
	Atmosphere	Atmosphere
Initial		
Softening		
Hemispherical		
Fluid		

Report Prepared By:

Gerard H. Cunningham  
Fuels Laboratory Supervisor

Note: The ash was calcined @ 1110 deg F (600 C) prior to analysis

Project: **Green Energy Hawaii**  
 Test Type: **Boiler Combustion Performance Analysis**

Unit:  
 Test Date:

Run Number	Process Parameters	
Test Date	Steam Production (lbs/hr)	40,000
Start-End	Electrical Output (kwh)	
Comment	Steam Heat Content	
100% Load		
Fuel Flow Rates		Calculated Exhaust Gas Flow Rates
gallons/minute	wacfm	18,947
lbs/hr as fired	dscfm	10,332
8,515	lbs/hr	54,965
5,886		
MMbtu/hr		
50.00		
Calculated Efficiencies		Calculated Stack Gas Parameters
Heat Rate (btu/kwh)	H2O, %	16.11%
Boiler Efficiency	O2, %	6.00%
	CO2, %	15.16%
Stack Temp (F)	Excess Air, %	40.40%
340	Mol Wt (wet)	28.68

Run:				
Emission Rates	As Measured %	Corrected to Ref O2 %	Mass Rate lbs/hr	Mass Rate lbs/MMbtu
O2	6.00%	3.00%		
CO2	15.16%			
	ppm	ppm		
NMHC, as CH4	49.50	59.43	1.277	0.0255
CH4				
THC, as CH4	75.50	90.65	1.95	0.0390
CO	222.00	266.55	10.00	0.2000
NOx	169.00	202.91	12.50	0.2500
SOx	48.55	58.29	5.00	0.1000
TSP			1.28	0.0256
PM10			1.28	0.0256

Fuel Analysis for: <b>Albezia wood</b>												Run:
Date	Load	ID No.	BTU/lb HHV	BTU/gal HHV	Ash	Moisture	% C	% H	% N	% O	% S	Total
analysis			5,872		0.88%	30.00%	34.10%	3.57%	1.03%	29.99%	0.03%	99.59%
												0.00%
												0.00%
												0.00%
	AVG		5,872		0.88%	30.00%	34.10%	3.57%	1.03%	29.99%	0.03%	99.59%
Normalized			8,495		1.25%		49.63%	5.19%	1.50%	43.64%	0.04%	100.00%
Normalized, Dry			7722.51									

**Attachment 5: Response 12**  
**March 2007 ESP Performance Specification**

## **14.0 POLLUTION CONTROL EQUIPMENT**

### **14.1 System Concept**

14.1.1 The emissions from the plant will be treated using a two step process. Particulates will be removed at the discharge of each of the two (2) boilers using dedicated multi-cyclone dust collectors (MDC) to remove the larger particles and as a pre-treatment to the single electrostatic precipitator (ESP) designed for the plant. The emissions rate from the MDC will be a maximum .20 lbs/MMBTU. The ash from the multi-cyclones will be deposited in steel tipping dumpsters employing drop chutes into the dumpsters. The emissions will be final treated with the ESP to achieve a final plant maximum emission rate of .025 lbs/MMBTU. Ash from the ESP will be collected via drop chutes into tipping dumpsters. The ash will then be used for local agricultural needs as a natural fertilizer. The MDC will be supplied by Chiptech. The ESP will be supplied by others.

### **14.2 Multi Cyclone Dust Collector (By Chiptech)**

- 14.2.1 Two (2) Multi-cyclone fly-ash particulate collector with a guaranteed emission rate of 0.2lbs./MMBTU.
- 14.2.2 Collection efficiency of 20- 25%
- 14.2.3 One (1) Rotary air lock for each multi-cyclone
- 14.2.4 Support stand
- 14.2.5 Four (4) steel tip dumpster
- 14.2.6 Drop chute connection to each tipping dumpster
- 14.2.7 Ash wetting system and conveyance system to provide continuous, uniform wetting

### **14.3 Electrostatic Precipitator**

- 14.3.1 Collecting plates constructed from solid rolled steel sheets not less than 18 gauge, adequately stiffened and baffled to give quiet gas areas at the surface of the plate to minimize re-entrainment.
- 14.3.2 The plates will be designed for a maximum temperature excursion to 800F.
- 14.3.3 Electromagnetic uplift-gravity impact rappers will be provided
- 14.3.4 Rigid electrodes will be provided and they will be fabricated from 16 gauge seamless tubing with uniformly spaced corona studs welded to the tubing. The electrodes will be stabilized and supported to maintain alignment at all temperature ranges of the precipitator's operation.
- 14.3.5 Each discharge electrode frame will be vibrated individually and the system will be designed such that both duration and frequency of vibration can be varied.
- 14.3.6 Two step-up transformers/rectifiers will be provided with the precipitator. Each set will be an outdoor type, oil insulated, self-air cooled unit with full-wave rectifiers. The transformer and rectifiers will be in the same tank. The transformer will be provided with a grounding switch and a key interlock. Each set will be rated for temperature rise of 45°C (at a maximum ambient of 50°C).
- 14.3.7 The high tension support insulators will be of the cylindrical, compression load type. The insulators will be porcelain, glazed inside and outside and will have ground ends. The insulators will be located out of the gas treatment area, and will be kept clean by purge air.

- 14.3.8 The precipitator will be furnished with key type safety interlocks with a sequential key arrangement to prevent access to any high voltage equipment without locking out the power supply and grounding the high voltage equipment. The following equipment will be interlocked: all quick opening precipitator access doors, transformer/rectifier ground switches and high voltage control unit circuit breakers.
- 14.3.9 Welded weatherproof individual insulator compartments will be provided to house insulators. The insulator compartments will be accessible by access doors with safety interlocks to prevent access to all high voltage areas except when the precipitator is de-energized and grounded.
- 14.3.10 The electrostatic precipitator shell will be fabricated from 3/16" thick ASTM A-36 steel plate with external ASTM A-36 structural stiffeners as required to support the electrostatic precipitator pressure, wind, live, and dead loads. The shell will be seal welded to form a totally gas tight structure.
- 14.3.11 The precipitator will be equipped with two transverse trough type hoppers. Each hopper will be fabricated from 3/16" ASTM A-36 steel plate, and supported with ASTM A-36 external structural shapes as required to support the hopper loads. Each hopper will be designed to support its weight when full of particulate. Particulate density is 65 lb/cu.ft. for structural sizing and 45 lb/cu.ft. for hopper capacity sizing. In addition, the hoppers will be of sufficient capacity to store particulate collected over a minimum period of 12 operating hours. The sides will be sloped to provide a minimum hopper wall angle of 60° from the horizontal. The end angle will be adjusted to insure a minimum hopper valley angle of 55°. The discharge opening will be 18" wide x 6'-0". Each hopper will be equipped with the following accessories.
- Each hopper will have a quick opening, key interlocked access door and a three (3) inch diameter poke hole.
  - A vibrator pad will be provided on one side of each hopper. The pad will be drilled to accommodate a vibrator for future mounting by purchaser if required to enhance dust removal.
- 14.3.12 The precipitator will include all structural steel with self-lubricating slide plates between the precipitator and support structure. The structural steel will be designed to provide for 8' - 0" clearance between the hopper discharge and grade.
- 14.3.13 The precipitator will be equipped with flanged inlet and outlet nozzles. The nozzles will be fabricated from externally stiffened 3/16" thick ASTM A-36 steel plate. The inlet nozzle will be a horizontal entry pyramid type with the bottom angle of the nozzle 45° from the horizontal. The inlet nozzle will include three flow distribution screens to assure uniform flow through the precipitator. No access is required.
- 14.3.14 Provide a vertical discharge "box" style outlet nozzle. The outlet nozzle will include a flow distribution device as required to assure uniform flow through the electrostatic precipitator. The nozzle will have a stub stack adapter for connection of the nozzle to the stub stack. No access is required.

#### **14.4 Stack and CEMS Platform**

- 14.4.1 A stub stack will be provided for attachment to the outlet nozzle. The stack discharge elevation will be approximately 75'-0" above the grade level. The stack will be rolled from

3/16" thick ASTM A-36 steel plate to an inside diameter of 4'-6". The stack will be stiffened as required for wind loads. The stack will include EPA test ports. A stack adapter will be provided for connecting the stack to the precipitator outlet nozzle. All external surfaces of the stack and the stack adapter will be painted with high temperature black paint.

14.4.2 Provide a permanent 180° testing platform (with hand railing) attached to the stack. Also, included is a caged ladder from the roof of the electrostatic precipitator to the platform. The platform will have galvanized grating. All access surfaces except the grating will be painted with one coat of primer and one coat of safety yellow enamel.

14.4.3 Factory installed hand railing with kick plate around the perimeter of the roof of the precipitator. Handrails and vertical posts will be 2" square tubing. Access openings to the hopper, roof and high voltage compartments will be 24" diameter. All access openings will be equipped with quick opening, hinged steel doors and gas tight seals. A safety key interlock system and high voltage warning signs will be provided for all quick opening access doors. All access doors will be easily accessible from walkways except those on the hopper.

## **14.5 Insulation**

14.5.1 Provide factory insulation of the electrostatic precipitator roof. The precipitator roof will be insulated with 6" of 8# density mineral wool plus 2" of fiberglass insulation over the stiffeners and then covered with ¼" checkered plate.

## **14.6 Painting**

14.6.1 Provide painting of the structural supports, access, insulator compartments, handrails and roof exterior with one coat of red primer and one coat of medium black enamel finish paint. All hot metal surfaces that will be exposed after the field insulation is completed will be painted with high temperature black paint. All stack ladders, stack platforms (including supports) and railings will be finish painted with safety yellow enamel.

## **14.7 Precipitator Controls**

14.7.1 A NEMA 4 precipitator control/distribution enclosure will be mounted on the roof. This panel will house the main circuit breaker, distribution bus, individual circuit breakers and the required distribution wiring. The panel will also provide collecting plate rapper controls, discharge electrode vibrator controls and purge air blower controls.

14.7.2 Provide a NEMA 4 microprocessor type high voltage control enclosure mounted on the side of each roof mounted transformer/rectifier. All components will be accessible through a hinged front door. The voltage controls will be completely automatic with auxiliary manual control. Both manual and automatic systems will provide full range control. Arc suppression will be provided by a current limiting device to reduce the voltage when a spark over condition exists in the precipitator. The controllers will be rated for a maximum ambient of 40°C. All enclosures will be constructed of 12 gauge steel and painted with ASA 61 gray enamel.

14.7.3 Provide a remote graphics voltage controller (GVC) for each transformer/rectifier. Each GVC controller will be mounted in a remote control panel. The standard size of the remote

panel for a two field electrostatic precipitator is 24" wide x 24" high x 8" deep. Three field electrostatic precipitators are six additional inches high. Other sizes may be required depending on the options selected.

- 14.7.4 The graphics controller provides bar graph and digital read outs of primary and secondary voltages and currents, as well as kW, spark rate, SCR conduction angle and the status of the T/R. This remote panel is to be mounted in the customers control room. Alarms will be provided on the GVC control unit for AC overcurrent, T/R over temperature, SCR high temperature, SCR imbalance, loss of memory, DC undervoltage and DC overvoltage. A main menu is provided to select functions for operation and troubleshooting. The graphics controller display is 16 lines x 40 characters wide. The unit can produce V/I curves, 24 hour trend plots, and 30 minute trend plots. The operator can remotely set all precipitator parameters such as setback, rise rate, current limit, etc. On line help text is available for making all adjustments.
- 14.7.5 Each controller will also have three indicator lights next to each GVC. These lights are for Control On, HV On, and Alarm.

#### **14.8 Continuous Emissions Monitoring System (CEMS)**

- 14.8.1 A Continuous Emissions Monitoring System (CEMS) and a Data Acquisition System (DAS) shall be provided and must be certifiable under all Federal, State and Local regulations as specified in the site emission permit. The system must monitor and report all regulated stack emissions, perform automatic calibration and alert plant personal in the event of pending violation. Provide complete system including stack sensors, interface panel, panel mounted devices all software, programming and wiring.

#### **14.9 Performance and Testing Guarantee**

- 14.9.1 Particulate-The proposed equipment, when operating at design conditions, is guaranteed to emit not more than 0.025 lbs. of particulate per MMBTU or to remove 95% by weight of the inlet particulate load. If the inlet particulate load is greater than the design conditions the efficiency of 95% is guaranteed; if it is equal or less than the design conditions a residual of 0.025 lbs. of particulate per MMBTU is guaranteed.
- 14.9.2 Opacity- Manufacturer to guarantee the one hour average opacity of the flue gas when operating at design conditions to be less than 10%. The opacity shall be determined by a certified smoke reader or certified opacity monitor.
- 14.9.3 Qualifications-The particulate sampling method will be the U.S. Environmental Protection Agency Method No. 5. Particulates are defined as solids at the precipitator operating conditions that can be collected. Condensibles are not included. A series of three consecutive tests shall be performed. If the average emissions from three acceptable tests are equal to or below the guarantee level then the unit has fulfilled the performance guarantee. The performance guarantee is not valid unless precipitator is insulated.
- 14.9.4 Test Period: The unit must be tested within 30 days after initial operation or 120 days after the final truck shipment to a U.S. port; whichever occurs first. If the unit is not tested within this time period, it shall be considered as accepted.

## **14.10 Piping and Breeching System**

14.10.1 Piping system shall be Sch. 40 carbon steel

14.10.2 Assembly shall be welded above 2" diameter

14.10.3 Assembly shall be threaded or socket welded 2" and below

14.10.4 Mating flanges shall be provided at equipment flanges

14.10.5 Valves/ flanges shall be CL.150

14.10.5 Breeching shall be 3/16" thk. carbon steel plate, insulated with high temperature covering.

**\*END OF SECTION\***

**Attachment 6: Response 13a**  
**Impacts Analysis for Noncarcinogenic HAPs**

**Maximum 8-hour Impacts, Noncarcinogens**

Pollutant/Data Source	HAP?	8-Hr Avg Ref. Exposure Level (ug/m3)	Maximum 8-hr Unit Impact (3) (ug/m3 per g/s)	Maximum Emission Rate, lb/hr	Maximum Emission Rate, g/s	Maximum 8-hr Concentration (ug/m3)	1/100th of TLV-TWA (ug/m3)	Exceeds 1/100th of TLV-TWA?
Sulfuric Acid Mist (1,4)	no	1,000	34.02	1.0	0.126	4.29	10	no
Fluorides (1)	no	25,000	34.02	--	--	--	250	n/a
Acetaldehyde (2)	yes	200,000	34.02	0.083	0.0105	0.356	2000	no
Acrolein (2)	yes	230	34.02	0.4	0.0504	1.715	2.3	no
Benzene (1)	yes	1,600	34.02	0.42	0.0529	1.800	16	no
1,3-Butadiene (1)	yes	4,400	34.02	--	--	--	44	n/a
Formaldehyde (2)	yes	17,000	34.02	0.44	0.055	1.886	170	no
Naphthalene (1)	yes	52,000	34.02	9.70E-03	1.22E-03	0.042	520	no
Toluene (1)	yes	188,000	34.02	4.60E-02	5.80E-03	0.197	1880	no
Xylene (1)	yes	434,000	34.02	1.25E-03	1.58E-04	0.005	4340	no
Antimony (1)	yes	500	34.02	1.25E-03	1.58E-04	0.005	5	no
Arsenic (1)	yes	10	34.02	1.10E-03	1.39E-04	0.005	0.1	no
Beryllium (1)	yes	0.20	34.02	6.00E-05	7.56E-06	0.000	0.002	no
Cadmium (1)	yes	10.0	34.02	2.10E-04	2.65E-05	0.001	0.1	no
Cobalt (2)	yes	20.0	34.02	3.30E-04	4.16E-05	0.001	0.2	no
Lead (1)	yes	50	34.02	2.40E-03	3.02E-04	0.010	0.5	no
Manganese (1)	yes	200	34.02	8.00E-02	1.01E-02	0.343	2	no
Nickel (1)	yes	200	34.02	1.65E-03	2.08E-04	0.007	2	no
Polycyclic Organic Matter (1)	yes	200	34.02	1.50E-04	1.89E-05	0.001	2	no
Selenium (1)	yes	200	34.02	1.40E-04	1.76E-05	0.001	2	no

**Notes**

1. TLV-TWA obtained from "2006 TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," ACGH Worldwide.
2. When Ref 1 listed no TLV-TWA, 8-hour exposure limits were obtained from <http://www.epa.gov/ttn/atw/toxsource/table2.pdf>: "Table 2. Acute Dose-Response Values for Screening Risk Assessments (6/12/2007)."
3. Unit impact based on full load operation of both boilers.
4. Assume 10% of sulfur in fuel converts to H2SO4.

### Maximum Annual Impacts, Noncarcinogens

Pollutant	HAP?	8-Hr Avg Ref. Exposure Level (ug/m3)	Maximum Annual Unit Impact (2) (ug/m3 per g/s)	Maximum Emission Rate, lb/hr	Maximum Emission Rate, g/s	Maximum Annual Concentration (ug/m3)	1/420th of TLV-TWA (ug/m3)	Exceeds 1/420th of TLV-TWA?
Sulfuric Acid Mist (1,4)	no	1,000	7.73	1.0	0.126	0.97	2.38	no
Fluorides (1)	no	25,000	7.73	--	--	--	59.52	n/a
Acetaldehyde (2)	yes	200,000	7.73	0.083	0.010458	0.081	476.2	no
Acrolein (2)	yes	230	7.73	0.4	0.0504	0.390	0.548	no
Benzene (1)	yes	1,600	7.73	0.42	0.05292	0.409	3.81	no
1,3-Butadiene (1)	yes	4,400	7.73	--	--	--	10.48	n/a
Formaldehyde (2)	yes	17,000	7.73	0.44	0.05544	0.429	40.476	no
Naphthalene (1)	yes	52,000	7.73	0.0097	0.0012222	0.009	123.81	no
Toluene (1)	yes	188,000	7.73	0.046	0.005796	0.045	447.62	no
Xylene (1)	yes	434,000	7.73	0.00125	0.0001575	0.001	1,033.3	no
Antimony (1)	yes	500	7.73	0.00125	0.0001575	0.001	1.190	no
Arsenic (1)	yes	10	7.73	0.0011	0.0001386	0.001	0.024	no
Beryllium (1)	yes	0.20	7.73	0.00006	7.56E-06	0.000	0.000	no
Cadmium (1)	yes	10.0	7.73	0.00021	2.646E-05	0.000	0.024	no
Cobalt (2)	yes	20.0	7.73	0.00033	4.158E-05	0.000	0.048	no
Lead (1)	yes	50	7.73	0.0024	0.0003024	0.002	0.119	no
Manganese (1)	yes	200	7.73	0.08	0.01008	0.078	0.48	no
Nickel (1)	yes	200	7.73	0.00165	0.0002079	0.002	0.476	no
Polycyclic Organic Matter (1)	yes	200	7.73	0.00015	0.0000189	0.000	0.476	no
Selenium (1)	yes	200	7.73	0.00014	1.764E-05	0.000	0.476	no

#### Notes

1. TLV-TWA obtained from "2006 TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," ACGH Worldwide.
2. When Ref 1 listed no TLV-TWA, 8-hour exposure limits were obtained from <http://www.epa.gov/ttn/atw/toxsource/table2.pdf>: "Table 2. Acute Dose-Response Values for Screening Risk Assessments (6/12/2007)."
3. Unit impact based on full load operation of both boilers.
4. Assume 10% of sulfur in fuel converts to H2SO4.

**Attachment 7: Response 13b**  
**Impact Analysis for Carcinogenic HAPs**

**EPA Region IX AIR-PRG Risk Calculation**

<b>Pollutant</b>	<b>Maximum Annual Unit Impact (1) (ug/m3 per g/s)</b>	<b>Maximum Emission Rate, lb/hr</b>	<b>Maximum Emission Rate, g/s</b>	<b>Maximum Annual Concentration (ug/m3)</b>	<b>EPA Region IX AIR_PRG (ug/m3)</b>	<b>EPA Region IX AIR_PRG Cancer Risk</b>
Acetaldehyde	7.73	0.083	0.010458	0.081	8.7E-01	9.292E-08
Benzene	7.73	0.42	0.05292	0.409	2.3E-01	1.779E-06
1,3-Butadiene	7.73	--	--	--	6.9E-03	--
Formaldehyde	7.73	0.44	0.05544	0.429	1.5E-01	2.857E-06
Naphthalene	7.73	0.0097	0.0012222	0.009	3.1E+00	3.048E-09
Arsenic	7.73	0.0011	0.0001386	0.001	4.5E-04	2.381E-06
Beryllium	7.73	0.00006	0.00000756	0.000	8.0E-04	7.305E-08
Cadmium	7.73	0.00021	0.00002646	0.000	1.1E-03	1.859E-07
Lead	7.73	0.0024	0.0003024	0.002	n/a	--
Nickel	7.73	0.00165	0.0002079	0.002	8.0E-03	2.009E-07
Polycyclic Organic Matter	7.73	0.00015	0.0000189	0.000	9.2E-04	1.588E-07
<b>Total</b>						<b>7.731E-06</b>

Notes

1. Unit impact based on full load operation of both boilers.



**Appendix D**  
**Letters of Support**





Bryan J. Baptiste  
Mayor

Beth A. Tokioka  
Director

**Office of Economic Development**  
County of Kauai  
4444 Rice Street, Suite 200  
Lihue, HI 96766  
(808) 241-6390 Tel \* (808) 241-6399 Fax

June 15, 2007

To Whom It May Concern:

Please allow me to express my support for Hawaiian Mahogany and its partnership with Green Energy on a bio-mass to energy project for Kaua'i. When complete, this project will supply renewable energy to Kaua'i Island Utility Cooperative, benefiting all residents of Kaua'i.

Bill Cowern, principal of Hawaiian Mahogany, is one of Kauai's outstanding citizens. His commitment to the preservation of our agricultural land through agro-forestry is a model for the rest of the state and our nation. He has hosted visits to his property for staff from the offices of U.S. Senators Daniel Akaka and Daniel Inouye and Congressman Neil Abercrombie, along with Congressman Collin Peterson, Chairman of the House Agriculture Committee. Bill is a responsible steward of our agricultural land and a leader in the search for sustainable solutions to the energy challenges facing Kauai.

Mahalo,

Beth Tokioka



## The Senate

STATE CAPITOL  
HONOLULU, HAWAII 96813

June 28, 2007

Mr. Eric Knutzen  
Green Energy Hawaii, LLC  
4313 Kapuna Road  
Kilauea, HI 96754

Subject: May 15, 2007 Meeting

Dear Mr. Knutzen,

Thank you for inviting me recently to meet with you and review the Green Energy LLC renewable energy project you are currently developing on Kaua'i.

After reviewing the material provided and discussing the project with my colleagues that are familiar with both the technology and the owners involved, I want to offer you my enthusiastic and personal support.

As you are well aware, our communities dependence of the importation of fossil fuel to generate electricity is fraught with negative implications and your project represents a significant step in helping us move down the renewable energy path.

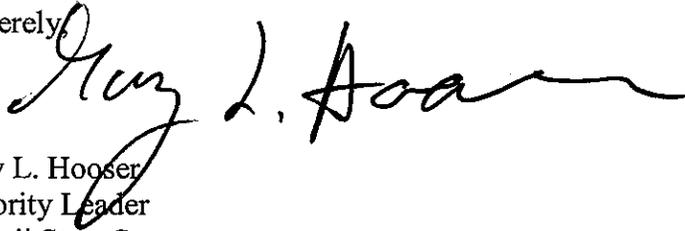
It is my hope that this endeavor will move swiftly through the necessary permitting process and be constructed and in operation at the earliest time possible. While I do not support the cutting of corners when it comes to the public review process, I am hopeful that County, State and Federal regulators whom might be involved - recognize the immediate and significant value that this project brings to our community and do what they can to facilitate an expeditious, yet thorough process.

Please, keep me posted as to the progress of Green Energy LLC Kauai's developments, as well as other projects that you might be pursuing around our state.

Mr Eric Knutzen  
Green Energy Hawai'i, LLC  
June 28, 2007  
Page 2

Please also do not hesitate to request my assistance should there be appropriate ways in which I might be able to assist you and your company in moving our community forward toward a more sustainable and renewable future.

Sincerely,

A handwritten signature in black ink, appearing to read "Gary L. Hooser". The signature is fluid and cursive, with a long horizontal stroke at the end.

Gary L. Hooser  
Majority Leader  
Hawaii State Senate  
7<sup>th</sup> Senatorial District – Kaua'i & Ni'ihau

GLH:mm



## HOUSE OF REPRESENTATIVES

STATE OF HAWAII  
STATE CAPITOL  
HONOLULU, HAWAII 96813

July 9, 2007

Mr. Eric Knutzen  
Green Energy Hawaii, LLC  
4313 Kapuna Road  
Kilauea, Hawaii 96754

Dear Mr. Knutzen:

I am pleased to write this letter of support for Green Energy Hawaii's renewable energy project. I understand that you are going through the critical planning and permitting process at the State and County levels. From a Kauai legislator's perspective, I believe it is extremely important to assist and foster renewable energy projects such as yours in order to prepare for Hawaii's environmental future.

I appreciated the opportunity to learn about the project, and this is what struck me most:

- The people of Kauai have experienced a significant increase in electricity costs for the past decade, driven by the rising price of crude oil on the international market. Green Energy Hawaii expects that the renewable energy project, through your association with the Kauai Island Utility Cooperative (KIUC), will result in significant savings for Kauai residents, and that the price of energy produced will be less than energy produced by fossil fuels.
- New jobs will be created on Kauai in both the energy plant operations and within the agriculture industry.
- Green Energy Hawaii is utilizing world class, cutting edge technology, specifically the "Gasification/Thermal Oxidation" technology. This technology will be beneficial to Kauai's environment in that it is carbon neutral.
- Finally, Green Energy Hawaii has demonstrated a commitment to developing the renewable energy project over the past four years, completing your environmental assessment, site purchase, air permitting, and conceptual design.

As it appears that this project will benefit the people of Kauai, as well as the State of Hawaii, both economically and environmentally, I want to extend my assistance and support going forward. We must all commit to reducing global warming for the sake of future generations, and Green Energy Hawaii will be an important part of this effort.

With Warmest Aloha,

Roland D. Sagum, III  
State Representative, District 16

**Representative Roland D. Sagum, III**  
*District 16: Niihau, Lehua, Koloa & Waimea*  
State Capitol, Room 426 – Honolulu, Hawaii 96813  
Phone: 586-6280 – Fax: 586-6281  
E-Mail: [repsagum@capitol.hawaii.gov](mailto:repsagum@capitol.hawaii.gov)



## HOUSE OF REPRESENTATIVES

STATE OF HAWAII  
STATE CAPITOL  
HONOLULU, HAWAII 96813

August 22, 2007

### **An Open Letter of Support of Green Energy to Benefit the People of Kaua'i.**

We are all faced with uncomfortable findings recently documented by the world's most respected environmental scientists in the spring of 2007 regarding global warming. Given our physical location here in Hawai'i, we are especially at risk for potential negative effects. What are we to collectively do to address this?

The answer to this is complex. Perhaps one of the most promising sustainability projects found on Kaua'i regards the renewable energy project being pursued by a local Kaua'i firm called Green Energy Hawaii LLC, through its wholly owned subsidiary Green Energy Team LLC (Green Energy). I've met with Green Energy's representatives, and found that after four years of development, Green Energy has reached an agreement with the utility on Kaua'i – KIUC, regarding the supply of approximately 12% of Kauai's electricity needs with renewable energy. Green Energy has identified state-of-the-art technology called "gasification / thermal oxidation", to convert agricultural wood waste into electricity, purchased a plant site, entered a joint venture with another Kaua'i firm called Hawaiian Mahogany - for feedstock supply, and fully developed the conceptual design of the plant.

The success of this project is important for all of us here on Kaua'i. It brings with it:

- Economic relief going forward on our electricity bills which are constantly being "fossil fuel adjusted" – upwardly
- It guarantees open space for the thousands of acres of planted trees
- Provides 39 agriculture related jobs
- Benefits the environment by providing a carbon neutral solution, without contributing to global warming
- Avoids the importation to Kaua'i of diesel by approximately 3,000,000 gallons per year, without having to send our utility's money overseas for such fossil fuel, economically benefiting Kaua'i

However, we must recognize that Green Energy has many challenges ahead of it to bring this vision of renewable energy to fruition to benefit literally everyone on Kaua'i. Some of the challenges include moving through the complex permitting process, as well as leasing an additional 2,000 acres of land to grow trees as feedstock - which DLNR is currently reviewing.

As such, please find this letter in strong support of the project. I would encourage you to also do what you can to prioritize and foster the success of the project.

Aloha,

REPRESENTATIVE JAMES KUNANE TOKIOKA

Kahili Farm LLC  
P.O. Box 670  
Koloa, HI. 96756

October 31, 2006

Mr. Eric Knutzen  
Green Energy Team LLC  
4313 Kapuna Road  
Kilauea, HI 96754

Re: Letter of Support. Neighboring Parcel Owner

Our Kahili Farm LLC membership voted to support your interest in developing your Biomass plant site based on the representations summarized below.

It is our understanding, that your proposed Biomass energy plant at approximately 8.5 net MW of production, will be converting wood chips and other organic feedstock sourced by Bill Cowern of Hawaiian Mahogany to sustainable electric energy. This is acceptable to us as long as there are no fossil fuels or solid wastes used as alternative fuels in the future. We believe that the emission profile would change with different fuels used in your proposed system.

We are pleased that you are committed to a state of the art wood boiler designed by Chiptec. It gives us more peace of mind knowing that Chiptec's systems have been installed next to hospitals and schools. One of our main concerns is the Particulate Matter emission that you have noted is approximately 0.21 lbs. to 0.25 lbs. of particulate, which varies depending on the moisture content of the Albiza, for every ton of Albiza chips that is gasified. You estimated 300 tons of material would be burned per day. We trust that your EAS will demonstrate that there are no potentially damaging health effects to families living on or near our property.

There were also concerns about traffic, noise, and dust from the operation. We understand from Bill Cowern, that the vehicles that will bring in trees and other biomass material will not use the road adjacent to Kahili Farm CPR Unit B. This is the road that currently has an electric security gate at the entrance and serves three homes at the present plus one of Bill Cowern's farm buildings.

To alleviate our concerns about noise, it is our understanding you intend to reduce sound waves from the daily operations, which include chipping logs, by building earth berms and planting trees sufficient to block out any noise impact to

our homes in the area. It is also our understanding that trees harvested in the area between our homes and the Biomass plant, will be strategically harvested to maintain a continual noise buffer.

Again, we want to express our appreciation that GET is willing to propose locating your Biomass plant at the location we visited which is near the north east corner of TMK: (4) 2-7-001-001, as indicated by the aerial photo.

In summary, our membership voted to support your interest in developing your site with the representations from (GET).

We are excited if your project can be a successful example to Kauai residents of how to live responsibly with abundant energy. We all believe it is a good idea to have a renewable energy plants on Kauai.

Thank you again for your time.

Sincerely yours.



Bob White

Member of Kahili Farm LLC



## Kahili Adventist School

Hawaiian Mission Academy - Kahili Campus  
P.O. Box 480, Lawai, Hawaii 96765

Telephone (808) 742-9294  
Fax (808) 742-6628

August 14, 2007

To Whom It May Concern:

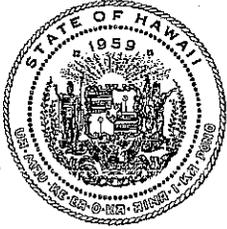
It was my pleasure to meet with Mr. Eric Knutzen and to hear his vision of what the mission of Green Energy Hawaii is and how this project will positively affect the lives of the residents of Kauai.

Not only are the partners of Green Energy Hawaii interested in lowering the cost of energy on the Island of Kauai through natural resources that protect our environment, but they have also dedicated themselves to the education of our young people in order to help insure that our natural resources will continue to be protected through future generations. Since we strongly believe that the young people of today are the leaders of tomorrow, it is imperative that we educate our students on the importance of being environmentally responsible. Green Energy Hawaii has accepted this challenge by purposefully building into their proposal a way for this education to happen.

We are looking forward to watching the progress of this innovative company and are excited to see what the future holds for Kauai when we all work together for the greater good of all.

Sincerely,

Wanda Lee  
Principal



## DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

LINDA LINGLE  
GOVERNOR  
THEODORE E. LIU  
DIRECTOR  
MARK K. ANDERSON  
DEPUTY DIRECTOR

STRATEGIC INDUSTRIES DIVISION  
235 S. Beretania Street, 5th Floor, Honolulu, Hawaii 96813  
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Tel.: (808) 587-3812  
Fax: (808) 586-2536

June 19, 2007

The Honorable Allan Smith  
Chairperson  
And Members  
State of Hawaii  
Board of Land and Natural Resources  
P. O. Box 621  
Honolulu, Hawaii 96809

Dear Chairperson Smith and Members:

This is to express our support of a 6.4 MW bioenergy project being planned for development on the Island of Kauai by Green Energy Hawaii, LLC.

We understand that, earlier this year, Green Energy Hawaii, LLC, a Kauai based firm, was awarded a power purchase agreement (PPA) by Kauai Island Utility Cooperative (KIUC). This PPA was the result of KIUC's selection of Green Energy Hawaii's project proposal in response to the utility's competitive request for renewable energy project proposals.

KIUC, and other Hawaii energy utilities, must comply with the State's Renewable Portfolio Standards (RPS) law, Chapter 269, Hawaii Revised Statutes. Hawaii's RPS law requires at least 20% of net electricity sales be provided by renewable energy by the year 2020. As you know, this is a high priority Administration energy initiative, aimed at increasing Hawaii's energy and economic security by achieving significant reductions of the State's use of imported fossil fuels, particularly petroleum, due to its high and volatile prices.

We understand that Green Energy Hawaii plans to develop a "closed loop" biomass to energy system; a system using only woodchips and other biomass materials for fuel from locally grown, dedicated tree crops, such crops to be continually re-cultivated. Hawaiian Mahogany, another Kauai company, has planted over 600,000 eucalyptus and albizia trees, a combination of species, which reduces the need for chemical fertilizers and produces high-quality, cabinet grade lumber, has partnered with Green Energy Hawaii to provide the necessary biomass for electricity production. According to KIUC, Green Energy Hawaii will use targeted gasification/thermal oxidation biomass to energy technology for its planned power production facility.

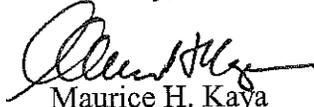
We understand that Green Energy Hawaii has petitioned the Board to lease approximately 2,000 acres of State land in conjunction with its need to sustain a dedicated supply of biomass for its renewable energy power production facility. Based on our understanding of the company's

technology and KIUC's technical evaluation and competitive selection of the project prior to execution of the PPA, we believe that Green Energy Hawaii's biomass to energy project is consistent with State energy and economic development policy objectives. We also believe that acquisition of the lease of State lands could contribute to the cost effectiveness of project development and ultimate renewable energy production.

Therefore, we support the company's efforts, and respectfully request the Board's favorable consideration.

Thank you for your consideration of these comments.

Sincerely,

A handwritten signature in black ink, appearing to read "Maurice H. Kaya", written in a cursive style.

Maurice H. Kaya  
Chief Technology Officer

c: Mr. Russell Y. Tsuji, Land Division  
Department of Land and Natural Resources



Resource  
Conservation &  
Development, Inc.

*Serving Kauai and Niihau, Hawaii*

3083 `Akahi Street • Suite 204 • Lihu`e, HI 96766

**VISION:** Mālama `Āina o Kaua`i. The community working together towards a harmonious relationship with the environment.

**MISSION:** To carry out a plan for the orderly conservation, development and prudent use of natural and human resources to improve economic, social and environmental opportunities for the people of Kaua`i County.

Phone (808) 246-0091 • FAX (808) 246-1719

June 14, 2007

**Board of  
Directors**

Peter Kea  
President

Owen Moe  
Vice President

Ray Maki  
Treasurer

Edward Kawamura  
Secretary

Bill Cowern  
Director

Sabra Kauka  
Director

Rhoda Libre  
Director

Bill Spitz  
Director

Gary Ueunten  
Director

Marilyn Wong  
Director

To Whom It May Concern

My name is Gilbert Peter Kea and I am the president of the board of directors for the Garden Island Resource Conservation and Development, Inc. It is my honor and privilege to express my support for Bill Cowern and I recommend him to you without reservation. I have known Bill for almost 10 years through his work and public service. He has served with dedication and inspiration for years on the board of directors of Garden Island Resource Conservation and Development Inc.

Bill Cowern has been an advocate for preserving our agricultural land through forestry for many years. He is an active member of the Garden Island RC&D Forestry Committee and he can always be counted on for his support when it comes to the important issues impacting our land. His concern for the future of our island is exemplary and his passion for the principles of sustainability and renewable energy serve as a model for the rest of us.

Bill is both a businessman and steward of the land. He is dedicated to sustainable business practices and he is seeking to keep agricultural lands available for the purpose of creating renewable energy resources for Kauai.

If you have any questions or need any further information please feel free to contact me.

Sincerely yours,

Gilbert P. Kea  
President,  
Garden Island Resource Conservation and Development Inc.

## **Kauai County Farm Bureau**

*Affiliated with Hawaii Farm Bureau Federation*

P.O. Box 3895 • Lihue Hi 96766-6895

808-828-2120 (phone/fax) 808-639-8423 (cell)

kcfb@hawaiiantel.net



### ***The Voice of Kauai's Agriculture***

June 12, 2007

To Whom It May Concern:

Bill Cowern has been an ACTIVE member of the Kauai County Farm Bureau for 17 years. He served on the board of directors for 10 years – 8 years as the Vice President.

As with all nonprofit organizations, active members lead to success of the organization. During the past 17 years, Mr. Cowern has been an integral part of the growth and success of the Kauai County Farm Bureau. Mr. Cowern is an extremely competent – a take charge kind of person. He is able to present creative ideas and communicate the benefits. He has been the chairman of several committees: Agricultural Property Tax & Farm Fair Systems (sound / cooling).

Presently, Mr. Cowern is not a board member, though he regularly attends board meetings, giving thoughtful incites and information from the numerous committees / meeting he attends in the community. In addition to the regular meetings of our organization, Mr. Cowern is seen volunteering / attending the five events that are sponsored annually by the bureau: Agricultural Trade & Equipment Show, Garden Fair, Agricultural & Environmental Awareness Day, Farmer Rally and the Kauai County Farm Bureau Fair.

Bill Cowern has been an asset to the Kauai County Farm Bureau – and we are grateful for his years of service to our organization.

Please feel free to contact us if you have further questions.

Sincerely,

Susan Keller  
Administrator

Liz Ronaldson  
President

**Memorandum of Understanding  
On Policy Principles For**

**Woody Biomass Utilization for Restoration and Fuel Treatments  
On Forests, Woodlands, and Rangelands**

**United States Department of Agriculture  
And  
United States Department of Energy  
And  
United States Department of the Interior**

**THIS MEMORANDUM OF UNDERSTANDING (MOU)** is hereby entered into by and among the United States Department of Agriculture, the United States Department of Energy, and the United States Department of the Interior.

***Preamble:** The Secretaries support the utilization of woody biomass by-products from restoration and fuels treatment projects wherever ecologically and economically appropriate and in accordance with the law.*

**A. PURPOSE:**

The purpose of this MOU is to demonstrate a commitment to develop and apply consistent and complementary policies and procedures across three Federal departments to encourage utilization of woody biomass by-products that result from forest, woodland, and rangeland restoration and fuel treatments when ecologically, economically, and legally appropriate, and consistent with locally developed land management plans, by:

- Communicating to our employees and partners that the harvest and utilization of woody biomass by-products can be an effective restoration and hazardous fuel reduction tool that delivers economic and environmental benefits and efficiencies;
- Promoting consideration of woody biomass utilization from restoration and fuels treatment instead of burning or other on-site disposal methods; and
- Encouraging development of new mechanisms that increase the benefits and efficiencies of woody biomass utilization.

This MOU is intended to maximize the coordination and effectiveness of the Departments of the Interior (DOI), Agriculture (USDA), and Energy (DOE) in furthering the purposes set forth in this MOU.

## **B. STATEMENT OF MUTUAL INTERESTS:**

**Background:** Today between 100 and 200 million acres of America's Federal lands are at risk of catastrophic wildfires in large part due to significant changes in forest and woodland structure that have occurred in the last century. Widespread wildfire suppression and past forest, woodland, and rangeland management activities have contributed to these changes. Innovative, large scale management is needed to restore at-risk ecosystems to healthy and resilient conditions.

In 2002, 7.2 million acres of Federal lands burned, nearly double the ten-year average. This followed the devastating 2000 wildfire season, during which over 8.4 million acres burned and which prompted development of the National Fire Plan. President Bush has focused attention on this issue in his Healthy Forests Initiative.

The President's Healthy Forests Initiative, the National Fire Plan and the joint Federal-State 10-year Comprehensive Strategy Implementation Plan all call for biomass and wood fiber utilization as an integral component of restoring our Nation's precious forests, woodlands, and rangelands. Biomass utilization can also meet a key objective of the National Energy Policy by contributing to diversification of the Nation's energy supply. Further, the August 20, 2002, *White House Report In Response to the National Energy Policy Recommendations to Increase Renewable Energy Production on Federal Lands* includes a Proposed Action (3.3) to "Establish a Biomass Initiative at the Department of the Interior." The Report was prepared by DOE and DOI but includes a number of actions by, and related to, USDA biomass utilization efforts. Coordination between DOI, USDA, and DOE is important to the success of these initiatives, as is working cooperatively with States, Tribes, private landowners, Non-Governmental Organizations, and other interested parties and potential partners.

In this MOU, *restoration* refers to those management actions that seek to restore forest, woodland, and/or rangeland health, including such things as thinning and other stocking control actions, species conversion, invasive species management, insect and disease management, and soil and water conservation actions. In this MOU, *fuels treatment* and *hazardous fuel reduction* are synonymous terms and refer to management actions that seek to reduce the rate of spread, intensity, resistance to control, and crowning potential of wildfires by reducing available fuel; examples include thinning, chipping, crushing, piling, burning, and actions that reduce or remove live and dead woody fuels. In this MOU, *woody biomass* is defined as the trees and woody plants, including limbs, tops, needles, leaves, and other woody parts, grown in a forest, woodland, or rangeland environment, that are the by-products of restoration and hazardous fuel reduction treatments. In this MOU, *woody biomass utilization* is defined as the harvest, sale, offer, trade, and/or utilization of woody biomass to produce the full range of wood products, including timber, engineered lumber, paper and pulp, furniture and value-added commodities, and bio-energy and/or bio-based products such as plastics, ethanol, and diesel.

**Need for this MOU:** USDA is responsible for the management of 192 million acres of National Forest System lands and for assisting in the management of 430 million acres of State and private forest lands. DOI is responsible for the management of 507 million acres of surface lands, of which approximately 120 million acres are forest and woodlands. DOE provides significant technical expertise in biomass energy and linkages to the renewable energy industry.

In addition, public assistance and grants programs administered by these three departments have positive benefits in capacity-building for woody biomass utilization in local communities, industries, and on private lands. Energy is a key market for low-value woody biomass, and DOE and USDA fund, support, and/or conduct a major share of the research concerning biomass energy alternatives.

Within the Federal family, these three departments profoundly affect whether and how woody biomass utilization is employed as a tool for forest, woodland, and rangeland restoration and fuels treatment. The development and implementation of consistent and complementary policies and procedures can help maximize Federal efficiency and effectiveness of woody biomass utilization.

Woody biomass utilization can help reduce or offset the cost and increase the quality of the restoration or hazardous fuel reduction treatments. Woody biomass utilization can also have additional value in that it may result in more diverse forest ecosystems, characterized by native flora and fauna, healthy watersheds, better air quality, improved scenic qualities, more fire-resilient landscapes, and reduced wildfire threats to communities, and may provide an alternative waste management strategy.

### **C. POLICY PRINCIPLES**

DOI, DOE and USDA will use their statutory authorities to support the Principles listed below, as appropriate:

#### **1) Include local communities, interested parties, and the general public in the formulation and consideration of woody biomass utilization strategies.**

*Examples:*

- Communications that further the understanding that the implementation of the President's Healthy Forests Initiative and National Fire Plan go beyond Federal boundaries and affect local communities.
- Collaborative partnerships and public involvement programs and projects that provide value and enhance the economics, successes, and opportunities of utilizing woody biomass.
- Efforts to share knowledge and technology with community leaders, business owners, and private forest landowners.

**2) Promote public understanding of the quantity and quality of woody biomass that may be made available from Federal lands and neighboring Tribal, State, and private forests, woodlands, and rangelands nationwide.**

*Examples:*

- Inventory and analyze known geographic, transportation, and land use designation parameters.
- Evaluate woody biomass utilization capability in communities near restoration and hazardous fuel reduction areas on Federal lands.
- Verify fire condition classes of Federal forests and woodlands.
- Inventory and classify woody material by condition classes.
- Assist non-Federal partners with assessments of biomass quantity and availability on non-Federal lands.

**3) Promote public understanding that woody biomass utilization may be an effective tool for restoration and fuels treatment projects.**

*Examples:*

- Encourage science-based analysis at the appropriate land use planning level for decisions whether to make woody biomass available for utilization.
- Emphasize local efforts directed at woody biomass availability and utilization.
- Encourage market analysis or forest products appraisal to determine whether woody biomass utilization should have preference over disposal through chipping, crushing, burning, and/or other on-site disposal methods.
- Explore landscape-level analysis and fine-scale resolution of forests, woodlands, and rangelands to support management, restoration, and hazardous fuel reduction treatments.
- Encourage strategies for economic development in local and rural communities for value-added wood products and woody biomass utilization.

**4) Develop and apply the best scientific knowledge pertaining to woody biomass utilization and forest management practices for reducing hazardous fuels and improving forest health.**

*Examples:*

- Continue to expand knowledge of bio-based products and bio-energy from wood fiber using the Biomass Research and Development Act of 2000, the Farm Security and Rural Investment Act of 2002, and other applicable authorities.
- Strengthen research and development capacity for woody biomass products and energy research, and sustainable forest harvesting and processing systems for small diameter material.
- Assist States and private non-industrial landowners in using short-rotation cropping systems and developing low-value product markets.
- Map woody biomass utilization capacity.

**5) Encourage the sustainable development and stabilization of woody biomass utilization markets.**

*Examples:*

- Promote renewable energy marketing strategies to stimulate investments in woody biomass utilization.
- Support efforts to allow retail electric power customers an option to pay an appropriate premium to purchase electricity generated from woody biomass resulting from restoration or hazardous fuels treatments.
- Encourage the production and marketing of electric energy generated from woody biomass resulting from restoration or hazardous fuels treatment.
- Inform the public of available Federal financial assistance to encourage the utilization of woody biomass from restoration and hazardous fuels treatments.
- Explore biomass transportation cost subsidies from the forest to point of use, where doing so saves or avoids higher costs of treatments or fire-fighting in the future.
- Promote new utilization technologies and technology transfer, research, and development of bio-ethanol and other bio-based products.

**6) Support Indian Tribes, as appropriate, in the development and establishment of woody biomass utilization within Tribal communities as a means of creating jobs, establishing infrastructure, and supporting new economic opportunities.**

*Examples:*

- Encourage the use of guaranteed or insured loans under the Indian Financing Act, 25 USC §1451 et seq., to the extent permissible under existing law, including a possible set-aside for pilot projects that support development of woody biomass generation utilizing hazardous fuels and by-products of forest health treatments.
- Use the Buy Indian Act, 25 USC §47, to the extent permissible by law, in the purchase or procurement of woody biomass products resulting from Indian labor or industry.
- Provide technical and policy assistance to Tribal governments for the establishment of woody biomass programs.
- Assess extent of woody biomass fuels on Indian lands.

**7) Explore opportunities to provide a reliable, sustainable supply of woody biomass.**

*Examples:*

- Investigate the feasibility of long-term or renewable contracts for removal of woody biomass from Federal lands.
- Explore expanded use of contracting authorities and mechanisms for hazardous fuel reduction or restoration treatments on public lands.
- Expedite, as appropriate, environmental analysis and review for priority restoration and hazardous fuel reduction sites in Federal forests, woodlands, and rangelands.

**8) Develop and apply meaningful measures of successful outcomes in woody biomass utilization.**

*Examples:*

- Social, economic, and environmental sustainability measures.
- Measures of unit-cost reductions in hazardous fuel treatment and forest health treatment through offset by woody biomass utilization.
- Performance or workload measures to track targets and accomplishments in the offer and sale of woody biomass from Federal lands.

**D. IT IS MUTUALLY UNDERSTOOD BY ALL PARTIES THAT:**

1) **AUTHORITIES.** These Principles will be implemented under the relevant authorities of the three Departments that are parties to this MOU.

2) **TERMINATION.** Any of the three Departments may terminate its participation in and agreement to this MOU, in whole or in part, at any time.

3) **PARTICIPATION IN SIMILAR ACTIVITIES.** This MOU in no way restricts the three Departments from participating in similar activities with other public or private agencies, organizations, and individuals.

4) **PRINCIPAL CONTACTS.** The principal contacts for this agreement are:

John Sebelius	John Stewart	John Ferrell
USDA Forest Service	USDOJ	USDOE
Research and Development	Wildland Fire Coordination	Office of Energy Efficiency
P.O. Box 96090	Room 3060, Main Interior Bldg	and Renewable Energy
Washington, DC 20090	Washington, DC 20240	1000 Independence Ave, SW
		Washington, DC 20585-0121

5) **NON-FUND OBLIGATION DOCUMENT.** This MOU is neither a fiscal nor a funds obligation document. Nothing in this MOU authorizes or is intended to obligate the parties to expend, exchange, or reimburse funds, services, or supplies, or transfer or receive anything of value. If it is necessary to expend, exchange, or reimburse funds for any supplies or services, it will be accomplished under a separate contract or agreement approved by an authorized individual, and such expenditures are subject to the availability of appropriations.

6) **NO RIGHT OF ACTION.** This MOU is strictly for internal management purposes for the Federal Government. It is not legally enforceable and shall not be construed to create any legal obligation on the part of the signatory Secretaries or their respective Departments. This agreement shall not be construed to provide a private right or cause for action by any person or entity.





**Appendix E**  
**Cultural Impact Assessment Documentation**



September 25, 2007

Department of Hawaiian Homelands  
P.O. Box 1879  
Honolulu, Hawaii 96805

**Subject: Current Traditional Cultural Uses in the Knudsen Gap, District of Lihue, Island of Kauai, Tax Map Keys 2-7-001:001 and 2-7-001:004**

Dear Department of Hawaiian Homelands:

Green Energy Team LLC (Green Energy Team) is proposing an agriculture waste-to-energy facility on Kauai, Hawaii. The need for the project arises because of the State of Hawaii Revised Statute (HRS) renewable portfolio standard (Title 15, Chapter 269, Part V) that mandates that each electrical utility company shall provide twenty percent of its net electricity through renewable energy by the end of the year 2020.

The proposed project site is located approximately 1.5 miles northeast of Knudsen Gap on the south side of the island of Kauai and identified with Tax Map Key (TMK) 2-7-001:001. The proposed site is located approximately 1,200 feet north of Kaumualii Highway and approximately 6 miles from the shoreline of the Pacific Ocean and is situated on a 6.75 acre plot of agricultural land cultivated with trees (see Figures 1-1 through 1-3). The land is all privately owned and leased by Hawaiian Mahogany, Inc. (HMI).

Since the proposed project is the development of an agriculture waste-to-energy facility it triggers the environmental review process mandated under HRS Chapter 343. The proposed facility would utilize agriculture waste processed into energy as an integral part of an existing agricultural operation. The facility would be an environmentally sound method of handling the waste stream of the agriculture operation, generating clean sustainable energy to the community of Kauai while stimulating further agricultural activity. The proposed action would include the construction of a 10-inch subsurface pipeline to transfer/deliver water from the Koloa Ditch System. The two proposed pipeline alignments are shown on Figure 2-3. The land utilized for the pipeline is also privately owned and leased by HMI.

Earth Tech is currently in the process of conducting a cultural impact assessment for the proposed action in compliance with Act 50 of HRS 343 and is therefore seeking statements from current traditional Hawaiian practitioners with regards to cultural uses in the project areas. Cultural uses include but are not limited to, hunting, fishing, gathering and religious services. If you can provide a list of current traditional Hawaiian practitioners in the project area and/or provide statements, please contact:

Ms. Michelle Mason, Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, Hawaii 96813  
Fax: (808) 523-8950  
Email: Michelle.Mason@earthtech.com

In addition, we would appreciate receiving any additional information you may have regarding native Hawaiian cultural beliefs, practices, and places that might be adversely affected by this proposed project.

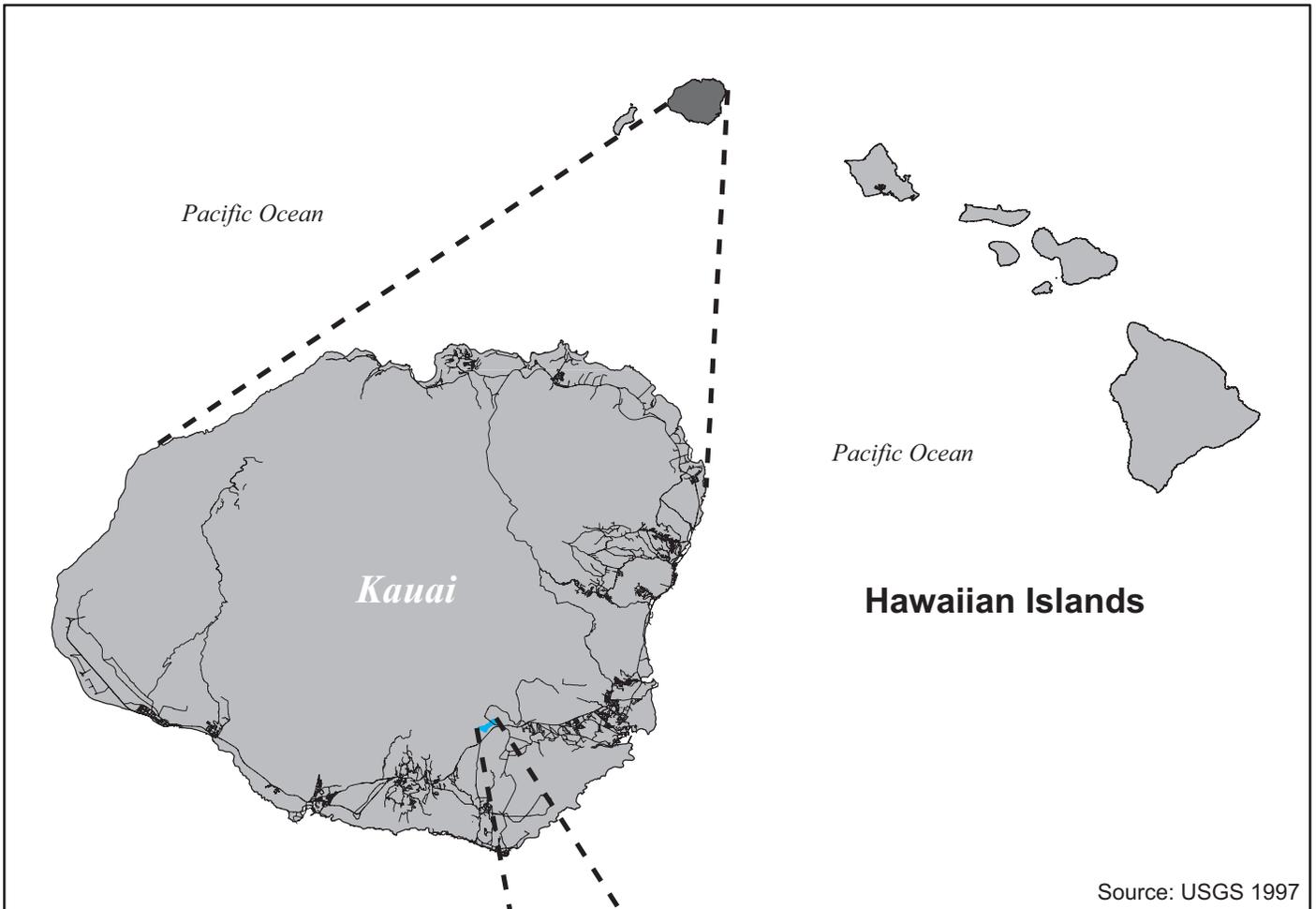
Thank you for your assistance, and should you have any questions, please contact me at 356-5322 or [michelle.mason@earthtech.com](mailto:michelle.mason@earthtech.com).

Sincerely,

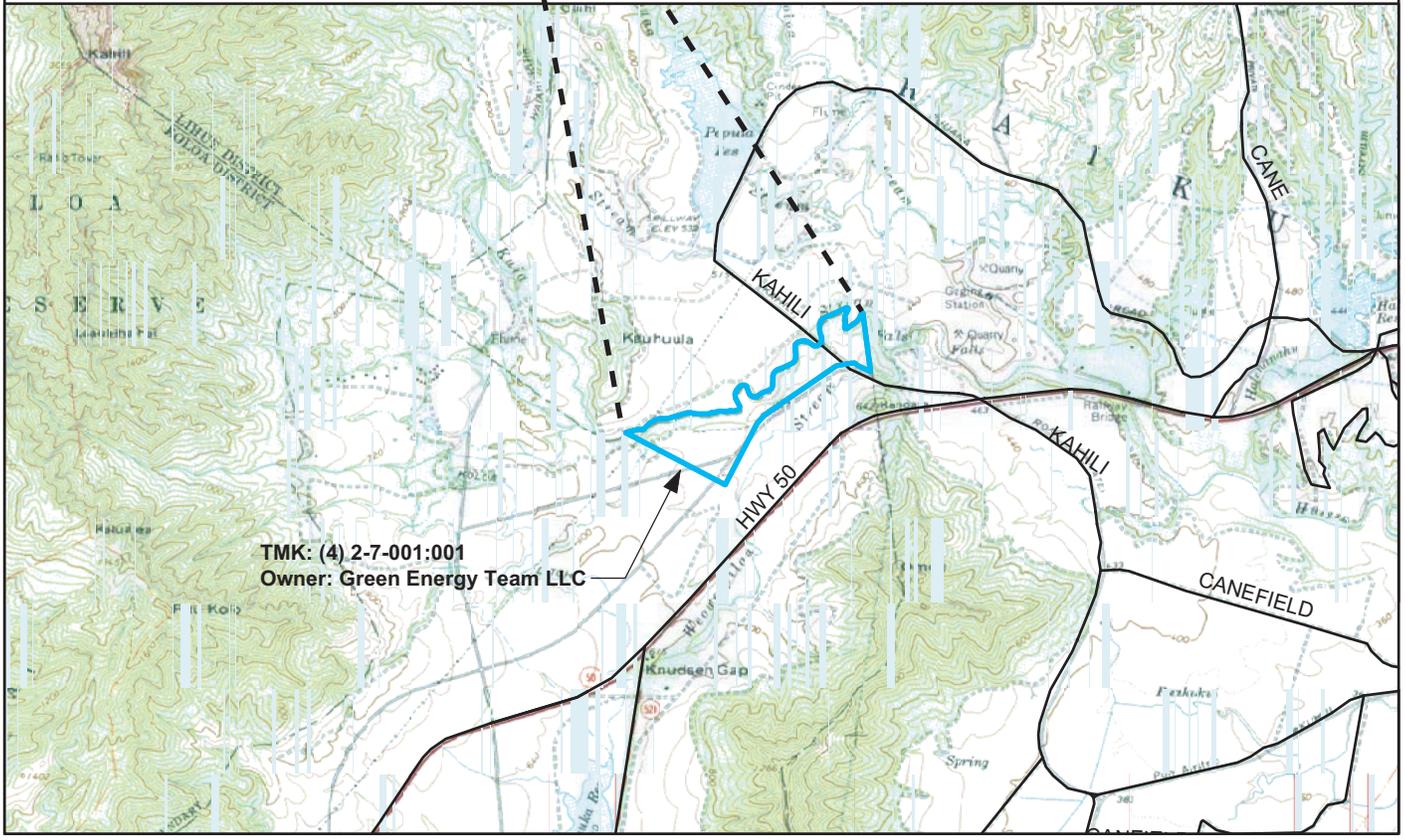


Michelle Mason  
Project Manager

Enclosures: Figures 1-1, 1-2, 1-3, and 2-3.



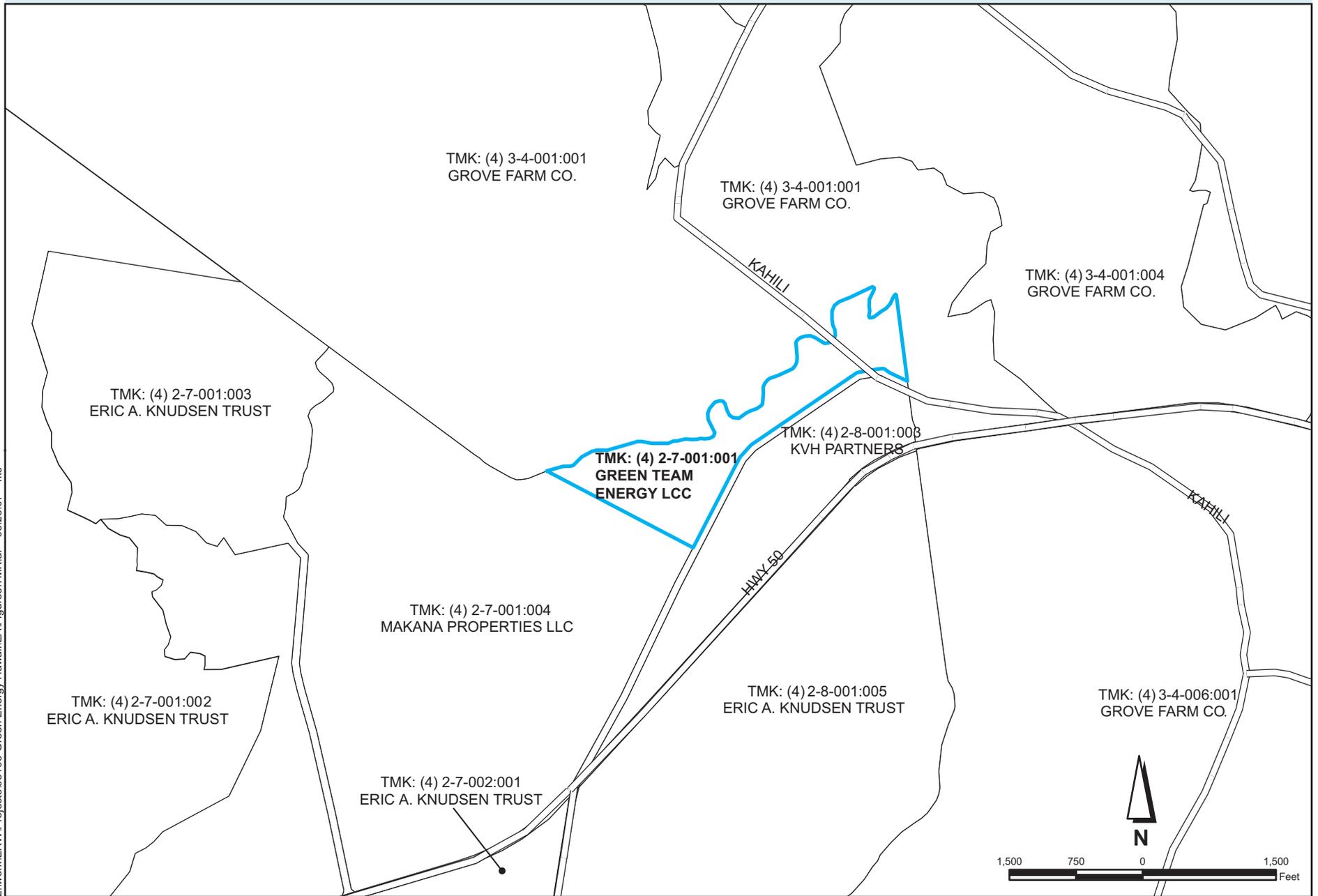
Source: USGS 1997



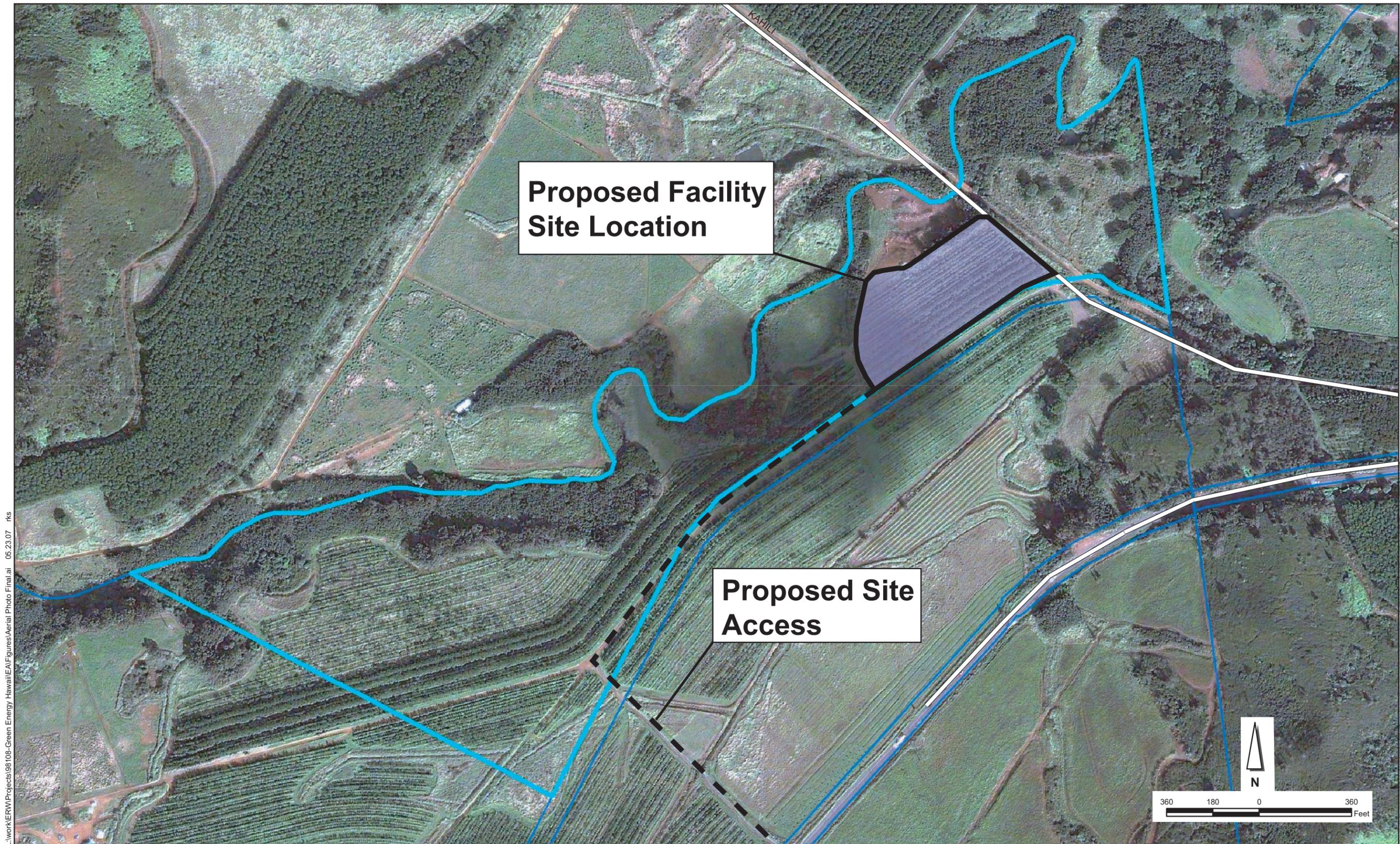
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**Figure 1-1**  
**Site Location and Topographic Map**  
**Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi**  
**Environmental Assessment**

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**Figure 1-2**  
**Tax Map Key**  
**TMK (4) 2-7-001:001**  
**Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi**  
**Environmental Assessment**



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Figure 1-3  
Aerial Photo of Proposed Property  
Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi  
Environmental Assessment

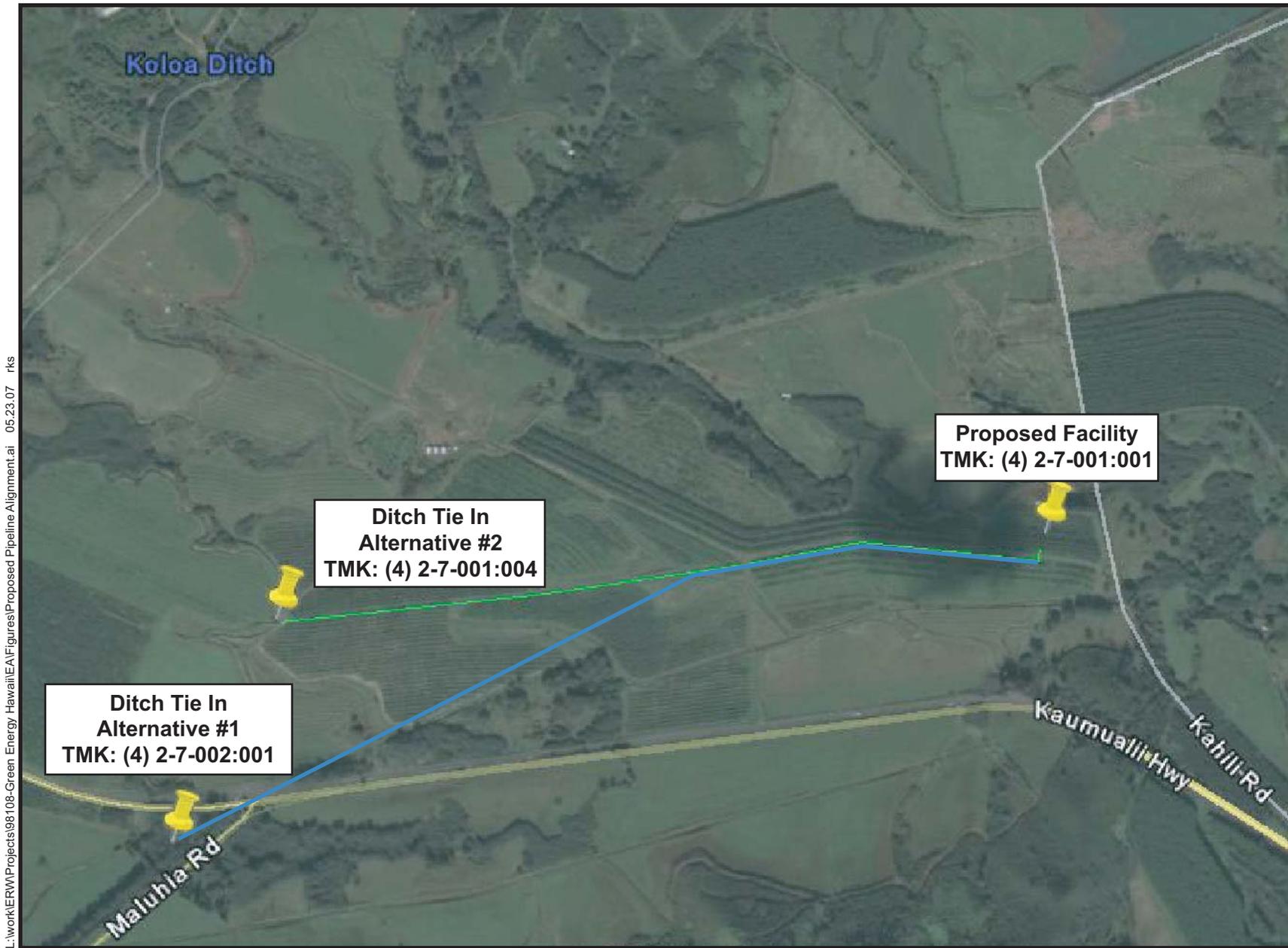


Figure 2-3  
Proposed Pipeline Alignment  
Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi  
Environmental Assessment



September 25, 2007

KAHEA  
P.O. Box 27112  
Honolulu, Hawai'i 96827-0112

**Subject: Current Traditional Cultural Uses in the Knudsen Gap, District of Lihue, Island of Kauai, Tax Map Keys 2-7-001:001 and 2-7-001:004**

Dear KAHEA:

Green Energy Team LLC (Green Energy Team) is proposing an agriculture waste-to-energy facility on Kauai, Hawaii. The need for the project arises because of the State of Hawaii Revised Statute (HRS) renewable portfolio standard (Title 15, Chapter 269, Part V) that mandates that each electrical utility company shall provide twenty percent of its net electricity through renewable energy by the end of the year 2020.

The proposed project site is located approximately 1.5 miles northeast of Knudsen Gap on the south side of the island of Kauai and identified with Tax Map Key (TMK) 2-7-001:001. The proposed site is located approximately 1,200 feet north of Kaumualii Highway and approximately 6 miles from the shoreline of the Pacific Ocean and is situated on a 6.75 acre plot of agricultural land cultivated with trees (see Figures 1-1 through 1-3). The land is all privately owned and leased by Hawaiian Mahogany, Inc. (HMI).

Since the proposed project is the development of an agriculture waste-to-energy facility it triggers the environmental review process mandated under HRS Chapter 343. The proposed facility would utilize agriculture waste processed into energy as an integral part of an existing agricultural operation. The facility would be an environmentally sound method of handling the waste stream of the agriculture operation, generating clean sustainable energy to the community of Kauai while stimulating further agricultural activity. The proposed action would include the construction of a 10-inch subsurface pipeline to transfer/deliver water from the Koloa Ditch System. The two proposed pipeline alignments are shown on Figure 2-3. The land utilized for the pipeline is also privately owned and leased by HMI.

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Ms. Michelle Mason, Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, Hawaii 96813  
Fax: (808) 523-8950  
Email: [Michelle.Mason@earthtech.com](mailto:Michelle.Mason@earthtech.com)

In addition, we would appreciate receiving any additional information you may have regarding native Hawaiian cultural beliefs, practices, and places that might be adversely affected by this proposed project.

Thank you for your assistance, and should you have any questions, please contact me at 356-5322 or [michelle.mason@earthtech.com](mailto:michelle.mason@earthtech.com).

Sincerely,



Michelle Mason  
Project Manager

Enclosures: Figures 1-1, 1-2, 1-3, and 2-3.



September 25, 2007

University of Hawaii at Manoa  
Center for Hawaiian Studies  
Hawaiian Studies Building Room 209A  
2645 Dole St  
Honolulu HI 96822

**Subject: Current Traditional Cultural Uses in the Knudsen Gap, District of Lihue, Island of Kauai, Tax Map Keys 2-7-001:001 and 2-7-001:004**

Dear UH Center for Hawaiian Studies:

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Ms. Michelle Mason, Earth Tech  
841 Bishop Street, Suite 500  
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Email: Michelle.Mason@earthtech.com

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Thank you for your assistance, and should you have any questions, please contact me at 356-5322 or michelle.mason@earthtech.com.

Sincerely,



Michelle Mason  
Project Manager

Enclosures: Figures 1-1, 1-2, 1-3, and 2-3.



# Record of Conversation

	Project no. 98108	Date: 10/01/07	Time: 2:30 pm
Earth Tech employee: Michelle Mason		Telephone call	
Other participants	Organization	Telephone no.	
Subject: Cultural Impact Assessment – Agriculture Waste-to-Energy Facility, Koloa, Kauai			
(1) Mr. Teddy Blake (808) 639-3248			
Mr. Blake was identified as an individual who could provide a list of individuals to contact that may be familiar with Hawaiian cultural practices in the Koloa area. The phone call was a follow-up to an e-mail sent to him on 09/25/07 with no response. He answered but said he would have to call me right back. No call back was received.			
9/25/07 @ 10:03 am. Emailed Mr. Blake as a follow up to phone call. No response.			
10/02/07 @ 9:45 am. Called Mr. Blake back. He said he would have to get back to me with the list of contacts and asked for my phone number. I asked him if he had received my e-mail but he said he gets so many some get lost. I sent the e-mail once again and cc:d Kanani Kagawa with the Office of Hawaiian Affairs.			
10/04/07 @ 5:00 pm. Called Mr. Blake to inquire on status of contact list. He said he was working on it and would get back to me when it was complete.			
10/08/07 @ 2:30 pm. Emailed Mr. Blake for status, no response.			
Actions:			
Copies to: Project File			

**Appendix F  
Photo Log**





Photo 1.  
Overview of Kaumuali'i  
Highway Facing East.  
Proposed Property is located  
Northeast of the Highway.



Photo 2.  
Access to the Proposed Project  
Site is via the Old Government  
Road



Photo 3.  
Old Government Road Facing  
Southeast Towards Kaumuali'i  
Highway



Photo 4.  
Overview of the Kaua'i Island Utility Co-operative (KIUC) Power Line which Crosses the Southwestern Area of the Proposed Property



Photo 5.  
Overview of the Southwest Proposed Property Perimeter Facing South.



Photo 6.  
Overview of the Southwest Proposed Property Perimeter Facing West



Photo 7.  
Overview of Northwest  
Perimeter of Property Facing  
West



Photo 8.  
Northwest Perimeter of  
Proposed Property Adjacent to  
the Feeder Stream Facing East



Photo 9.  
Continuation of Northwest  
Perimeter of Proposed Property  
Facing North/Northwest



Photo 10.  
Overview of the Koloa Ditch  
Access Point Located in the  
Northwest Area of the  
Proposed Property, Which  
Leads to Hula 'Aiea River



Photo 11.  
Overview of the Eastern Most  
Portion of the Proposed  
Property Across the Old Cane  
Road.



Photo 12.  
Overview of the Heavily  
Vegetated Kōloa Ditch located  
on the Proposed Property



Photo 13.  
Perspective Photo of  
Eucalyptus Orchard Located on  
the Proposed Property



Photo 14.  
Overview of Adjacent Property  
to the Southwest Facing East

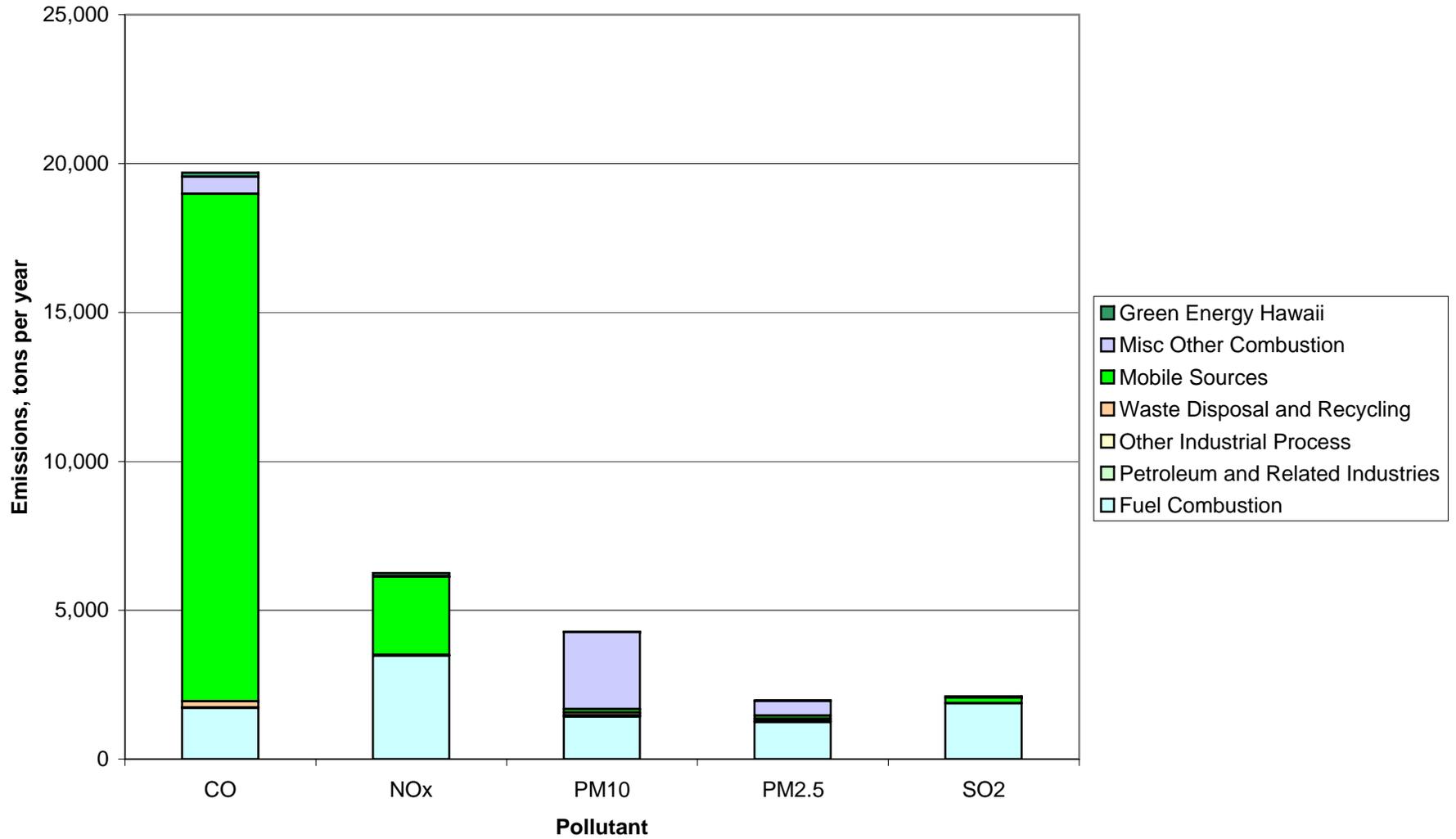


Photo 15.  
Overview of the Adjacent  
Property to the Southwest  
Facing South

**Appendix G**  
**Graphical Comparison of Air Emissions Sources**



## Emissions from Green Energy Hawaii Compared with Emissions from Other Sources on Kauai



Other emission sources from USEPA 2001 emissions inventory for Kauai County, HI.



**Appendix H**  
**Responses to Comments Received on Draft EA**



Response to Comments Received the County of Kauai Planning  
Department





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## MEMORANDUM

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**TO:** Earth Tech  
**ATTN:** Michelle Mason  
**FROM:** Imai Aiu, Deputy Planning Director  
**SUBJECT:** Green Energy Hawai'i EA Comments  
**DATE:** September 24, 2007

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In reading the Green Energy Hawai'i EIS the Planning Department has the following comments

- The only alternative discussed is the "No Action." There is brief mention of another site that is considered unfeasible, however I would find it helpful if they used that site to defend why this site is appropriate. I would be particularly interested if that site was one of the old mills on island. We do want alternative energy, however in our perfect world that plant would fit into one of our existing zonings. One of the alternatives should at least discuss that possibility.
- The emissions data gets rather technical and difficult to comprehend, but that is the nature of such data. What is missing is any definitive conclusion and mitigating measures required by law as the plant will be a major source. The only mitigating measures discussed are dust control during construction. Furthermore the project never defends itself by pointing out how it can be seen as decreasing emissions by meeting electrical demands with a cleaner source.
- The project does not address the flight paths of seabirds as it will be affecting a dark corridor and I assume running 24-7.
- The hazardous waste material section is thin. We should have a listing of chemicals used, volumes stored and any related EPA regulations, possible effects when spilled, and containment and mitigation plan.
- I am not sure I buy the comparison of the wood chipper to a concrete mixer. I would think it would run more like a chainsaw when one considers frequency. Will the chipper be run 24-7? Are there enclosures that can be discussed as part of the alternatives?
- Can the 2-4 crossings of Kaumuali'i Highway be backed up with an operational plan and a distribution of the acreage under production. At what times would the crossings happen?

- There needs to be a rendering done from the highway, showing the smoke stack and the effect of tree thinning.
- Statement is made that no water other than ditchwater will be used however what about sanitation and drinking water on site?
- The use of 195 tons of wood chips per day needs to be backed up with calculations showing that the plant can be sustained with the wood from the Hawaiian Mahogany plantation.
- Overall the project is presented more conceptually than realistically. In order to make a decision on this Use Permit one needs to have the benefits quantified (how much money can a consumer expect to save? How much will emissions be reduced vs. burning diesel?) so they can be compared against the impacts operating the plant will create.

Mahalo

Imaikalani Aiu

Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi, Hawaiʻi  
 Review Comments: Imai Aiu, Deputy Planning Director, County of Kauaʻi  
 Date: September 7, 2007

Comment No.	Comment
1	The only alternative discussed is the "No Action." There is brief mention of another site that is considered unfeasible, however I would find it helpful if they used that site to defend why this site is appropriate. I would be particularly interested if that site was one of the old mills on island. We do want alternative energy, however in our perfect world that plant would fit into one of our existing zonings. One of the alternatives should at least discuss that possibility.

Response: The alternative site presented in the EA is also zoned as agriculture, and is located in the Hanamaulu area. Multiple and in-depth discussions were taken with the landowner about establishing our plant next to the existing KIUC Kapaia plant. Pros and Cons are as follows:

**Pros**

The Kapaia area already has an established utility site, and an additional plant might be found to be acceptable from all parties, including the neighbors.

The KIUC substation is thought to be robust enough to be able to handle the additional energy production without significant modifications, reducing costs.

The landowner was receptive, though the landowner would require significant time to review and subsequently decide whether or not the land would be leased.

**Cons**

Most importantly, the location does not satisfy the benefits of "distributed generation", whereas utilities such as KIUC prefer production geographically placed in between production units. In this case, the subsequently selected site is in-between the Port Allen and Kapaia KIUC plants, filling in a "weak zone". This contributes to improved operating performance by KIUC, benefiting KIUC members. In other words, placing the Green Energy plant right next to the Kapaia plant would simply have increased production in that location, without producing in areas where KIUC units are not close by.

Distance for the feedstock to be hauled from Knudsen Trust lands up to Kapaia would require higher pricing to KIUC, versus the subsequently selected plant site on Knudsen Trust lands found in the epicenter of the existing feedstock tree plantations. Less transportation distance = lower costs = lower pricing to the KIUC cooperative membership, and lower consumption of diesel fuel for trucking and less road traffic.

Distance for the feedstock to be hauled would also result in an adverse impact to traffic and transportation infrastructure, and increased air pollution from diesel trucks.

Multiple year analyses by landowner could potentially be required, delaying the project past the KIUC required start up time period.

Note that establishing a plant in another area could have negative impact on emissions if it's located near hills or deep valleys. Energy plants are best on flat plains or on hill tops. This information has been included in Section 2.3.2 of the Final EA.

2	The emissions data gets rather technical and difficult to comprehend, but that is the nature of such data. What is missing is any definitive conclusion and mitigating measures required by law as the plant will be a major source. The only mitigating measures discussed are dust control during construction. Furthermore the project never defends itself by pointing out how it can be seen as decreasing emissions by meeting electrical demands with a cleaner source.
---	--

Response: Biomass plants by their nature emit lower levels of several pollutants associated with fossil fuels such as Naphtha or Diesel.

First, biomass has little sulfur, so the production of SO<sub>2</sub>, which is a major pollutant and precursor of acid rain, is very low. Fossil fuels, even low sulfur fuel sources currently used on Kauai, generate higher levels of SO<sub>2</sub> compared to a wood plant.

Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi, Hawaiʻi  
 Review Comments: Imai Aiu, Deputy Planning Director, County of Kauaʻi  
 Date: September 7, 2007

Second, wood plants are also low generators of NO<sub>x</sub> or nitrogen oxides. NO<sub>x</sub> is a criteria air pollutant as well as a precursor to the formation of Ozone. Wood plants generate less NO<sub>x</sub> than a fossil fuel plant. For CO<sub>2</sub>, a greenhouse gas, wood plants are *carbon neutral*. In other words, the CO<sub>2</sub> generated by the combustion of wood waste is then in turn consumed by the trees that grow back to replace the harvested wood. Fossil fuel plants are net increasers of CO<sub>2</sub>, as every pound of fuel the plant consumes liberates CO<sub>2</sub> that had been stored for a millennia. This CO<sub>2</sub> that is generated is never recaptured and results in a net increase in CO<sub>2</sub> to the atmosphere. In fact, this net generation of CO<sub>2</sub> thereby increases the amount of greenhouse gases in the atmosphere, which right now is of great focus and concern around the world.

Similarly, wood combustion results in minimal emissions of heavy metals such as mercury or lead that are found in a number of fossil fuels. A biomass plant *is* the clean alternative.

Regarding which technology is being proposing, Green Energy has selected "Gasification/Thermal Oxidation" versus a straight combustion unit, which produces fewer emissions as described below. Green Energy is committed not only to decreasing emissions but in also providing an outstanding renewable energy solution which would reduce the island's dependency and use of fossil fuels. Green Energy also recognizes that the United States Environmental Protection Act's Clean Energy Programs are working with state policy makers, electric and gas utilities, energy customers, and other key stakeholders for clean energy. By identifying, designing and implementing clean energy policy and technology solutions, the EPA maintains that clean energy delivers important environmental and economic benefits. Moreover, renewables are sustainable energy resources: they avoid depletion of natural resources for future generations.

**Gasification/ Thermal Oxidation ("Gasification")**

Gasification is considered by many experts to be one of the most efficient technology/process available for converting solid biomass fuel (wood chips) into usable energy (BTUs). Several key benefits of the gasification process include low particulate emissions - due to a precisely controlled air flow via computer controls, and a high flame temperature (2,100 F +) in the boiler. The flame has a sufficient residence time in the boiler to destroy a greater amount of VOC emissions compared to other types of combustion systems Other types of combustion system -i.e. stokers or straight combustion, can not generate nor maintain very high flame temperature. This is primarily due to the design of those systems, and the large amounts of excess air use in them.

Since the gasification process produces lower particulate emissions - compared to other traditional types of biomass combustion units - a simple mechanical (multi-cyclone) can be utilized to capture a majority of the particulate leaving the plant. However, to further reduce the particulate emissions from the plant Green Energy has selected an ESP or Electrostatic Precipitator to be designed into the system. The ESP is considered to be one of the most efficient processes for removing particulates from the exhaust stream. The ESP is capable of collecting 95% or better of the particulates in the exhaust stream.

This information and a table comparing emissions from Chiptec's gasification/thermal oxidation units have been added to the Final EA in Section 2.1.2 and Table 4-1.

3	The project does not address the flight paths of seabirds as it will be affecting a dark corridor and I assume running 24-7.
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Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi, Hawaiʻi  
 Review Comments: Imai Aiu, Deputy Planning Director, County of Kauaʻi  
 Date: September 7, 2007

Response: The Division of Forestry and Wildlife (DFW) was consulted and provided recommendations on outdoor lighting that will assist the project in minimizing the risk of causing "take" of listed seabirds. With the implementation of the outdoor lighting recommended by the DFW, the impacts to migratory seabirds would be mitigated. The lighting would be designed in multiple switching of lights, so that areas not being used are not illuminated. This includes the loading and chipping areas as well, which may only be active two to three hours per 24 hour time period. Lights would also be extinguished to help protect seabirds. To minimize and avoid risk of causing "take" of listed seabirds, the following mitigation measures have been added to Section 4.2 of the Final EA:

- All outdoor lights would be fully shielded or full cut-off light styles;
- Uplighting would be avoided;
- Use of an amber colored or other color (blue, green) filter or bulb would be used to assist in decreasing risk of seabird attraction;
- Avoid painting buildings and other facilities white or light reflecting colors. Earth tones would be used;
- Green Energy Team LLC and or it's consultants would consult with DLNR and USFWS prior to finalizing lighting selections; and
- Motion detection-activated lights would be used to prevent lights from being on for extended periods of time. Collisions of seabirds with facility wires and other structures would also be avoided as much as possible.

With the implementation of the above, no significant adverse impacts to listed seabirds would be expected.

4	The hazardous waste material section is thin. We should have a listing of chemicals used, volumes stored and any related EPA regulations, possible effects when spilled, and containment and mitigation plan.
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Response: Power plants use small quantities of chemicals for water treatment - as their primary business is the generation of electrical power, not the generation of a product. The three largest amounts of chemicals used are chemicals found around homes and swimming pools as follows:

First, bleach is used to help purify the plant's cooling water.

Second, muriatic acid is used to help regenerate the plant's water purifiers, and

Third, caustic soda is used in the plant's water purification process.

There are also other specialty chemicals used to help treat the plant's boiler water and cooling water, but the amounts applied are minimal.

As such, the majority of chemicals used are fairly common, and the more specialized chemicals are minimal in their use. Additionally, all chemicals are stored in a double containment arrangement so that if there are any leaks, there are secondary containment vessels to catch the liquids. The plant would be operated in accordance with a Spill Prevention, Control and Countermeasures (SPCC) Plan which would outline best management practices and spill prevention and containment procedures. This information has been added to Section 4.5 of the Final EA. The pertinent regulations have also been added.

5	I am not sure I buy the comparison of the wood chipper to a concrete mixer. I would think it would run more like a chainsaw when one considers frequency. Will the chipper be run 24-7? Are there enclosures that can be discussed as part of the alternatives?
---	---

Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi, Hawaiʻi  
 Review Comments: Imai Aiu, Deputy Planning Director, County of Kauaʻi  
 Date: September 7, 2007

Response: There are many factors that can be considered to have potential annoying effect to human being from a noise source, such as frequency component. However, the EA only assessed potential noise impacts using available noise guidelines based on specific noise metrics with which frequency components have been reflected through the A-weighted average process - as discussed in the EA. Therefore the level used in the analysis only considers the absolute noise level power from each source, although the frequency component might differ from each source.

A chainsaw does not have any shields around it as compared to a typical wood chipper, and a direct line of sight of the location where the noise is generated exists for a chainsaw. Therefore we believe the wood chipper noise level is somewhat comparable to a concrete mixer as both processes are partially enclosed when compared to an open chainsaw. Furthermore, the average 82 dBA reference level for a wood chipper appears to be conservative, as compared to other construction equipment listed in Table 4-5.

The actual chipper which we've conceptually reviewed has an 85 decibel level at a 30 foot distance, and can produce the volume of chips we're targeting in merely two to three hours. However, chipping may be run periodically at varying times. In fact, as sound is greatly attenuated by the berms, vegetation, and distance, the noise level is expected to be only 45 dBA at the property lines of Hawaiian Mahogany's leased lands in the direction of neighbors. The height of the berms has been revised to 5 feet at the south side of the facility to 12 feet (versus 11 feet) at the north end. Three tree line buffers would also to be planted as additional noise mitigation measure. Figure 4-6 and 4-7 of the Final EA present the proposed tree line buffers. Again, it should be noted that even without the implementation of the mitigation measures (e.g., constructed berms, landscaping, etc.), the noise level at the property boundary would only be 45 dBA, which is below the most stringent permissible sound level.

6	Can the 2-4 crossings of Kaunuaui Highway be backed up with an operational plan and a distribution of the acreage under production. At what times would the crossings happen?
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Response: Our feedstock operational plan related to the above crossings is as follows:

We anticipate approximately 10 trailer loads per day in total all hauling logs. Of these, 2-3 on average would have to cross the highway. This might be four in one day, and one the next. The crossings are expected to take place in the early morning hours between 10:00 pm and 5:00 am, to have minimal impact on traffic We have already discussed this with Steve Kyono of DOT regarding the safety issues that need to be addressed – such as timing, lighting, etc. This is not a significant change from what has previously been run for sugar cane, and other agricultural related activities in the area. The wagons will be similar to cane haul trailers, only wider and will haul 20 to 30 tons per trailer of whole logs. Thus the number of 7 to 10 trailer loads per day.

7	There needs to be a rendering done from the highway, showing the smoke stack and the effect of tree thinning.
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Response: A rendering has been added to the Final EA that indicates the view from the highway. The green band at the top of the rendering is the actual renewable energy plant, which is the facility's tallest building. With the green upper band, our intention is that the building will virtually blend into the tree line seen from the highway. The feedstock building is targeted to sit below the tree line. (See Figure 4-5 of the Final EA.)

8	Statement is made that no water other than ditchwater will be used however what about sanitation and drinking water on site?
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Response: Bottled water will be used for drinking water purposes, and either bottled water or a simple system to partly clarify ditch water will be used for sanitation water.

9	The use of 195 tons of wood chips per day needs to be backed up with calculations showing that the plant can be sustained with the wood from the Hawaiian Mahogany plantation.
---	--

Response: Green Energy Team LLC has a contract with a local tree farmer to provide 195 tons of feedstock per day for 20 years.

10	Overall the project is presented more conceptually than realistically. In order to make a decision on this Use Permit one needs to have the benefits quantified (how much money can a consumer expect to save? How much will emissions be reduced vs. burning diesel?) so they can be compared against the impacts operating the plant will create.
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Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi, Hawaiʻi

Review Comments: Imai Aiu, Deputy Planning Director, County of Kauaʻi

Date: September 7, 2007

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Response: The major sources of air emissions in the county are mobile sources (such as on- and off-road vehicles), power and heat generation, industrial processes, and the burning of solid waste. The air emissions from the Green Energy Hawaiʻi project will be a very small contribution to total emissions in the county. A visual comparison of the major sources of air emissions on Kauaʻi when compared with Green Energy's projected emissions has been added to the Final EA. Comments received from the Office of Hawaiian Affairs (OHA) included the following "OHA is supportive of the innovative agricultural waste-to-energy ideas being put forth in this project and in the way it strives to cleanly meet the 20 percent renewable energy goal of HRS Title 15, Chapter 269. OHA notes that this project makes use of an already existing agricultural operation and that it will convert a forestry waste-product to energy." As you know, Green Energy is committed to the overall reduction of fossil fuels historically and currently being used. This project will greatly assist KIUCs compliance with the State mandate. Green Energy's vision is to provide outstanding renewable energy solutions for the benefit of all residents of Kauaʻi. Green Energy is committed to decreasing emissions and also providing an outstanding renewable energy solution which would reduce the island's dependency and use of fossil fuels. Green Energy also recognizes that the United States Environmental Protection Act's Clean Energy Programs are working with state policy makers, electric and gas utilities, energy customers, and other key stakeholders for clean energy. By identifying, designing and implementing clean energy policy and technology solutions, the EPA maintains that clean energy delivers important environmental and economic benefits. Moreover, renewables are sustainable energy resources: they avoid depletion of natural resources for future generations.

Given all of this, perhaps the single greatest motivation behind moving forward with Green Energy's project is simply that everyone on Kauaʻi is expected to economically benefit. Driving this electricity bill savings for all who receive a KIUC electricity bill is that the fact that KIUC expects that the price of electricity to the KIUC cooperative membership will be significantly less over the life of the twenty year agreement than fossil fuel. All of us on Kauaʻi have had to pay for the increase of oil pricing from 1998 to 2005 of over 22% per year. A more detailed explanation of the economic win for every household on Kauaʻi is found in the first section of the permit application binder.

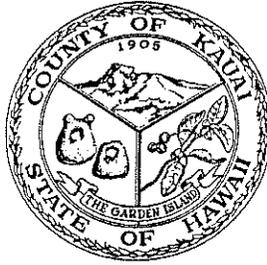
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Response to Comments Received from the County of Kauai Department  
of Public Works



**BRYAN J. BAPTISTE**  
MAYOR



**DONALD M. FUJIMOTO**  
COUNTY ENGINEER  
TELEPHONE 241-6600

**GARY K. HEU**  
ADMINISTRATIVE ASSISTANT

**EDMOND P.K. RENAUD**  
DEPUTY COUNTY ENGINEER  
TELEPHONE 241-6640

**AN EQUAL OPPORTUNITY EMPLOYER**  
**COUNTY OF KAUA'I**  
DEPARTMENT OF PUBLIC WORKS  
4444 RICE STREET  
MO'IKEHA BUILDING, SUITE 275  
LIHU'E, KAUA'I, HAWAII 96766-1340

September 17, 2007

Earth Tech, Inc.  
841 Bishop Street, Suite 500  
Honolulu, HI 96813  
ATTENTION: Ms. Michelle Mason

**SUBJECT:** Environmental Assessment (EA) Agricultural Waste-To-Energy Facility  
Koloa, Kauai – Tax Map Key No. (4) 2-7-001:001

Dear Ms. Mason:

We reviewed the Environmental Assessment. As shown, the proposed facility structures would be located on a relatively flat area elevated above the confluence of Kula Stream and Weoweopilau Stream and would be outside the Special Flood Hazard Area according to the FEMA Flood Insurance Rate Map panel 305E. Building permits will be required for the different buildings.

Should you have any questions, please contact Mario T. Antonio of my staff at (808)241-6859.

Very truly yours,

  
\_\_\_\_\_  
DOUGLAS HAIGH, P.E.  
Chief of Building Division

MTA

Copy to: DONALD M. FUJIMOTO, P.E. County Engineer



Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kaua`i, Hawai`i  
Review Comments: Douglas Haigh, P.E., Chief of Building Division, County of Kaua`i  
Date: September 17, 2007

Comment No.	Comment
1	We reviewed the Environmental Assessment. As shown, the proposed facility structures would be located on a relatively flat area elevated above the confluence of Kula Stream and Weoweopilau Stream and would be outside the Special Flood Hazard Area according to the FEMA Flood Insurance Rate Map panel 305E. Building permits will be required for the different buildings. Should you have any questions, please contact Mario T. Antonio of my staff at (808) 241-6859.

Response: Comment noted. The information in Section 3.7 of the Final EA has been updated to reflect this information.



Response to Comments Received from the State of Hawaii Office of  
Hawaiian Affairs





**STATE OF HAWAII**  
**OFFICE OF HAWAIIAN AFFAIRS**  
711 KAPI'OLANI BOULEVARD, SUITE 500  
HONOLULU, HAWAII 96813

HRD07/3047B

September 4, 2007

Michelle Mason  
Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, Hawai'i 96813

**RE: Draft Environmental Assessment, Agriculture Waste-To-Energy Facility,  
Kōloa, Kaua'i, TMK: 2-7-001:001.**

Dear Ms. Mason,

The Office of Hawaiian Affairs (OHA) is in receipt of the above referenced request for comments concerning a Draft Environmental Assessment (DEA) for the Agriculture Waste-To-Energy Facility in Kōloa on the island of Kaua'i. We have the following comments.

OHA is supportive of the innovative agricultural waste-to-energy ideas being put forth in this project and in the way it strives to cleanly meet the 20 percent renewable energy goal of HRS Title 15, Chapter 269. OHA notes that this project makes use of an already existing agricultural operation and that it will convert a forestry waste-product to energy.

OHA's few concerns rest with assuring that Department of Health Clean Water Branch and Clean Air Branches are complied with. In particular OHA looks forward to seeing the Covered Source Permit in the final Environmental Assessment. While OHA understands that the applicant intends for all the water taken from the Kōloa Ditch to be returned, OHA is concerned that there are no figures for how much water will be removed from the water system at a time. Further, OHA notes that some of this water is used for cooling and steam which means that not all of the water taken will be returned. Again, OHA looks forward to seeing an assessment of how much water will taken and will be missing from the system.

Michelle Mason  
Earth Tech  
September 4, 2007  
Page 2

Also regarding water, OHA appreciates that there is an assessment for the temperature of the water to be returned to Kōloa Ditch. However, there is no assessment for the turbidity of such water.

OHA is also concerned with the assessment related to traditional cultural uses in the project vicinity. The DEA states that a consultation has been initiated and that, "The results of this consultation will be presented in the Final EA." Naturally, OHA finds it difficult to comment on a lack of information and once again looks forward to seeing the results of this assessment. As we stated in our previous letter, we seek assurances that the cultural assessment follow the Office of Environmental Quality Control guidelines. OHA has contacted Kananai Kagawa of our Kaua'i branch who informs us that you sent her a copy of the DEA, and that she in turn relayed you to Teddy Blake to assist you in this regard.

While there has been a determination of "no effect" from the State Historic Preservation Division for this project, OHA requests that if the project goes forward, should iwi kūpuna or Native Hawaiian cultural or traditional deposits be found during ground disturbance, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

Additionally, OHA would also like to suggest that the project area be landscaped with additional native or indigenous species and the invasive species should be removed. Doing so would not only serve as practical water-saving landscaping practices, but also serve to further the traditional Hawaiian concept of mālama 'āina and create a more Hawaiian sense of place.

Lastly, OHA notes that the lighting and painting for this project may impact or even result in the taking of the Newell's shearwater and Hawaiian petrel. These birds are protected by one or more state and federal laws and the proposed project is located on an island which supports approximately 80 percent of the world's remaining Newell's shearwater breeding population. As such, OHA urges that the painting and lighting be tailored to the Department of Land and Natural Resources recommendations in Appendix A and your own mitigation measures on page 4-4 of the DEA.

Thank you for the opportunity to comment. If you have any further questions or concerns, please contact Grant Arnold at (808) 594-0263 or [granta@oha.org](mailto:granta@oha.org).

Michelle Mason  
Earth Tech  
September 4, 2007  
Page 3

Sincerely,

A handwritten signature in black ink, appearing to read "Clyde W. Nāmu'o". The signature is fluid and cursive, with a horizontal line extending from the end.

Clyde W. Nāmu'o  
Administrator

C: Kanani Kagawa  
Community Resources Coordinator, Kaua'i Office  
Office of Hawaiian Affairs,  
3-3100 Kuhio Hwy. Suite C4  
Līhu'e, Hawai'i 96766-1153



Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi, Hawaiʻi  
 Review Comments: Mr. Clyde W. Namʻo, Administrator, Office of Hawaiian Affairs  
 Date: September 4, 2007

Comment No.	Comment
1	The Office of Hawaiian Affairs (OHA) is in receipt of the above referenced request for comments concerning a Draft Environmental Assessment (DEA) for the Agriculture Waste-To-Energy Facility in Kōloa on the island of Kauaʻi. We have the following comments.  OHA is supportive of the innovative agricultural waste-to-energy ideas being put forth in this project and in the way it strives to cleanly meet the 20 percent renewable energy goal of HRS Title 15, Chapter 269. OHA notes that this project makes use of an already existing agricultural operation and that it will convert a forestry waste-product to energy.

Response: We appreciate your comments on the Draft EA. Green Energy also recognizes that the United States Environmental Protection Act's Clean Energy Programs are working with state policy makers, electric and gas utilities, energy customers, and other key stakeholders for clean energy. By identifying, designing and implementing clean energy policy and technology solutions, the EPA maintains that clean energy delivers important environmental and economic benefits. Moreover, renewables are sustainable energy resources: they avoid depletion of natural resources for future generations.

2	OHA'S few concerns rest with assuring that Department of Health Clean Water Branch and Clean Air Branches are complied with. In particular OHA looks forward to seeing the Covered Source Permit in the final Environmental Assessment.
---	---

Response: Green Energy would comply with all applicable permits, laws, and regulations and has been working closely with all local agencies including the Department of Health. The Application for the Covered Source Permit have been added as Appendix C in the Final EA.

3	While OHA understands that the applicant intends for all the water taken from the Kōloa Ditch to be returned, OHA is concerned that there are no figures for how much water will be removed from the water system at a time. Further, OHA notes that some of this water is used for cooling and steam which means that not all of the water taken will be returned. Again, OHA looks forward to seeing an assessment of how much water will taken and will be missing from the system. Also regarding water, OHA appreciates that there is an assessment for the temperature of the water to be returned to Kōloa Ditch. However, there is no assessment for the turbidity of such water.
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Response: The anticipated maximum instantaneous water demand is 286 gallons per minute (gpm), an amount the Kōloa Ditch can maintain. The average water requirement flow rate is expected to be about 60% of the maximum instantaneous amount, or approximately 172 gpm. The maximum instantaneous effluent returned to the Kōloa Ditch would be 100 gpm. The difference between the 286 gpm and 100 gpm is explained by the following:

- Maximum cooling tower evaporation losses = 96 gpm
- Maximum fire protection = 50 gpm
- Maximum domestic water = 35 gpm
- Maximum plant losses from leaks = 5 gpm

Samples collected from the Kōloa Ditch indicate that the turbidity of the water is between 2.9 and 10.2 NTUs. The effluent would be treated through an ultrafiltration process such that the turbidity of the water would be as low if not lower than the influent. This information has been added to the Final EA.

4	OHA is also concerned with the assessment related to traditional cultural uses in the project vicinity. The DEA states that a consultation has been initiated and that, "The results of this consultation will be presented in the Final EA." Naturally, OHA finds it difficult to comment on a lack of information and once again looks forward to seeing the results of this assessment. As we stated in our previous letter, we seek assurances that the assessment follow the Office of Environmental Quality Control guidelines. OHA has contacted Kananai Kagawa of our Kauaʻi branch who informs us that you sent her a copy of the DEA, and that she in turn relayed you to Teddy Blake to assist you in this regard.
---	---

Response: Section 4.3 and Appendix D of the Final EA contains the Cultural Impact Assessment conducted in accordance with the Office of Environmental Quality Control guidelines. Earth Tech has been in discussions with Kanani Kawaga of your Kauaʻi branch as well Teddy Blake. Communication has also been initiated with KAHEA, Department of Hawaiians Homelands, and the University of Hawaiʻi Center for Hawaiian Studies.

Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi, Hawaiʻi  
 Review Comments: Mr. Clyde W. Namʻo, Administrator, Office of Hawaiian Affairs  
 Date: September 4, 2007

5	While there has been a determination of “no effect” from the State Historic Preservation Division for this project, OHA requests that if the project goes forward, should iwi kiipuna or Native Hawaiian cultural or traditional deposits be found during ground disturbance, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.
---	---

Response: Section 4.3 indicates that “If archaeological or human remains are inadvertently discovered during construction activities, the construction contractor would stop all construction activities and immediately notify the SHPD prior to the continuation of activities.” It now goes on to indicate “In addition, should iwi kiipuna or Native Hawaiian cultural or traditional deposits be found during ground disturbance, work would cease, and the appropriate agencies would be contacted pursuant to applicable law. Based on comments received from the OHA, landscaping with native or indigenous species would be implemented during the construction phase of the project. This would assist in further blending the facility into the natural environment and reducing visual impacts, as well as serving to create a more Hawaiian sense of place.”

6	Additionally, OHA would also like to suggest that the project area be landscaped with additional native or indigenous species and the invasive species should be removed. Doing so would not only serve as practical water-saving landscaping practices, but also serve to further the traditional Hawaiian concept of malama `aiana and create a more Hawaiian sense of place.
---	---

Response: Comment noted. Green Energy is committed to the environment as well as Hawaiian affairs and interests. Landscaping with native or indigenous species would also be implemented during the construction phase of the project using seed bank/plant stock from the *ahupua`a* to the best extent possible. This will assist in further blending the facility into the natural environment and reducing visual impacts, as well as serving to create a more Hawaiian sense of place. This information has been added to Sections 4.3, 4.8, and 4.13.

7	Lastly, OHA notes that the lighting and painting for this project may impact or even result in the taking of the Newell’s shearwater and Hawaiian petrel. These birds are protected by one or more state and federal laws and the proposed project is located on an island which supports approximately 80 percent of the world’s remaining Newell’s shearwater breeding population. As such, OHA urges that the painting and lighting be tailored to the Department of Land and Natural Resources recommendations in Appendix A and your own mitigation measures on page 4-4 of the DEA.
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Response: To minimize and avoid risk of causing “take” of listed seabirds, the following mitigation measures have been added to Section 4.2 of the Final EA:

1. All outdoor lights would be fully shielded or full cut-off light styles;
2. Uplighting would be avoided;
3. Use of an amber colored or other color (blue, green) filter or bulb would be used to assist in decreasing risk of seabird attraction;
4. Avoid painting buildings and other facilities white or light reflecting colors. Earth tones would be used;
5. Green Energy Team LLC and or it’s consultants would consult with DLNR and USFWS prior to finalizing lighting selections; and
6. Motion detection-activated lights would be used to prevent lights from being on for extended periods of time. Collisions of seabirds with facility wires and other structures would also be avoided as much as possible.

With the implementation of the above, no significant adverse impacts to listed seabirds would be expected.

Response to Comments Received from the State of Hawaii Department  
of Land and Natural Resources Division of Forestry and Wildlife



LINDA LINGLE  
GOVERNOR OF HAWAII



**STATE OF HAWAII**  
**DEPARTMENT OF LAND AND NATURAL RESOURCES**  
DIVISION OF FORESTRY AND WILDLIFE  
1151 PUNCHBOWL STREET, ROOM 325  
HONOLULU, HAWAII 96813  
TEL (808) 587-0166 FAX (808) 587-0160

**ALLAN A. SMITH**  
INTERIM CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

**Peter T. Young**  
DEPUTY DIRECTOR - LAND

DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES  
BOATING AND OCEAN RECREATION  
BUREAU OF CONVEYANCES  
COMMISSION ON WATER RESOURCE MANAGEMENT  
CONSERVATION AND COASTAL LANDS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

May 31, 2007

Ms. Michelle Mason  
Project Manager  
EarthTech  
641 Bishop Street, Suite 500  
Honolulu, Hawaii 96813-3920

Dear Ms. Mason:

Subject: Letter of Determination, DLNR Forestry and Wildlife review of Agriculture (Biomass) Waste-to-Energy Project, Koloa District, Island of Kauai. TMK: 2-7-001: 001 and 004.

DLNR, Division of Forestry and Wildlife has reviewed the information relating to the proposed Waste-to-Energy Project near Koloa, Kauai and provide the following comments for your consideration. Relating to seabirds attraction to lights, the attached brochure will help reduce these problems that will occur for petrels and shearwaters. Please incorporate all mitigation measures explained in this brochure into the planning of the project. All questions should be made through the Kauai Branch of the Division of Forestry and Wildlife office at (808) 274-3433. Thank you for the opportunity to comment on your project.

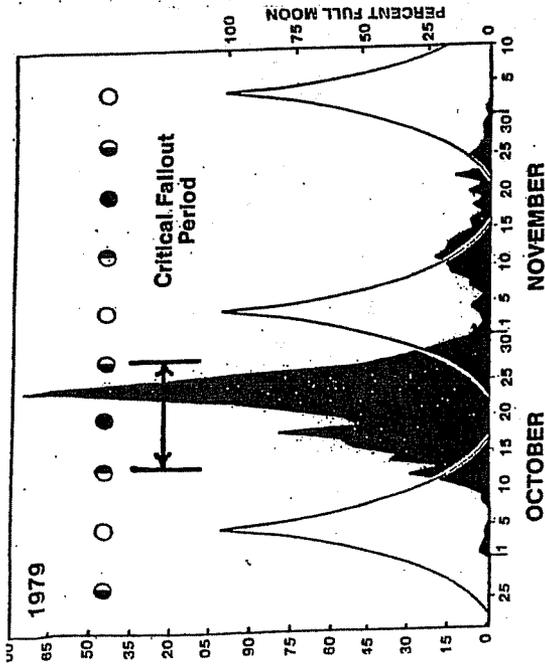
Sincerely yours,

Paul J. Conry  
Administrator

C: DOFAW Kauai Branch

Attachment





**Figure 4.** Relationship of shearwater "fallout" to the moon phases. The critical period of fallout occurs during the week before and after the new moon (darkest nights). Dowsing lights that are not absolutely necessary during that period could substantially reduce the annual shearwater fallout problem.

**What To Do If Shearwaters Fall In Your Area**

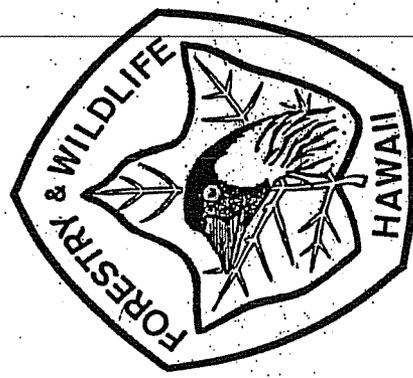
1. Collect birds as soon as possible to avoid losses to dogs and cats. They are generally docile birds and are easily handled. Take them to the nearest "shearwater aid station" located at county fire stations and at a few private business locations around the island. If birds must be held overnight, keep them in ventilated cardboard box with a secure lid.
2. Do not release birds by tossing them into the air. They may have unseen internal injuries and could become more badly injured.

**TECHNICAL ASSISTANCE IS AVAILABLE  
FOR ADDITIONAL INFORMATION, CONTACT:**

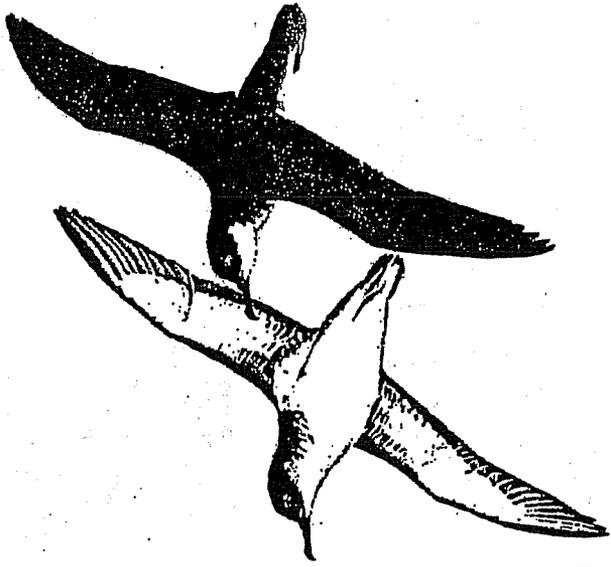
State of Hawaii  
Department of Land and Natural Resources  
Division of Forestry and Wildlife  
P.O. Box 1671  
Lihue, Hawaii 96766  
245-4433

U.S. Dept. of the Interior  
Fish and Wildlife Service  
P.O. Box 87  
Kilauea, Hawaii 96754  
828-1413

The Nature Conservancy  
of Hawaii  
1026 Nuuanu Avenue, Suite 201  
Honolulu, Hawaii 96813  
537-4508



**DEPARTMENT OF  
LAND AND NATURAL RESOURCES**



# THE NEWELL'S SHEARWATER LIGHT ATTRACTION PROBLEM

**A GUIDE FOR ARCHITECTS,  
PLANNERS, AND RESORT MANAGERS**

**INTRODUCTION:**

The future of a native Hawaiian seabird, the Newell's Shearwater, is threatened by the growth of new urban developments. Every year on Kauai, nearly 1,500 Newell's Shearwaters are attracted to bright urban lights, fly into unseen objects and fall to the ground. Fortunately, 90% of them are recovered and successfully returned to the wild through the "SOS" (save our shearwater) program which involves the cooperation of the general public.

This brochure is designed to describe the bird, its problems with lights and specifically what architects planners, resort managers and the general public can do to reduce or avoid the light attraction problem.

**THE BIRD**

The Newell's Shearwater once nested on all of the major Hawaiian Islands, but the mongoose, introduced to Hawaii, Maui, Hilo, Oahu and Oahu in the late 1800's is believed to have caused the extinction of shearwaters on those islands. Kauai is the last stronghold for this unique native Hawaiian seabird.

Newell's Shearwaters nest during the spring and summer months in the interior mountains of Kauai. They dig a long burrow into the ground beneath dense vegetation and lay a single egg each year. The eggs hatch during July and August, and the nestlings are reared within the burrow. The adult birds abandon the nestlings a week or two before they are old enough to fly. The nestlings become hungry, and leave the nesting grounds by themselves shortly after nightfall. They feed for the open ocean, and must depend upon their instincts to find food. They do not return to their nest, but fly south towards the equator where they still remain all winter on the open seas until the following spring.

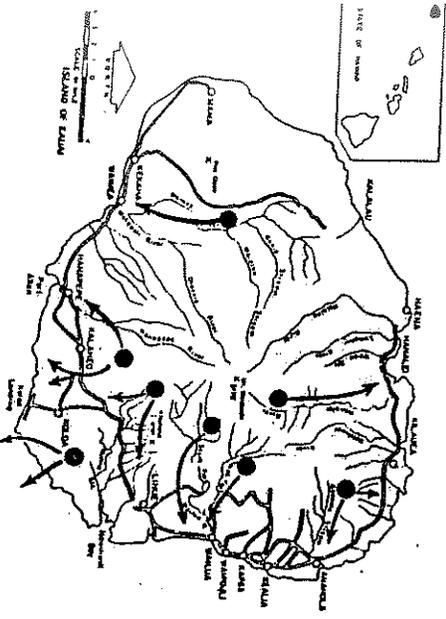


Figure 1. Map showing known nesting areas of the Newell's Shearwater.

**THE THREATS:**

**PREDATORS:** Dogs, cats, rats and feral pigs are known to kill some shearwaters and their young on the nesting grounds each year. The accidental establishment of a new predator to Kauai such as the mongoose, could cause the rapid extinction of this bird. Mongoose sightings on Kauai should be reported to wildlife officials promptly.

**LIGHT ATTRACTION:** Young shearwaters leaving their nests for the first time, do so only after dark. They are inexperienced and have a natural attraction to bright lights. Flying near urban areas, they become temporarily blinded by the lights and fly into unseen objects such as utility wires, trees, buildings and automobiles. Often times they are just confused and exhausted. Most often they are only stunned and fall to the ground, but about 10 percent of them die each year. The problem is growing because of the increased number of urban lights associated with new resort and residential developments. The greatest "fallout" problem occurs near coastal towns, particularly near river mouths.

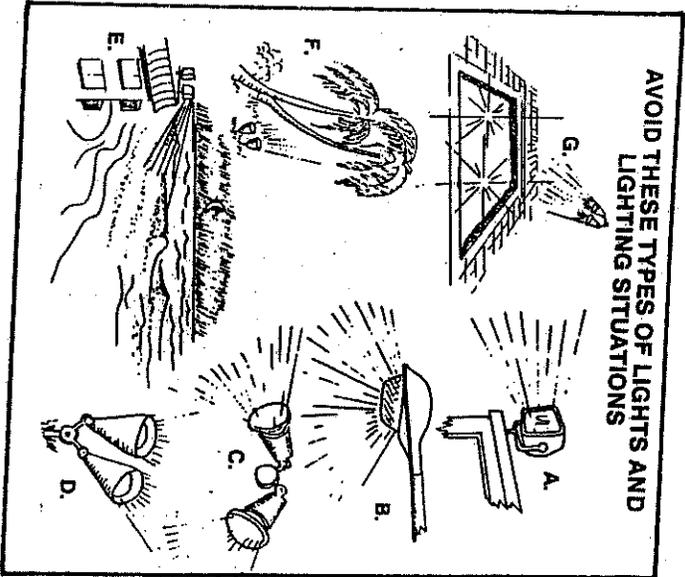


Figure 2. Avoid these types of lights: A. Unshielded high intensity floodlights on tall structures, B. Street lights without shields, C. Unshielded spotlights, D. Spotlights aimed upwards. Avoid periods (new moon) during October and November. E. Floodlights on surf, F. Spotlights aimed up at vegetation, G. Spotlights

**WHAT CAN WE DO TO HELP ?**

**Architects and Planners**

- Be aware of the light attraction problem during the planning stages of new development.
- Make every effort to avoid lighting situations where light glare projects upwards or laterally (see figure 2). Avoid large high-intensity floodlights located on building tops or poles whenever possible.
- Use shielded lights, cut-off luminaires, or indirect lighting whenever possible. (See figure 3).
- Avoid locating bright lights near utility wires or other objects that could be difficult for birds to see at night.

**Hotel, Resort and Condominium Managers**

- When converting to new exterior light fixtures, consider installing shielded lights, cut-off luminaires or indirect lighting.
- Consider installing shields on exterior lights that are known to attract shearwaters. Some light manufacturers offer ready made shields. In some cases inexpensive shields can be fabricated.
- Avoid using unnecessary lighting during the critical shearwater fall-out period. (October and November each year).
- **Note:** The heaviest fall-out occurs on and around the new moon, generally for only 10 to 12 days. (See figure 4). Dowsing unnecessary floodlights that light up the surf or shine upward upon buildings or trees for that short period, could significantly reduce shearwater fall-out.

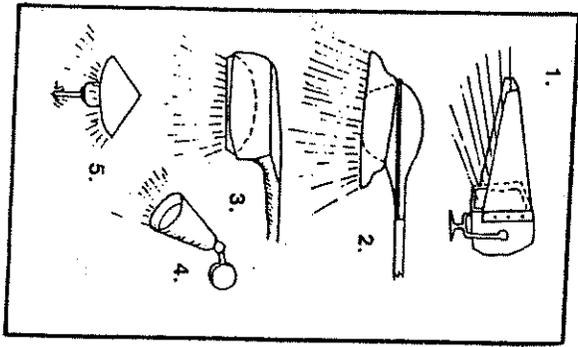


Figure 3. Use these types of lights whenever possible: 1. Shielded floodlights, 2. Shielded streetlights, 3. Cut-off luminaire, 4. Shielded spotlight, 5. Indirect luminaire.

Mr. Paul Conry, Administrator  
Department of Land and Natural Resources  
Division of Forestry and Wildlife  
1151 Punchbowl Street, Suite 325  
Honolulu, Hawaii 96813

Subject: Draft Environmental Assessment (EA), Agriculture Waste-to-Energy Facility, Kōloa, Kaua'i, Hawaii'i, TMK: 2-7-001:001

Dear Mr. Conry,

Thank you for your comments on the Draft EA for the proposed Agriculture Waste-to-Energy Facility. Responses to comments contained in your letter are summarized below:

To minimize and avoid risk of causing "take" of listed seabirds, the following mitigation measures have been added to Section 4.2 of the Final EA:

1. All outdoor lights would be fully shielded or full cut-off light styles;
2. Uplighting would be avoided;
3. Use of an amber colored or other color (blue, green) filter or bulb would be used to assist in decreasing risk of seabird attraction;
4. Avoid painting buildings and other facilities white or light reflecting colors. Earth tones would be used;
5. Green Energy Team LLC and or it's consultants would consult with DLNR and USFWS prior to finalizing lighting selections; and
6. Motion detection-activated lights would be used to prevent lights from being on for extended periods of time. Collisions of seabirds with facility wires and other structures would also be avoided as much as possible.

These mitigation measures have been added to Section 4.2 and with their implementation, no long-term adverse impacts would be expected.

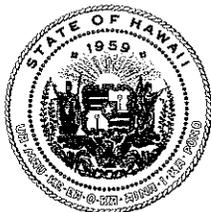
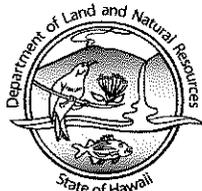
Sincerely,



Michelle Mason  
Project Manager



LINDA LINGLE  
GOVERNOR OF HAWAII



**STATE OF HAWAII**  
**DEPARTMENT OF LAND AND NATURAL RESOURCES**

DIVISION OF FORESTRY AND WILDLIFE  
KAUAI DISTRICT  
3060 EIWA STREET, ROOM 306  
LIHUE, KAUAI, HAWAII 96766

ALLAN A. SMITH  
INTERIM CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA  
DEPUTY DIRECTOR

PETER T. YOUNG  
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES  
BOATING AND OCEAN RECREATION  
BUREAU OF CONVEYANCES  
COMMISSION ON WATER RESOURCE MANAGEMENT  
CONSERVATION AND COASTAL LANDS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

Michelle Mason  
Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, HI 96813

Re: Project 98108

Aloha Ms. Mason,

The Division of Forestry and Wildlife (DOFAW) received the letter dated May 21, 2007 regarding Green Energy Team Inc and the proposed Agricultural Waste-to-Energy-Facility in Koloa, Kaua'i . This letter provides recommendations on outdoor lighting that will assist the project in minimizing the risk of causing "take" of listed seabirds.

Newell's shearwater and Hawaiian petrel are protected by one or more state and federal laws including the federal Migratory Bird Treaty Act (16 USC 703 et seq.), the federal Endangered Species Act (16 USC 1531 et seq.), and the Hawaii Revised Statutes Chapter 195D pertaining to protection of endangered and threatened species. Each of these laws defines the killing and/or injury of protected species as "take". Unauthorized "take" is punishable by criminal and/or civil provisions and can include substantial monetary fines (\$25,000-\$50,000 per bird) and/or imprisonment, depending on circumstances. In order to obtain authorization to cause "take" an entity consults with the State and Federal agencies to determine if such authorization is required.

The proposed project is located on Kaua'i which supports approximately 80% of the world's remaining Newell's shearwater breeding population. Hawaiian petrels also breed on Kaua'i but in smaller numbers than Newell's petrels. Both of these species nest in mountainous forest habitat and fly over the lowland areas to reach the sea. During this migration they can become attracted to outdoor lights and as a result often fall to the ground where they are injured or killed if not rescued by humans. The fledgling seabirds are particularly sensitive to lighting during their first flight to the sea, a migration that occurs annually from mid September through mid December.

### **Recommendations for the Proposed Agriculture Waste-to-Energy Facility**

Based on the project location, certain type of outdoor lighting are likely to cause adverse effects to listed seabirds. To minimize and avoid risk of causing "take" of listed seabirds, the proposed project should follow the following design principles:

1. All outdoor lights should be fully shielded or full cut-off light styles;
2. Uplighting should be avoided;

3. Use of an amber colored or other color (blue, green) filter or bulb can be used to assist in decreasing risk of seabird attraction;
4. Avoid painting buildings and other facilities white or light reflecting colors. Earth tones are preferred;
5. It is recommended that Green Energy Team LLC and or it's consultants consult with DLNR and USFWS prior to finalizing lighting selections; and
6. Motion detection-activated lights are recommended to prevent lights from being on for extended periods of time.

Collisions of seabirds with facility wires and other structures should also be analyzed and avoided as much as possible. If you have questions or would like additional information please do not hesitate to contact us.

Aloha,



Andrea Erichsen  
Kaua'i Seabird Habitat Conservation Plan Coordinator  
Department of Land and Natural Resources  
P.O. Box 458  
Waimea, HI 96796  
(808) 346-3489 mobile  
(808) 338-1361 office/fax  
Andrea.L.Erichsen@hawaii.gov

Thomas K. Kaiakapu  
Wildlife Manager –Kaua'i District  
Department of Land and Natural Resources  
Division of Forestry and Wildlife  
State Office Building  
3060 Eiwa Street  
Lihue, Kaua'i, HI 96766-1875  
(808) 274-3440 office



www.hawaii.gov/dlnr/



www.dofaw.net

# ACCEPTABLE ONLY WITH PROPER BULB(S)

# UNACCEPTABLE

WALKWAY/PATH  
LIGHTING



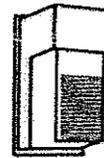
Low Profile Bollards  
with Louvers



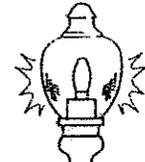
Globe  
Fixture



Unshielded  
Carriage



Wallpack



Acorn  
Fixture

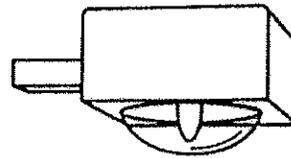
STREET/PARKING  
LIGHTING



Full Cutoff  
Low Pressure Sodium  
Streetlight



Fully Shielded  
NEMA Light

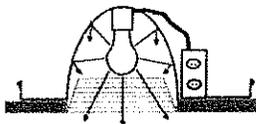


Drop-Lens/Sag-Lens  
w/ exposed bulb



Unshielded  
Streetlight

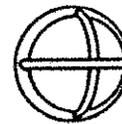
ARCHITECTURAL  
LIGHTING



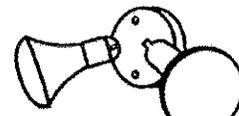
Recessed Can  
w/ baffles



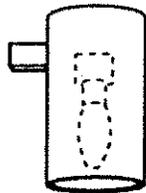
Glare Buster



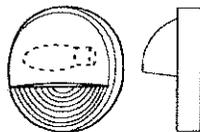
Nautical  
Wall Sconce



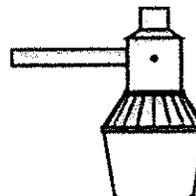
Floodlight



Canister  
Downlight



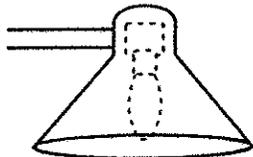
'Eyelid' Step  
Light



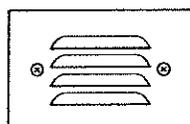
NEMA Security  
Light



Partially Shielded  
Floodlight



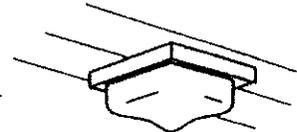
Downlight



Louvered  
Step Light



Shielded Security  
Light



Drop-Lens  
Canopy Light

Bulbs for all fixtures should be of the Yellow 'Bug' Light variety incandescent or compact fluorescent.



Ms. Andrea Erichson  
Kaua'i Seabird Habitat Conservation Plan Coordinator  
Department of Land and Natural Resources  
P.O. Box 458  
Waimea, HI 96796

Subject: Draft Environmental Assessment (EA), Agriculture Waste-to-Energy Facility, Kōloa, Kaua'i, Hawaii'i, TMK: 2-7-001:001

Dear Ms. Erichson,

Thank you for your comments on the Draft EA for the proposed Agriculture Waste-to-Energy Facility. Responses to comments contained in your letter are summarized below:

To minimize and avoid risk of causing "take" of listed seabirds, the following mitigation measures have been added to Section 4.2 of the Final EA:

1. All outdoor lights would be fully shielded or full cut-off light styles;
2. Uplighting would be avoided;
3. Use of an amber colored or other color (blue, green) filter or bulb would be used to assist in decreasing risk of seabird attraction;
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5. Green Energy Team LLC and or it's consultants would consult with DLNR and USFWS prior to finalizing lighting selections; and
6. Motion detection-activated lights would be used to prevent lights from being on for extended periods of time. Collisions of seabirds with facility wires and other structures would also be avoided as much as possible.

These mitigation measures have been added to Section 4.2 and with their implementation, no long-term adverse impacts would be expected.

Sincerely,



Michelle Mason  
Project Manager



Response to Comments Received from the State of Hawaii Office of  
Environmental Quality Control



LINDA LINGLE  
GOVERNOR OF HAWAII



LAURENCE K. LAU  
ACTING DIRECTOR

**STATE OF HAWAII  
DEPARTMENT OF HEALTH  
OFFICE OF ENVIRONMENTAL QUALITY CONTROL**

235 SOUTH BERETANIA STREET  
LEIOPAPA A KAMEHAMEHA, SUITE 702  
HONOLULU, HAWAII 96813  
Telephone (808) 586-4185  
Facsimile (808) 586-4186  
Electronic Mail: [OEQC@doh.hawaii.gov](mailto:OEQC@doh.hawaii.gov)

August 15, 2007

Ian K. Costa, Planning Director  
County of Kaua'i Planning Department  
444 Rice Street, Suite A473  
Lihu'e, Hawaii 96766-1326

Dear Mr. Costa:

**Subject:** Draft Environmental Assessment for Green Energy Team LLC  
Proposed Agriculture Waste-To-Energy Facility  
Tax Map Key 2-7-01:1 and 2-8-01:3  
Koloa District, Kauai

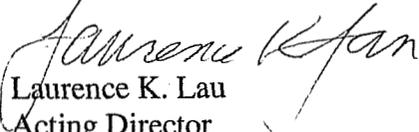
Thank you for the opportunity to review the subject document. The Office of Environmental Quality Control has these comments:

1. Please correct the spelling of United on USGS on page vi.
2. On chapter 2.0, please discuss the lifetime of the proposed facility and the projected availability of the agricultural waste flow; is the supply of Albizia and Eucalyptus wood chips infinite?
3. At the bottom of page 4-9, first sentence of 4.12, is "...proposed facility's laboratory." Is this correct or is it lavatory?
4. On the last paragraph of page 4-10, line 3 of the second sentence reads "... and the effluent water would treated prior to being ..." Please edit the sentence to read correctly.
5. On page 4-11, please describe/identify the discharge point of effluent back into the Koloa Ditch System. The water intake process or tie-ins are discussed in detail and shown on Figure 2-3. Will the tie-in points also serve as discharge points? Please describe this process.

6. Please discuss any waste by-products of the gasification/thermal oxidation process and the proper disposal of such waste.

Please call Herman Tuiolosega at (808) 586-4185 if you have any questions.

Sincerely,

  
Laurence K. Lau  
Acting Director

c: Michelle Mason, Earth Tech, Inc.

Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kaua`i, Hawai`i  
 Review Comments: Mr. Laurence K. Lau, Acting Director, Office of Environmental Quality Control  
 Date: August 15, 2007

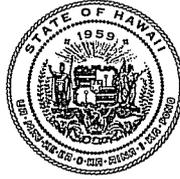
Comment No.	Comment
1	Please correct the spelling of United on USGS on page vi.
Response: Revised as requested.	
2	On chapter 2.0, please discuss the lifetime of the proposed facility and the projected availability of the agricultural waste flow; is the supply of Albizia and Eucalyptus wood chips infinite?
Response: Green Energy Team LLC has a contract with a local tree farmer to provide 195 tons of feedstock per day for 20 years. See revised text in Section 2.1.1.	
3	At the bottom of page 4-9, first sentence of 4.12, is ". . . proposed facility's <u>laboratory</u> ." Is this correct or is it <u>lavatory</u> ?
Response: The correct word is "lavatory"; correction has been made.	
4	On the last paragraph of page 4-10, line 3 of the second sentence reads ". . . and the effluent water <u>would treated</u> prior to being . . ." Please edit the sentence to read correctly.
Response: The correct wording is "would be treated prior to being released"; correction made.	
5	On page 4-11, please describe/identify the discharge point of effluent back into the Kōloa Ditch System. The water intake process or tie-ins are discussed in detail and shown on Figure 2-3. Will the tie-in points also serve as discharge points? Please describe this process.
Response: The text in Section 4.14 has been modified to indicate that the effluent tie-in points would be approximately 50 feet downstream of the influent discharge point.	
6	Please discuss any waste by-products of the gasification/thermal oxidation process and the proper disposal of such waste.
<p>Response: Gasification is considered by many experts to be one of the most efficient technology/process available for converting solid biomass fuel (wood chips) into usable energy. Several key benefits of the gasification process include low particulate emissions due to a precisely controlled air flow via computer controls and a high flame temperature (2,100 °F +) in the boiler. The flame has a sufficient residence time in the boiler to destroy a greater amount of volatile organic emissions compared to other types of combustion systems. Other types of combustion system (i.e., stokers or straight combustion) cannot generate nor maintain very high flame temperature. This is primarily due to the design of those systems and the large amounts of excess air used in them.</p> <p>Since the gasification process produces lower particulate emissions compared to other traditional types of biomass combustion units, a simple mechanical (multi-cyclone) can be utilized to capture a majority of the particulates leaving the plant. However, to further reduce the particulate emissions from the plant, Green Energy has selected an ESP, or Electrostatic Precipitator to be designed into the system. The ESP is considered to be one of the most efficient processes for removing particulates from the exhaust stream. The ESP is capable of collecting 95% or better of the particulates in the exhaust stream.</p> <p>This information and a table comparing emissions from Chiptec's gasification/thermal oxidation units have been added to the Final EA in Section 2.1.2 and Table 4-1.</p> <p>Beyond the air emissions noted above, solid waste by-products in the form of toxic ash are not found. In fact, the non-toxic wood ash resulting from the process represents about 1.5% of the original feedstock tonnage introduced into the system, and is to be used by Hawaiian Mahogany as a fertilizer for its tree plantations. This outstanding "closed loop" application demonstrates Green Energy's ambition to be an outstanding sustainable energy provider in an environmentally friendly way.</p>	



Response to Comments Received the State of Hawaii Department of  
Health Environmental Planning Office



LINDA LINGLE  
GOVERNOR OF HAWAII



CHIYOME L. FUKINO, M.D.  
DIRECTOR OF HEALTH

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

In reply, please refer to:  
EPO-07-163

September 7, 2007

Ms. Michelle Mason  
Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, Hawaii 96813

Ms. Mason:

SUBJECT: Draft Environmental Assessment for Agriculture Waste-To-Energy Facility  
Koloa, Kauai, Hawaii  
TMK: (4) 2-7-001: 001

Thank you for allowing us to review and comment on the subject application. The document was routed to the various branches of the Department of Health (DOH) Environmental Health Administration. We have the following Wastewater Branch, Clean Water Branch, Safe Drinking Water Branch, Clean Air Branch, and General comments. Also, our Solid and Hazardous Waste Branch will send their comments to you directly.

#### Wastewater Branch

The project is located in the Critical Wastewater Disposal Area (CWDA) where no new cesspools will be allowed.

Our main concern is the treatment and disposal of domestic wastewater that would be generated by the facility. Wastewater treatment and disposal has been briefly addressed by stating that on-site treatment and disposal system such as a septic system will be utilized. We concur with this method of domestic like wastewater.

We recommend that the developer check with our Clean Water Branch on the proposed disposal of process and cooling waters into the Koloa Ditch.

All wastewater plans must meet Department's Rules, HAR Chapter 11-62, "Wastewater Systems." We do reserve the right to review the detailed wastewater plans for conformance to applicable rules. If you have any questions, please contact the Planning & Design Section of the Wastewater Branch at 586-4294.

Clean Water Branch

The Department of Health, Clean Water Branch (CWB), has reviewed the subject document and offers these comments on your project. Please note that our review is based solely on the information provided in the subject document and its compliance with Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at <http://www.hawaii.gov/health/environmental/env-planning/landuse/CWB-standardcomment.pdf>.

1. Any project and its potential impacts to State waters must meet the following criteria:
  - a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.
  - b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.
  - c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).
2. Please call the Army Corps of Engineers at (808) 438-9258 to see if this project requires a Department of the Army (DA) permit. Permits may be required for work performed in, over, and under navigable waters of the United States. Projects requiring a DA permit also require a Section 401 Water Quality Certification (WQC) from our office.
3. You are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55). For the following types of discharges into Class A or Class 2 State waters, you may apply for NPDES general permit coverage by submitting a Notice of Intent (NOI) form:
  - a. Storm water associated with industrial activities, as defined in Title 40, Code of Federal Regulations, Sections 122.26(b)(14)(i) through 122.26(b)(14)(ix) and 122.26(b)(14)(xi).
  - b. Storm water associated with construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. An NPDES permit is required before the start of the construction activities.
  - c. Once through cooling water less than one (1) million gallons per day.

- d. Hydrotesting water.
- e. Construction dewatering effluent.

You must submit a separate NOI form for each type of discharge at least 30 calendar days prior to the start of the discharge activity, except when applying for coverage for discharges of storm water associated with construction activity. For this type of discharge, the NOI must be submitted 30 calendar days before to the start of construction activities. The NOI forms may be picked up at our office or downloaded from our website at:  
<http://www.hawaii.gov/health/environmental/water/cleanwater/forms/genl-index.html>.

- 4. For types of wastewater not listed in Item 3 above, including cooling water greater than one (1) million gallons per day, or wastewater discharging into Class 1 or Class AA waters, you must obtain an NPDES individual permit. An application for an NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. The NPDES application forms may be picked up at our office or downloaded from our website at <http://www.hawaii.gov/health/environmental/water/cleanwater/forms/indiv-index.html>.
- 5. You must also submit a copy of the NOI to the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD), or demonstrate to the satisfaction of the CWB that SHPD has or is in the process of evaluating your project. Please submit a copy of your request for review by SHPD or SHPD's determination letter for the project along with your NOI or NPDES permit application, as applicable.
- 6. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of \$25,000 per day per violation.

If you have any questions, please visit our website at <http://www.hawaii.gov/health/environmental/water/cleanwater/index.html>, or contact the Engineering Section, CWB, at 586-4309.

#### Safe Drinking Water Branch

The document states that there is no infrastructure currently within the project area. It further states that the project expects to employ a staff of approximately 30 (9 per shift 24 hour seven day per week operation). These numbers would qualify the facility as a non-transient non-community public water system if the project were to be supplied by its own water source for human consumption.

Further, while this document does mention the establishment of a septic system for human waste disposal, it does not mention the disposal of the waste products from the operation of the proposed demineralization processes necessary to treat the surface water for the boilers.

In view of the lack of these discussions, we submit the following standard comments to cover the possibilities that; 1) a new public water system will be established and 2) underground injection facilities will be employed for the disposal of water demineralization effluents/wastes.

### Clean Air Branch

#### **A Project that May Require an Air Pollution Control Permit**

The project must comply with all applicable Air Pollution Control Permit conditions and requirements.

#### **Control of Fugitive Dust**

Fugitive dust emissions occur during all phases of construction and operations. Activities close to existing residences, businesses, public areas or thoroughfares can cause dust problems. For cases involving mixed land use, we strongly recommend that buffer zones be established, wherever possible, in order to alleviate potential nuisance problems. We recommend that the contractors operate under a dust control management plan. The plan does not require the Department of Health approval, however it will help with identifying and minimizing the dust problems from the proposed project.

Examples of measures that can be included in the dust control plan are:

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

All activities must comply with the provisions of Hawaii Administrative Rules, §11-60.1-33 on Fugitive Dust. If you have any questions, please contact the Clean Air Branch at 586-4200.

Ms. Mason  
September 7, 2007  
Page 5

General

We strongly recommend that you review all of the Standard Comments on our website: [www.state.hi.us/health/environmental/env-planning/landuse/landuse.html](http://www.state.hi.us/health/environmental/env-planning/landuse/landuse.html). Any comments specifically applicable to this project should be adhered to.

If there are any questions about these comments please contact Jiakai Liu with the Environmental Planning Office at 586-4346.

Sincerely,



KELVIN H. SUNADA, MANAGER  
Environmental Planning Office

c: EPO  
WWB  
CWB  
SDWB  
CAB

Attachment: Safe Drinking Water Branch Standard Comments



# Safe Drinking Water Branch Standard Comments

August 21, 2007

## Safe Drinking Water Branch

The Safe Drinking Water Branch administers programs in the areas of: 1) public water systems; 2) underground injection control; and 3) groundwater protection. Our general comments on projects are as follows.

### **Public Water Systems**

- Federal and state regulations define a public water system as a system that serves 25 or more individuals at least 60 days per year or has at least 15 service connections. All public water system owners and operators are required to comply with Hawaii Administrative Rules, Title 11, Chapter 20, titled Rules Relating to Potable Water Systems.
- All new public water systems are required to demonstrate and meet minimum capacity requirements prior to their establishment. This requirement involves demonstration that the system will have satisfactory technical, managerial and financial capacity to enable the system to comply with safe drinking water standards and requirements.
- Projects that propose development of new sources of potable water serving or proposed to serve a public water system must comply with the terms of Section 11-20-29 of Chapter 20. This section requires that all new public water system sources be approved by the Director of Health prior to its use. Such approval is based primarily upon the submission of a satisfactory engineering report which addresses the requirements set in Section 11-20-29.
- The engineering report must identify all potential sources of contamination and evaluate alternative control measures which could be implemented to reduce or eliminate the potential for contamination, including treatment of the water source. In addition, water quality analyses for all regulated contaminants, performed by a laboratory certified by the State Laboratories Division of the state of Hawaii, must be submitted as part of the report to demonstrate compliance with all drinking water standards. Additional parameters may be required by the Director for this submittal or additional tests required upon his or her review of the information submitted.
- All sources of public water systems must undergo a source water assessment which will delineate a source water protection area. This process is preliminary to the creation of a source water protection plan for that source and activities which will take place to protect the source of drinking water.

- Projects proposing to develop new public water systems or proposing substantial modifications to existing public water systems must receive approval by the Director of Health prior to construction of the proposed system or modification. These projects include treatment, storage and distribution systems of public water systems. The approval authority for projects owned and operated by a County Board or Department of Water or Water Supply has been delegated to them.
- All public water systems must be operated by certified distribution system and water treatment plant operators as defined by Hawaii Administrative Rules, Title 11, Chapter 11-25 titled; Rules Pertaining to Certification of Public Water System Operators.
- All projects which propose the use of dual water systems or the use of a non-potable water system in proximity to an existing potable water system to meet irrigation or other needs must be carefully design and operate these systems to prevent the cross-connection of these systems and prevent the possibility of backflow of water from the non-potable system to the potable system. The two systems must be clearly labeled and physically separated by air gaps or reduced pressure principle backflow prevention devices to avoid contaminating the potable water supply. In addition backflow devices must be tested periodically to assure their proper operation. Further, all non-potable spigots and irrigated areas should be clearly labeled with warning signs to prevent the inadvertent consumption on non-potable water. Compliance with Hawaii Administrative Rules, Title 11, Chapter 11-21 titled; Cross-Connection and Backflow Control is also required.
- All projects which propose the establishment of a potentially contaminating activity (as identified in the Hawai`i Source Water Assessment Plan) within the source water protection area of an existing source of water for a public water supply should address this potential and activities that will be implemented to prevent or reduce the potential for contamination of the drinking water source.
- For further information concerning the application of capacity, new source approval, operator certification, source water assessment, backflow/cross-connection prevention or other public water system programs, please contact the Safe Drinking Water Branch at 586-4258.

### **Underground Injection Control (UIC)**

- Injection wells used for the subsurface disposal of wastewater, sewage effluent, or surface runoff are subject to environmental regulation and permitting under Hawai`i Administrative Rules, Title 11, Chapter 11-23, titled Underground Injection Control (UIC). The Department of Health's approval must be first obtained before any injection well construction commences. A UIC permit must be issued before any injection well operation occurs.
- Authorization to use an injection well is granted when a UIC permit is issued to the injection well facility. The UIC permit contains discharge and operation limitations, monitoring and

reporting requirements, and other facility management and operational conditions. A complete UIC permit application form is needed to apply for a UIC permit.

- A UIC permit can have a valid duration of up to five years. Permit renewal is needed to keep an expiring permit valid for another term.

For further information about the UIC permit and the Underground Injection Control Program, please contact the UIC staff of the Safe Drinking Water Branch at 586-4258.

### **Groundwater Protection Program**

- Projects that propose to develop a golf course are asked to use the Guidelines Applicable to Golf Courses in Hawai'i (Version 6) in order to address certain groundwater protection concerns, as well as other environmental concerns.



Mr. Kelvin Sunada, Manager  
State of Hawaii Department of Health  
Environmental Planning Office  
P.O. Box 3378  
Honolulu, HI 96801-3378

Subject: Draft Environmental Assessment (EA), Agriculture Waste-to-Energy Facility, Kōloa, Kaua'i,  
Hawai'i, TMK: (4) 2-7-001:001

Dear Mr. Sunada,

Thank you for your comments on the Draft EA for the proposed Agriculture Waste-to-Energy Facility.  
Responses to comments contained in your letter are summarized below:

The domestic wastewater would be properly treated and disposed via a septic system. Additional information on the system has been added to the Final EA.

No wastewater from any demineralization processes is proposed. The effluent water will be properly treated via a ultrafiltration process prior to discharge. Additional effluent information has been added to the Final EA.

We thank you for the information on mitigations measures for fugitive dust. These have been added to the Final EA.

With regards to your comments about applicable permits and applications, the proponent, Green Energy Team LLC, intends to continue to work closely with your various branches to ensure that all applicable permits and applications are obtained.

Sincerely,



Michelle Mason  
Project Manager



## Response to Comments Received from Kōloa Community Association



**Koloa Community Association  
PO Box 1313  
Koloa, HI 96756**

September 6, 2007

Michelle Mason, Project Manager  
Earth Tech  
841 Bishop Street, Suite 500  
Honolulu, HI 96813

RE: Project No. 98108 – Agriculture Waste to Energy Facility, Koloa Kauai  
Green Energy Team LLC

Mrs. Mason,

The Koloa Community Association was provided a copy of the Draft Environmental Assessment from the Kauai Planning Department very recently and was asked to comment on this application. This draft was circulated to our board of directors for comment.

The Proponent, Green Energy Team LLC, made no presentation to the Koloa Community Association so we are very much not familiar with the specifics of the project compared to the immediate landowners. We believe that our community would be very interested in this project and have many more questions about it, particularly our Omao residents who are directly downwind from this activity that includes not only the plant but the wood chipping activity at the area they would be harvesting.

We are familiar with Mr. Bill Cowern of Hawaiian Mahogany Inc. and his leasing of Knudsen land for the growing of the Albizia trees for fuel and respect his knowledge in this area.

The purpose of this facility is to produce electrical power for use by island residents from a local, renewable, and sustainable non-fossil fuel source. The outcome will be a reduction of dependence on imported fossil fuels. The facility is intended to help put KIUC in compliance with a State law that mandates that utilities provide at least 20% of its energy from renewable sources.

The project is on a parcel of 64 acres however it is not clear whether it is only limited to this area or whether the chipping will extend into the areas outside of this parcel that are closer to residential areas.

We note that we have no way to tell whether this plant is sufficient economically to handle the product in the field or whether this plant will need to be upsized later.

We note that the plant will emit over 109 tons per year of NOx which is considered and is considered a major source of this pollutant.

The second biggest concern was the water aquifer which is highly vulnerable to contamination.

Other concerns regarding noise, traffic, views from the scenic Kaumualii highway, alternative sites, becoming garbage to energy facility were expressed by members.

We support the concept of this project, but are still concerned about the environmental impacts and need to make sure that all of these are addressed. We do not think that they are addressed enough and ask that further analysis by way of an EIS be done.

Thank you,

Louis Abrams, President

Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi, Hawaiʻi

Review Comments: Louis Abrahams, President, Kōloa Community Association

Date: September 6, 2007

Comment No.	Comment
1	<p>The Kōloa Community Association was provided a copy of the Draft Environmental Assessment from the Kauaʻi Planning Department very recently and was asked to comment on this application. This draft was circulated to our board of directors for comment.</p> <p>The Proponent, Green Energy Team LLC, made no presentation to the Kōloa Community Association so we are very much not familiar with the specifics of the project compared to the immediate landowners. We believe that our community would be very interested in this project and have many more questions about it, particularly our Omao residents who are directly downwind from this activity that includes not only the plant but the wood chipping activity at the area they would be harvesting.</p>
<p>Response: A representative of the proponent, Green Energy LLC, subsequently contacted you and presented the project to you at your board meeting on September 20, 2007. As shared with you then, Green Energy is committed to the overall reduction of fossil fuels historically and currently being used. This project will greatly assist the membership of the KIUC cooperative to comply with the State mandate. Green Energy's vision is to provide outstanding renewable energy solutions for the benefit of all residents of Kauaʻi.</p>	
2	<p>We are familiar with Mr. Bill Covern of Hawaiian Mahogany Inc. and his leasing of Knudsen land for the growing of the Albizia trees for fuel and respect his knowledge in this area.</p>
<p>Response: Comment noted.</p>	
3	<p>The purpose of this facility is to produce electrical power for use by island residents from a local, renewable, and sustainable non-fossil fuel source. The outcome will be a reduction of dependence on imported fossil fuels. The facility is intended to help put KIUC in compliance with a State law that mandates that utilities provide at least 20% of its energy from renewable sources.</p>
<p>Response: Comment noted. Green Energy is committed to the overall reduction of fossil fuel currently being used on the island. This project will greatly assist the membership of the KIUCs cooperative to comply with the State mandate. Green Energy's vision is to provide outstanding renewable energy solutions for the benefit of all residents of Kauaʻi.</p>	
4	<p>The project is on a parcel of 64 acres however it is not clear whether it is only limited to this area or whether the chipping will extend into the areas outside of this parcel that are closer to residential areas.</p>
<p>Response: As indicated in Section 2.1.1 of the Draft EA, approximately 30% of the feedstock would be chipped at the planting locations to reduce bulkiness. All wood chippings would be conducted in areas that are not adjacent to residential areas to avoid any noise impacts. Three tree line buffers would also be planted as an additional noise mitigation measure. Figure 4-6 and Figure 4-7 present the proposed tree line buffers. Landscaping with native or indigenous species would also be implemented during the construction phase of the project using seed bank/plant stock from the <i>ahupua`a</i> to the best extent possible. This will assist in further blending the facility into the natural environment and reducing both noise and visual impacts. These mitigation measures have been added to Final EA.</p>	
5	<p>We note that we have no way to tell whether this plant is sufficient economically to handle the product in the field or whether this plant will need to be upsized later.</p>
<p>Response: There are no future plans to upsize the plant. If there were, the proper environmental review process would be conducted.</p>	
6	<p>We note that the plant will emit over 109 tons per year of NO<sub>x</sub> which is considered and is considered a major source of this pollutant.</p>
7	<p>The second biggest concern was the water aquifer which is highly vulnerable to contamination.</p>

Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi, Hawaiʻi  
 Review Comments: Louis Abrahams, President, Kōloa Community Association  
 Date: September 6, 2007

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Response: Mitigation measures have been added to Section 4.14 to indicate that the plant would be operated in accordance with a Spill Prevention, Control and Countermeasures (SPCC) Plan which would outline best management practices and spills prevention procedures. Green Energy LLC is committed to preventing discharges to the environment, and maintaining the highest standards for SPCC through regular review, updating, and implementation of this SPCC Plan for the facility. Full approval and implementation of the SPCC Plan is extended by Green Energy Team LLC management, at a level with authority to commit the necessary resources.

8	Other concerns regarding noise, traffic, views from the scenic Kaumualiʻi highway, alternative sites, becoming garbage to energy facility were expressed by members.
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Response: See responses to all the comments above which address these concerns. In addition, a rendering of the visual plane from the highway has been included as Figure 4-5 in the Final EA. It should also be noted that this facility is not designed to accommodate garbage.

9	We support the concept of this project, but are still concerned about the environmental impacts and need to make sure that all of these are addressed. We do not think that they are addressed enough and ask that further analysis by way of an EIS be done.
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Response: During the environmental review process, analysis of impacts was conducted. There are no anticipated long-term adverse impacts identified which would constitute the preparation of an environmental impact statement. The Office of Environmental Quality Control reviewed the Draft EA and made no mention for the need to prepare an EIS in the comments received (see their comments with responses in the Final EA).

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## Response to Comments Received from the Kahili Farm LLC



Kahili Farm LLC  
P.O. Box 670  
Koloa, Hi. 96756  
Ph: (808) 245-7575, Fax: (808) 245-9237

September 6, 2007

Ms. Michelle Mason, Task Manager  
Earth Tech, Inc.  
841 Bishop Street, Suite 500  
Honolulu, Hawaii 96813

Re: Draft Environmental Assessment, Agriculture Waste-to-Energy Facility,  
Koloa, Kauai, Hawaii

Dear Ms. Mason,

Thank you for sending Kahili Farm LLC a copy of the draft EA for the proposed Agriculture Waste-to-Energy Facility in Koloa. I appreciate the opportunity to comment on the Draft EA. Please note that I wrote to Eric Knutzen on October 31, 2006. This was the only letter of support included in the Draft EA. It was based on the representations made by Eric Knutzen over several meetings and phone conversations. We are adjoining property owners, TMK: (4) 2-7-001-004. We own unit B in the Kahili Mountain Farms CPR. Our property is down wind of the proposed project. Unit B is owned by Kahili Farm LLC. Our LLC has not voted on the new proposal which changes from leasing six acres of the subject parcel to the purchase of the entire 64 acres of TMK: (4) 2-7-1-1. However, I have noted several points in the Draft EA, which were not included but represented to Kahili Farm LLC members. Please note the following:

1. There is no mention that the site would only be allowed to process only wood chips and other organic feed-stock into electricity. Our support was conditional as noted in our letter dated October 31, 2006. We supported the project as long as no fossil fuels, solid wastes or other alternative fuels would be utilized. It has been represented to us by Eric Knutzen, that there would be no plans to expand the scope of the location to include the utilization of solid waste to energy. If the Agricultural Waste to Energy plant is approved, we do not want to see this as the first step in approval for a second plant that would convert solid waste to energy. We want to see a written agreement that would run with the land, which confirms that no solid waste would be utilized as a source of electrical energy on this proposed

2. The Draft EA makes a serious miscalculation in the distance to the nearest house. Our LLC owns a home that is approximately .8 miles from the proposed facility. We also own three additional homes in the area and have building permits for four more homes.

Our unit B will have a total of 8 homes in the next two years. Could you please verify the distance to our closest home.

3. Eric Knutzen has assured us that they will do everything he can to mitigate the negative effect of this commercial operation. Yet, we noted that there was no mention in the EA of one of the mitigating measures presented to us. We were told that the tree farm operation East of our property, would alternatively harvest different rows of trees in order to allow for a noise buffer to be maintained between our property and the proposed facility. We would like to see this included into Green Energy's proposal.

4. Earth berms have been suggested at a height of 5 feet to 11 feet. Eric Knutzen assured us, that he would adjust the height of the berm to whatever was necessary to mitigate the effects of their operation. We would like to see a sound study to determine if we will be able to hear the operation from our nearest home.

5. We indicated that one of our main concerns is the Particulate Matter emissions that were represented to be approximately .21 lb. to .25 lbs. per ton of Albiza chips. The Table 4-3, Modeled Maximum Project Impacts notes particulate emissions. We could not determine if the data shown in the table corresponds with the representations made by Green Energy. Could you please verify this?

6. We support the interest in developing the biomass plant but want to be assured that the representations made and the noise and emission impacts are sufficient to address our concerns for maintaining the rural nature of our homes in the area.

If you have any questions, please feel free to call me.

Sincerely,

Bob White  
Kahili Farm Member

Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi, Hawaiʻi  
 Review Comments: Bob White, Kahili Farm LLC  
 Date: September 6, 2007

Comment No.	Comment
1	<p>Thank you for sending Kahili Farm LLC a copy of the draft EA for the proposed Agriculture Waste-to-Energy Facility in Kōloa. I appreciate the opportunity to comment on the Draft EA. Please note that I wrote to Eric Knutzen on October 31, 2006. This was the only letter of support included in the Draft EA. It was based on the representations made by Eric Knutzen over several meetings and phone conversations. We are adjoining property owners, TMK: (4) 2-7-001-004. We own unit B in the Kahili Mountain Farms CPR. Our property is down wind of the proposed project. Unit B is owned by Kahili Farm LLC. Our LLC has not voted on the new proposal which changes from leasing six acres of the subject parcel to the purchase of the entire 64 acres of TMK: (4) 2-7-1-1. However, I have noted several points in the Draft EA, which were not included but represented to Kahili Farm LLC members. Please note the following:</p> <p>There is no mention that the site would only be allowed to process only wood chips and other organic feed-stock into electricity. Our support was conditional as noted in our letter dated October 31, 2006. We supported the project as long as no fossil fuels, solid wastes or other alternative fuels would be utilized. It has been represented to us by Eric Knutzen, that there would be no plans to expand the scope of the location to include the utilization of solid waste to energy. If the Agricultural Waste to Energy plant is approved, we do not want to see this as the first step in approval for a second plant that would convert solid waste to energy. We want to see a written agreement that would run with the land, which confirms that no solid waste would be utilized as a source of electrical energy on this proposed.</p>

Response: We appreciate your comments on the Draft EA. It needs to be noted that the conversion of fossil fuels, solid wastes, or other alternative fuels is not planned for in the future; this proposed action is strictly for the conversion of wood chips and other organic feed stock to be converted into energy. It is not the desire of Green Energy Team LLC to develop any energy except for agriculture waste-to-energy. If another entity were to propose another type of waste-to-energy plant on the island of Kauaʻi, they would be required to conduct their own environmental review process to analyze the potential impacts.

2	<p>The Draft EA makes a serious miscalculation in the distance to the nearest house. Our LLC owns a home that is approximately .8 miles from the proposed facility. We also own three additional homes in the area and have building permits for four more homes. Our unit B will have a total of 8 homes in the next two years. Could you please verify the distance to our closest home.</p>
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Response: Comment noted. The approximate distance has been re-evaluated and now reported as 0.84 miles. However, the impacts would not change, as this is still a distance that noise and air emissions to the affected area would not cause adverse impacts. Please refer to Sections 4.1 and 4.8 of the Final EA for the impacts anticipated for air quality and noise, respectively.

3	<p>Eric Knutzen has assured us that they will do everything he can to mitigate the negative effect of this commercial operation. Yet, we noted that there was no mention in the EA of one of the mitigating measures presented to us. We were told that the tree farm operation East of our property, would alternatively harvest different rows of trees in order to allow for a noise buffer to be maintained between our property and the proposed facility. We would like to see this included into Green Energy's proposal.</p>
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Response: The proposed action is to harvest alternative rows of the Albizia and Eucalyptus trees to assist with a noise and visual buffer to mitigate any impacts. This information is found in Sections 4.8 and 4.13 of the Final EA. It should also be noted that the Eucalyptus trees are reliant on the Albizia trees for nitrogen, a vital component to their cultivation. Therefore, the trees would be cultivated and harvested in a manner that supports this vital ecosystem.

4	<p>Earth berms have been suggested at a height of 5 feet to 11 feet. Eric Knutzen assured us, that he would adjust the height of the berm to whatever was necessary to mitigate the effects of their operation. We would like to see a sound study to determine if we will be able to hear the operation from our nearest home.</p>
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Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi, Hawaiʻi  
 Review Comments: Bob White, Kahili Farm LLC  
 Date: September 6, 2007

Response: The noise prediction was made without considering any potential reduction from the construction of earth berms. Therefore the prediction is conservative and it still shows that the noise to be generated from facility operations would unlikely result in significant noise impacts and no mitigation measures such as the construction of earth berms would likely be warranted. However, the applicant still proposes to construct berms around the facility, as indicated in the EA, to ensure a further reduction of noise. The height of the berms has been revised to 5 feet at the south side of the facility to 12 feet (versus 11 feet) at the north end. Three tree line buffers would also be planted as an additional noise mitigation measure. Figure 4-6 and Figure 4-7 present the proposed tree line buffers. Please note that even without the implementation of the mitigation measures (e.g., constructed berms, landscaping, etc.), the noise level at the property boundary would only be 45 dBA, which is below the most stringent permissible sound level.

The purpose of the EA noise analysis is to evaluate whether the potential noise resulting from the facility operations would be significant using the most stringent stationary source permissible levels established by the state noise control ordinance to protect various land uses. If the facility will be in compliance with such ordinance, it can be concluded that such facility would not result in significant noise impact and no mitigation measures and study would be required.

A qualitative analysis of noise sources and impacts predict that noise levels would comply with state noise ordinances at the property boundary.

5	We indicated that one of our main concerns is the Particulate Matter emissions that were represented to be approximately .21 lb. to .25 lbs. per ton of Albiza chips. The Table 4-3, Modeled Maximum Project Impacts notes particulate emissions. We could not determine if the data shown in the table corresponds with the representations made by Green Energy. Could you please verify this?
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Response: The boiler is designed to burn approximately 4.3 tons of wood chips per hour, with a maximum particulate matter emission rate of 1.25 pounds per hour. This is equivalent to a particulate emission rate of approximately 0.29 lbs per ton of Albizia chips.

6	We support the interest in developing the biomass plant but want to be assured that the representations made and the noise and emission impacts are sufficient to address our concerns for maintaining the rural nature of our homes in the area.
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Response: Green Energy LLC is committed to the environment and maintaining the rural nature of the island of Kauaʻi. It is the rural environment that enables this environmentally friendly technology to be enabled on Kauaʻi. The mitigation measures for noise and air emissions detailed in the Final EA would be implemented. Cooperation and communication with the affected community will continue during project development to ensure that any adverse impacts to adjacent landowners are adequately mitigated.

Response to Comments Received from Mrs. Elizabeth Knudsen Toulon



Project Title: Draft EA for Agriculture Waste-to-Energy Facility, Kōloa, Kauaʻi, Hawaiʻi  
 Review Comments: Mrs. Elizabeth Knudsen Toulon  
 Date: September 6, 2007

Comment No.	Comment
1	<p>Thank you for this opportunity to provide comments to the draft EA for this proposed facility.</p> <p>Please note that TMK 2-7-1-1, the proposed site for the facility, currently is not owned by Green Energy Team, but rather by the Eric A. Knudsen (EAK) Trust.</p>
Response: Comment noted.	
2	<p>Please note that the distance to the nearest existing residence is not 1.3 miles, as stated on page 4-7 of the EA, but rather approximately .84 miles.</p>
Response: Comment noted. The Final EA reflects this distance.	
3	<p>Please note that the EAK Trust property adjacent to the proposed facility (TMK 2-8-1-3) also has residential density for at least five residences. The noise and emissions impact and proposed mitigating measures for this neighboring parcel were not addressed in the EA.</p>
<p>Response: The Final EA will reflect the changes of distance from the nearest residence from 1.3 miles to 0.84 miles. The noise prediction was made without considering any potential reduction from the construction of earth berms. Therefore the prediction is conservative and it still shows that the noise to be generated from facility operations would unlikely result in significant noise impacts and no mitigation measures such as the construction of earth berms would likely be warranted. However, the applicant still proposes to construct berms around the facility, as indicated in the EA, to ensure a further reduction of noise. The height of the berms has been revised to 5 feet at the south side of the facility to 12 feet (versus 11 feet) at the north end. Three tree line buffers would also be planted as an additional noise mitigation measure. Figure 4-6 and Figure 4-7 present the proposed tree line buffers. In order to evaluate how effectively the berms will work on noise reduction, a field noise measurement program can be implemented at those closely located residential houses prior to and after the construction of the facility, if necessary. Again, it should be noted that even without the implementation of the mitigation measures (e.g., constructed berms, landscaping, etc.), the noise level at the property boundary would only be 45 dBA at the property boundary, which is below the most stringent permissible sound level. Green Energy is committed to the environment as well as local affairs and interests. Landscaping with native or indigenous species would also be implemented during the construction phase of the project using seed bank/plant stock from the <i>ahupua`a</i> to the best extent possible. This would assist in further blending the facility into the natural environment and reducing both noise and visual impacts.</p> <p>The purpose of the EA noise analysis is to evaluate whether the potential noise resulting from the facility operations would be significant using the most stringent stationary source permissible levels established by the state noise control ordinance to protect various land uses. As the facility will be in compliance with such ordinance, it can be concluded that the facility would not result in significant noise impact and therefore no mitigation measures would be required. A qualitative analysis of noise sources and impacts predict that noise levels would comply with state noise ordinances at the property boundary.</p> <p>In addition, mitigation measures for air emissions were designed into the project through the use of best available control technology as well as an inherently low-emitting generating technology to minimize emissions.</p> <p>It should be noted that Green Energy is committed to decreasing emissions, and also to providing an outstanding renewable energy solution which would reduce the island's dependency and use of fossil fuels. Green Energy also recognizes that the United States Environmental Protection Act's Clean Energy Programs are working with state policy makers, electric and gas utilities, energy customers, and other key stakeholders for clean energy. By identifying, designing and implementing clean energy policy and technology solutions, the EPA maintains that clean energy delivers important environmental and economic benefits. Moreover, renewables are sustainable energy resources: they avoid depletion of natural resources for future generations.</p>	
4	<p>Agriculture advisors have recommended that parcel 2-8-1-3 could be utilized for taro production, because the climate is similar to Hanalei valley, and there is abundant irrigation water available to this parcel. Demand for taro is high and few agricultural parcels on Kauaʻi are suitable for taro production. Residences on farms are highly desirable to deter theft and vandalism of crops as well as to provide housing for farmers. If the noise impact of the proposed facility is not mitigated, the future residential and agricultural value of parcel 2-8-1-3 would be destroyed.</p>

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Response: The EA assessed noise levels were compared to the most stringent permissible noise level established by the state in the noise control ordinance to protect the value of various kinds of land uses around a stationary facility. If such stringent permissible level is not exceeded as predicted in the EA, the value of the surrounding parcels would unlikely be affected.

Also, see response to Comment 3.

5	Please note on page 4-7 of your report, you state that the “outdoor continuous noise sources on the proposed project site would involve the operation of one front end loader with 80 dBA source strength and one wood chipper with 82 dBA strength at the same time.” The EA does not state what the combined dBA would be for these two continuous (24/7) noise sources.
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Response: The combined level from these two sources will be 84 dBA (82 dBA + 80 dBA logarithmically). This level was further used to predict the level at the nearest residence due to the distance attenuation assuming conservatively that the sound propagation surface is flat and reflective. The text in Section 4.8 has been modified to indicate that the operation of the front-end loader and wood chipper would not be “outdoor continuous noise sources”, but rather “intermittent noise sources” as they would not be run 24 hours a day.

Also, see response to Comment 3.

6	Please include the information which demonstrates that the proposed measures to mitigate the noise pollution would be adequate, not only for the nearest existing residences, but for potential residences on neighboring parcels.
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Response: Based on the EA analysis results, noise levels at the property boundary would comply with the state noise ordinance and no noise mitigation measures are warranted. The mitigation measures discussed in the EA is for demonstration of the commitment of the applicant to further reduce the potential noise impacts in the neighboring parcels regardless of whether a significant noise impact would occur under the proposed action. Therefore, an analysis of the effectiveness of the proposed noise berms to further reduce noise impacts is not required in the EA. However, Green Energy is committed to install such noise berms. Three tree line buffers would also to be planted as an additional noise mitigation measure. Figure 4-6 and Figure 4-7 present the proposed tree line buffers.

Also, see response to Comment 3.

7	The only measures proposed to mitigate the noise pollution are a five foot berm (11 feet on the northern side) with one row of trees on top of the berm. Please include the information that demonstrates that such a berm and single row of trees would be adequate to mitigate the noise pollution to all surrounding and nearby parcels.
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Response: In general, for those residential parcels behind these berms, the berms will interrupt the direct line of sight from the noise sources to the applicable parcels. Therefore, the noise impact on these parcels will be reduced beyond the estimated noise levels. For those parcels that are not located behind these berms, there is essentially no noise reduction that can be achieved by these berms. However, as indicated in the response to the previous comment, the noise mitigation measures are not warranted according to the EA.

Also see response to Comment 3.

8	If a berm and trees cannot sufficiently mitigate the noise generated from the proposed facility, please recommend enclosures or other barriers to diminish the noise so as not to destroy the future usability of neighboring parcels.
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Response: See response to Comment 3.

9	No mention was made in the EA of the effect of wind carrying both noise and emissions. EAK Trust parcel 2-7-1-3 is directly down wind of the proposed facility. This parcel is the location of Kahili Mountain Park and Kahili Adventist School.
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Response: Although meteorological conditions do have certain effects on the sound propagation, these effects are quite complicated and rarely considered in the common practice of making noise prediction. For example, when wind is strong, wind itself creates noise that can hardly be separated from the noise from the facility operations addressed in the EA.

The air concentration levels are the function of the wind direction. However, the dispersion modeling was conducted using the meteorological data that consist of hourly wind condition including various wind directions from time to time. Therefore the downwind effect on the emissions dispersion was considered and reflected in those predicted levels discussed in the EA.

The air quality impact analysis included in the air permit application evaluated the effect of air emissions at all receptors surrounding the facility and demonstrated that the project will not cause any air quality standards to be violated. The air quality standards are set at levels that are protective of public health, so compliance with the air quality standards assures that the emissions from the project will not affect public health in any location. The application for the Covered Source Air Permit has been added as Appendix B to the Final EA. A letter of support from the Kahili Adventist School is included as Appendix D.

10	Has the Green Energy Team considered that a more appropriate site for their facility might be next to the Grove Farm gravel pit? This area is near the proposed site, just to the east. It is easily accessible to both the power lines and to the green waste that is proposed to be harvested. The gravel pit location has natural topography that buffers noise, and it would concentrate noise uses together, to minimize the impact of the facility on the usability of neighboring parcels.
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Response: In discussion with the neighbor parcel owners, it was proposed that the site be moved approximately 1,530 feet north east near the boundary facing the Grove Farm gravel pit as described in this comment. Though Green Energy incurred a significant design cost change to move the site to this location, the site was moved. The Kahili Farm LLC, as a neighboring parcel owner, is pleased with this move of the site as described, and has in fact signed a letter of support for the project (see Appendix D of the Final EA).



