Environmental Impact Statement Preparation Notice

KAHEAWA WIND POWER II
WIND ENERGY GENERATION FACILITY

UKUMEHAME, MAUI, HAWAI‘I

PREPARED FOR:

Kaheawa Wind Power II, LLC

PREPARED BY:

PLANNING SOLUTIONS

DECEMBER 2007

PROJECT SUMMARY

Project:	**Kaheawa Wind Power II**
Applicant	Kaheawa Wind Power II, LLC 8 Kiopaʻa Street, Suite 104 Pukalani, HI 96768 Contact: Mike Gresham Phone: (808) 298-1055
Approving Agency	Office of Conservation and Coastal Lands Department of Land and Natural Resources State of Hawaiʻi P.O. Box 621 Honolulu, HI 96809 Contact: Sam Lemmo Phone: (808) 587-0381
Location	Kaheawa Pastures, Māʻalaea, Ukumehame ahupuaʻa, Lahaina District, Island of Maui
Tax Map Key	4-8-001:001 and 3-6-001:014
Parcel Area	1,387.71 and 3,414 acres
Project Site Area	300-400 acres, depending on final design
State Land Use District	Conservation
County Zoning	Not Applicable (State Conservation District)
Proposed Action	Construction of a new 21-30 MW wind power facility within the State Conservation District. The facility will be adjacent to the existing Kaheawa Wind Power facility above Māʻalaea, Maui, Hawaiʻi.
Associated Actions Requiring Environmental Assessment	Use of Conservation District Lands, use of State-owned land.
Required Permits & Approvals	Conservation District Use Permit, NPDES Construction Permit, PUC Approval, FAA Clearance, Section 10 Incidental Take License
Parties Consulted	The applicant consulted the State Department of Land and Natural Resources Office of Conservation and Coastal Lands, Division of Forestry and Wildlife, Land Division, State Historic Preservation Division, and the U.S. Fish and Wildlife Service during the preparation of this EISPN.
Anticipated Determination	Completion of an Environmental Impact Statement
Consultant	Planning Solutions, Inc. 210 Ward Ave, Suite 330 Honolulu, HI 96814 Contact: Perry White (808) 550-4483

SUMMARY

Kaheawa Wind Power II LLC (KWP II LLC) is proposing to establish a 21-30 megawatt (MW) wind power generating facility and related improvements at Kaheawa Pastures above Māʻalaea, Maui, Hawaiʻi. The proposed wind energy generation facility, Kaheawa Wind Power II (KWP II) would be located primarily west with a possible extension to the east or southeast of the existing 30 MW Kaheawa Wind Power project (hereinafter called KWP I), and like the existing project, it would supply wind-generated electricity to Maui Electric Company Ltd. (MECO). If the required land use approvals and environmental permits are granted, KWP II LLC will:

- Obtain a lease from the State Department of Land and Natural Resources for an approximately 400 acre portion of parcels (2) 4-8-001:001 and (2) 3-6-001:014, contiguous to the existing area leased by KWP I.
- Create new internal service roads that connect the facility to the main KWP I access road.
- Erect fourteen to twenty General Electric (GE) 1.5 MW wind turbine generators (WTGs).
- Install electrical power lines connecting all of the turbines with an electrical substation.[1]
- Install electrical substation and interconnection facilities to connect the plant to the existing MECO power transmission system.
- Install a Battery Energy Storage System (BESS) in the electrical substation.
- Construct a new operations and maintenance building to house operations personnel, equipment and facility spare parts.
- Construct meteorological towers and a communications tower to support data gathering and control functions.

The project is designed to provide a source of affordable, renewable energy to Maui's residents. It would provide economic benefits in the form of cost savings compared to fossil fuel-driven energy, as well as a hedge against future fossil or bio-fuel cost increases when compared to today's avoided costs. It would also provide environmental benefits in the form of reduced emissions of green house gases and other pollutants. The expected life span of the facility is 20 years, after which time the owner will either exercise an option to extend the lease or remove the facilities.

[1] The connection to the substation will either be underground or overhead depending on the final siting areas selected for the WTGs. These are described in detail in Chapter 2.

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1.0 PURPOSE AND NEED

1.1 INTRODUCTION AND OVERVIEW

1.1.1 APPLICANT BACKGROUND

Kaheawa Wind Power II LLC (KWP II LLC) was formed by UPC Hawai‘i Holdings LLC. The latter is comprised of two entities: UPC Wind Partners, LLC, a Boston-based wind energy company, and Makani Nui Associates, LLC, a Maui-based partnership providing local resources for the project.[2] It was created for the express purpose of developing a second increment of wind generation facilities adjacent to the existing Kaheawa Wind Farm above Mā‘alaea, Maui, Hawai‘i (see Figure 1.1). The principals of UPC Wind Partners are among the world's leading wind power developers with extensive experience in financing, constructing, operating and managing large wind energy projects in America and worldwide. In North America, UPC Wind Partners has a portfolio of over 3,000 megawatts (MW) in development.

1.1.2 PROJECT OVERVIEW

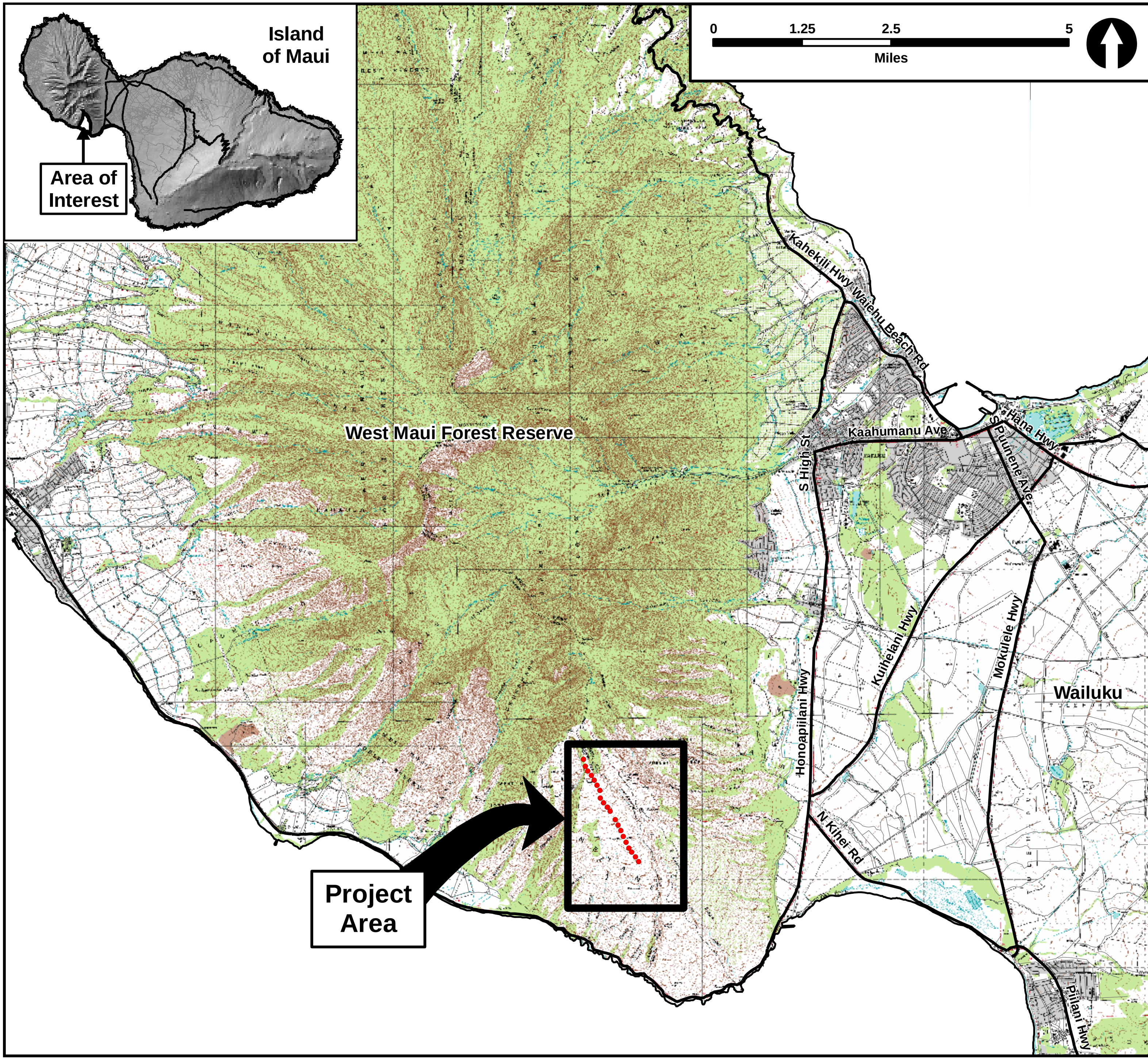
Kaheawa Wind Power II LLC is proposing a new 21-30 MW wind energy generation facility at Kaheawa Pastures. The proposed project, which is known as Kaheawa Wind Power II (KWP II), is situated immediately adjacent to the existing 30 MW Kaheawa Wind Power (KWP I) project, which commenced operation in the summer of 2006.

Like the existing KWP I project, KWP II would supply wind-generated electricity to Maui Electric Company Ltd. (MECO) under the terms of a Public Utilities Commission (PUC) approved power purchase agreement (PPA). KWP II will consist of fourteen to twenty General Electric (GE) 1.5 MW wind turbine generators (WTGs), an operations and maintenance building, underground (and possibly overhead) cables carrying electrical power from the individual wind generators to an electrical substation, a Battery Energy Storage System, a short overhead transmission line connecting the substation with the MECO transmission system, a communications system, wind monitoring equipment, and service roadways to connect the new facilities to the existing main access road serving KWP I.

The exact number and location of turbines will be decided upon once additional meteorological data has been collected that will allow KWP II to better characterize the wind resource, after further discussions have been held with MECO on the design features needed to best integrate the new facilities into the electrical grid, and following completion of the EIS process. Hence, there is no "preferred alternative" at this time. Nonetheless, the information that is currently available allowed KWP II to define the desired range of output for the proposed facility and to eliminate several alternatives from consideration, as described in further detail in Chapter 2.

Under the range of alternatives being considered, twelve to fourteen of the WTGs would be installed in an articulated row roughly parallel to the KWP I turbines 7 through 16, (hereinafter referred to as the "downwind WTGs"), two to four turbines would be installed to the southeast along side of the existing access road (hereinafter referred to as the "down road" string), and the remaining two to four WTGs will be installed at the southern (*makai*) end of the existing KWP I turbines (hereinafter referred to as the "down string" WTGs) as shown on Figure 1.2. An alternate siting area is referred to as the "up wind" string and could contain up to 15 WTGs as shown on Figure 1.2.

[2] The principals of Maui-based Makani Nui Associates are Hilton Unemori of ECM, Inc., an electrical and civil engineering firm in Wailuku, and Kent Smith, formally of Smith Development and currently Senior Partner of KSD Hawaii, a real estate development company located in Makawao. ECM is one of Maui's largest and best known electrical engineering firms, with 28 years of experience in Hawai‘i and extensive interface with Maui Electric Company, Ltd. and its parent company. KSD Hawaii also has ongoing professional relationships with the utilities, as well as 18 years of experience in real estate development, due diligence, entitlements, permitting, financing, and construction management.



Legend:

Existing KWP 1 Turbines

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Prepared By:

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Sources:

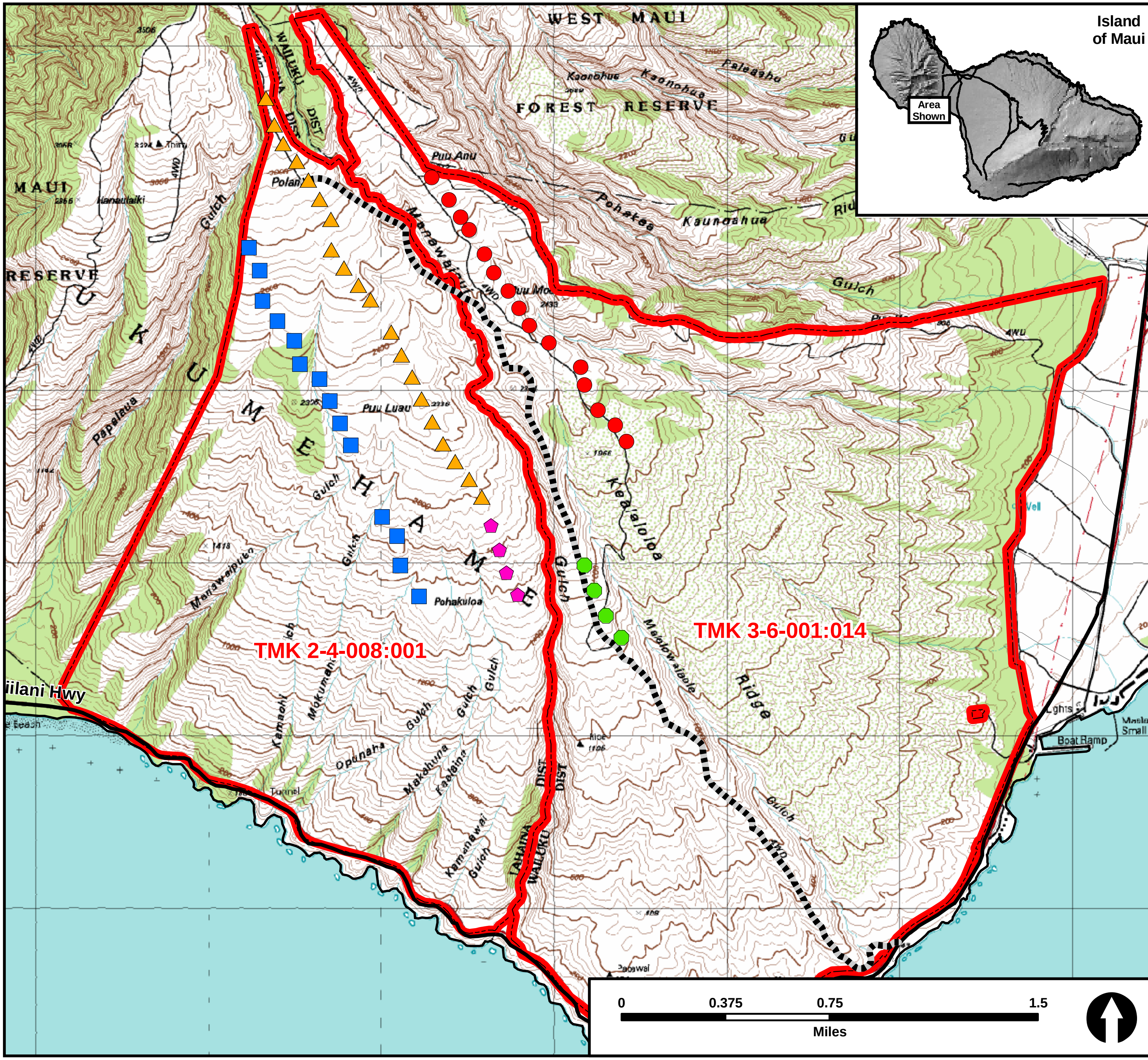
-UPC Wind Management, LLC
-State of Hawai'i GIS

Figure 1.1:

Location Map

Kaheawa Wind Power II

Figure 1-1 Location Map 2007-11-21.mxd



Legend:

- Existing KWP I Turbines
- Highways
- Roadways
- Existing Access Road

Proposed KWP II Sites:

- Upwind Sites
- Downwind Sites
- Downroad Sites
- Downstring Sites

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Sources:

- -UPC Wind Management, LLC
- -State of Hawai'i GIS
- -USGS 7.5' Quad Map

Figure 1.2:

Vicinity Map

Kaheawa Wind Power II

Figure 1- 2 Vicinity Map 2007-11-21.mxd

The remainder of this chapter is divided into the following major parts:

- Section 1.2 explains the purpose of the project and describes the benefits associated with adding wind energy generating capacity to Maui's system.
- Section 1.3 lists the overall objectives that were used to define the proposed action and alternatives.

1.2 PURPOSE & NEED FOR THE PROJECT

Maui Island is presently heavily dependent upon fossil fuels for its electrical energy needs. The purpose of the proposed project is to provide a renewable source of energy that can be substituted for a significant proportion of that energy. As currently proposed, the project will provide an estimated 70,000 to 99,800 megawatt-hours of electricity per year (MWh/year) to MECO's system.[3] This is enough electricity to power about 7,700 to 11,000 average Maui homes (at 750 kilowatt-hours per month). The availability of this power will reduce the environmental costs of energy by replacing a portion of Maui's fossil fuel usage with a clean, renewable resource. The project also converts a portion of the electrical energy generated on Maui to a "local renewable" fuel source, helping the State move toward its goal of energy independence and sustainability. Based on the best available projections of the cost of fossil fuel, it will also provide electricity to Maui's residents at a lower cost than would be possible using fossil fuel. Each of these benefits is discussed in more detail in the following subsections.

1.2.1 CONTRIBUTION TO MECO'S RENEWABLE ENERGY PORTFOLIO

On June 2, 2004, Hawaii's Governor signed Act 95 (Session Laws of Hawai'i 2004) into law. Act 95 replaced the previous renewable portfolio standard (RPS) goal with an enforceable standard. These standards require utilities to make renewable energy generation an increasing percentage of their portfolio:

- 7% of net electricity sales by December 31, 2003;
- 8% of net electricity sales by December 31, 2005;
- 10% of net electricity sales by December 31, 2010;
- 15% of net electricity sales by December 31, 2015; and
- 20% of net electricity sales by December 31, 2020.

The law allows utilities to count existing renewables in the total. It also allows an electric utility company and its electric utility affiliates to aggregate their renewable portfolios in order to achieve the renewable portfolio standard.[4]

MECO estimates that in 2007 it will achieve a Renewable Portfolio Standard of approximately 23%. Approximately one-third of that is expected to come from KWP I, with the bulk of the remainder coming from HC&S and programs encouraging energy savings and efficient technologies such as solar hot water heating. MECO has indicated that it welcomes the opportunity to add more renewable generating capacity to its system and has specifically encouraged the developers of KWP I to explore the possibility of using the area adjacent to the existing facility for further wind energy development (MECO letter dated March 14, 2006). KWP II LLC has since entered into initial discussions with MECO about negotiating a power purchase agreement (PPA) for the proposed KWP II facility.

[3] This conservatively assumes that the turbines operate at an average of 40% capacity over the course of a year. The actual number of megawatt-hours per year (MWh/year) is expected to be somewhat higher than this.

[4] This means that the Hawaiian Electric Company affiliates -- Hawaiian Electric, Maui Electric, and Hawaii Electric Light Company -- may add together their renewable energy numbers to meet the goal.

On April 30, 2007, MECO submitted its latest *Integrated Resource Plan* (*IRP-3*) to the State of Hawai'i Public Utilities Commission (PUC). MECO's "Preferred Plan" calls for the addition of another 10.5 MW of as-available wind generating capacity in 2011 (Figure ES-1 Preferred Plan – Maui Division, page ES-9). The limited amount of new wind generating capacity that is included in the Preferred Plan is largely a function of the system's ability to integrate a variable source such as wind into the islandwide system. The Action Plan in IRP-3 (See Section 12.2 of IRP-3) contains a number of elements aimed at increasing the ability of the system to use more wind energy. MECO has expressed its intention to continue to:

- Work with potential renewable energy project developers.
- Evaluate and install transmission line interconnection requirements, as appropriate, to enable additional renewable energy projects.
- Undertake several tasks designed to mitigate system reliability impacts associated with as-available energy resources so that additional capacity can be considered. These tasks include:
  - Work to design, site, procure, and install electronic shock absorbers (ESA) that will enhance the ability of the transmission system to deal with very short term power supply variations.
  - Conduct an analysis of the Maui Electric system similar to the one that General Electric is now carrying out on the Big Island. As part of the electrical system analysis, the study will evaluate the utilization of available mitigating technology to address the effect of wind variability on grid frequency and the potential impact of additional wind farms being added to the system.[5]

1.2.2 ECONOMIC EFFECTS

Initially, the project would generate economic activity through construction employment and equipment and material sales. Over the long term, its operation will create additional operations and maintenance jobs, business activity (by suppliers), and tax and lease revenues. However, the project's most important economic effect on the island will be to stabilize a portion of the energy fuel cost incurred by MECO as it generates electricity for Maui island residents and businesses by its fixed price contract with MECO.

KWP II LLC forecasts two different kinds of quantifiable economic benefits of the project. One group is associated with the construction of the new capital infrastructure that would be installed as part of the project. The second group has to do with the economic benefits that will result from the reduced outflow of dollars that accompany lower fossil fuel use.

1.2.2.1 Construction of New Infrastructure

The proposed project involves the expenditure of approximately $17M for site construction contracts and services. This will result in local jobs during design, development, and construction. That expenditure will lead to approximately $1,500,000 in state excise tax revenues;

Over the life of the facility, it will also:

- Produce an estimated $6,000,000 of lease revenue to the state for land use;
- Generate approximately $5,000,000 in job-related income (plus the income tax revenues); and
- Lead to an additional $2,000,000 in County property tax revenues (0.2%/yr over 25 years).

1.2.2.2 Effects of Reduced Fossil Fuel Purchases

KWP II LLC estimates that the proposed project would reduce fossil fuel consumption by an estimated 138,000 to 198,000 barrels per year, significantly lowering Maui's dependence on imported

[5] This analysis is intended to help MECO determine the amount of additional intermittent generation the system can accept without unduly impacting the reliability and operability of the island grid. In conjunction with this, the utility is evaluating Pumped Storage Hydro as a means of addressing the intermittency of the wind resource.

fossil fuels.[6] Fossil fuel pricing has historically been volatile, while over time continuing to increase in real terms. The recent past is no exception, with crude reaching its historical inflation adjusted peak price in November of 2007. Fuel prices are subject to fluctuation based on supply and demand conditions as well as political concerns that can affect the long term availability of world supply. While fuel prices will likely increase (but may decrease) over time KWP II LLC estimates that if fuel prices remain constant over the life of the project, the substitution of wind energy for fossil fuel energy will reduce the amount that MECO spends on imported fuel by approximately $100,000,000 (based on oil at $80/barrel and avoided cost at $0.22 per kWh). Reducing the proportion of its energy that comes from fossil fuel would also buffer the system from the energy cost fluctuations that accompany volatile oil prices. The purchase power agreement that KWP II LLC is seeking to negotiate with MECO would provide MECO energy at rates that are below the utility's current avoided costs.[7]

As fuel costs are a significant component of MECO's quarterly avoided cost calculations, those avoided costs can and do fluctuate dramatically. During the third quarter of 2007, MECO's avoided cost was $197 per megawatt-hour during peak use hours and $180/MWh during off-peak hours. As fuel costs go up or down in the future avoided cost as defined by the Public Utility Regulatory Policy Act of 1978 (PURPA) will change proportionately. KWP II LLC's proposal to MECO offers to sell energy to MECO at a fixed price which is <u>not</u> correlated to avoided cost. This pricing structure could save MECO about $5 million annually in fuel costs over the project lifetime as compared to today's PURPA-based avoided cost. The savings could potentially be greater if fossil fuel prices continue to increase over the term of the contract.

1.2.3 ENVIRONMENTAL AND PUBLIC HEALTH BENEFITS

Reducing the consumption of fossil fuel for energy generation by the estimated amount (138,000 to 198,000 barrels per year) will benefit the environment in a number of ways. The most important of these is by reducing air pollutant emissions associated with the combustion of fossil fuels. Additional emission reductions will stem from the elimination of the need to transport petroleum fuels from distant ports to the island. These reductions in fossil fuel consumption would result in the following environmental benefits:

- Avoidance of approximately 107-153 million pounds of carbon dioxide (CO_2) annually emitted into the atmosphere.
- Elimination of approximately 0.75-1.0 million pounds of sulfur dioxide (SO_2) annually emitted into the atmosphere.
- Elimination of approximately 195,000-275,000 pounds of nitrogen oxides (NO_X) annually emitted into the atmosphere.

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[6] This estimate is based on the following: (a) Net capacity factor = 38%; (b) average heat rate for MECO-owned generation = 11,500 BTU/Net kWh; (c) BTU Savings = 803,905-1,148,436 MMBTU/yr; (d) 5.825 MMBTU/BBL of distillate (diesel) fuel oil; and 21 to 30 MW installed capacity.

[7] The term "avoided cost" means the amount that a utility does not have to spend if it obtains power from an outside source rather than from its own facilities. In this instance, it means the operation and maintenance costs (including fuel) that MECO would not incur if it purchases electrical energy from KWP II. The State of Hawai'i Public Utilities Commission will be the ultimate arbiter of that rate. The avoided-cost concept became a public policy tool in the context of energy efficiency. Under the landmark Public Utility Regulatory Policy Act of 1978 (PURPA), electric utilities were required to consider pricing policies and other means of demand management. Frustrated with the high costs of supply-side means of balancing electrical supply with demand, many state regulators provided utilities with incentives for implementing demand-management strategies. PURPA also required electric utilities to consider purchasing power from qualifying facilities (that is, independent producers not primarily engaged in generating or selling electrical power, and meeting other conditions). PURPA requires utilities to compensate Independent Power Producers (IPPs) fairly by paying them the amount the utility avoids having to spend by not having to generate the power themselves (hence the term "avoided cost"). Avoided cost provides the basis of the rate required to be paid to qualifying facilities for purchased power under PURPA. Since PURPA was enacted, electricity production by independent producers and co-generators has been encouraged.

These gases are known to contribute to various undesirable environmental effects including global warming and acid rain. Additionally it has been shown that these gases are detrimental to human health and the health of other living organisms. In general, the elimination of these harmful chemicals should result in reduced health costs and respiratory illnesses, although this benefit is likely to be less important in Hawai‘i than it is in when the wind power allows fossil fuel use in heavily polluted areas to be reduced.

1.3 OVERALL OBJECTIVES OF THE PROPOSED ACTION

Based on the identified needs of its system described above, KWP II LLC has identified the following objectives for the proposed action.

(1) *Bring on-line at the earliest possible date a 21 to 30 MW wind power generating facility on the island of Maui to increase the portion of Maui's energy derived from renewable sources and reduce dependencies on fossil fuels*[8].

(2) *Minimize the cumulative costs, environmental and visual impacts of the new facility by sharing key infrastructure (i.e., access road, equipment parts, construction equipment) with the existing KWP I wind farm.*

(3) *Locate the additional generating capacity in such a way as to minimize the need for additional MECO power interconnection infrastructure, thereby avoiding unnecessary economic and environmental impacts associated with connecting to the MECO system.*

(4) *Ensure that the size and operating characteristics of the new wind farm are compatible with MECO's overall system requirements to facilitate their integration into the company's grid.*

(5) *Locate the wind farm in an area with compatible surrounding land uses.*

(6) *Ensure that the new facility is compatible and compliant with the approvals granted for the KWP I site and all their associated conditions.*

(7) *Maintain environmental quality and contribute to maintaining energy costs at a reasonable level.*

[8] Its preference is for the full 30 MW, but the lesser amount is economically viable if monitoring demonstrates that the wind regime is as anticipated.

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2.0 ALTERNATIVES CONSIDERED

2.1 INTRODUCTION

This chapter describes the physical and operational characteristics of the facilities that will be constructed if the proposed project receives all needed approvals. It also describes the alternative means of achieving the objectives for the proposed action identified in Section 1.3 above.

The description is divided into four major parts.

- Section 2.2 describes the facilities that would comprise the KWP II facility and connect it with the MECO transmission system.
- Section 2.3 discusses the anticipated schedule for the construction of the project.
- Section 2.4 provides preliminary cost estimates for each of the major components.
- Finally, Section 2.5 discusses the alternatives to the proposed action.

2.2 TECHNICAL DESCRIPTION OF THE PROPOSED PROJECT

2.2.1 OVERVIEW

KWP II LLC proposes to construct a new 21 to 30 MW wind power generating facility adjacent to the existing wind farm at Kaheawa Pastures on the island of Maui (see Figure 2.1). If the required land use approvals and environmental permits are granted, KWP II LLC will:

- Obtain a lease from the State Department of Land and Natural Resources for approximately 400 acres of land within parcels (2) 4-8-001:001 and (2) 3-6-001:014. This property is contiguous to the 200-acre area leased for KWP I.
- Construct new internal service roads as needed to connect to the existing main access road.
- Install 14 to 20 General Electric (GE) 1.5 MW wind turbines, including excavation and construction of foundations, and erection of the support towers and transformers. The four areas within which the WTGs may be constructed are shown in Figure 2.2. From left to right the areas (and the number of WTGs that could be accommodated within each) are as follows.
  - *Downwind WTG Siting Area*. This siting area parallels and is approximately 2,000 feet to the west of, the lower end of the string of WTGs that make up KWP I. There is space for up to 14 WTGs in this location.
  - *Down-String WTG Siting Area*. This area is located adjacent to the existing KWP I access road starting just below the existing WTGs. It contains space for two to four WTGs.
  - *Down-Road WTG Siting Area*. This area is located to the east of Manawainui Gulch along the western side of the existing KWP I access road. Stretching from approximately 1,100 feet to 1,300 feet above sea level, this siting area also contains space for two to four WTGs.
  - *Up Wind WTG Siting Area*. This area is located immediately to the east of the existing KWP I project. This is an alternate primary location for up to 15 WTGs. This area runs parallel to the existing KWP I string from approximately 1,250 feet to 3,000 feet above sea level.
- Install an underground electrical collection network connecting all of the turbines, including excavation and burying of all wires and re-vegetation of the disturbed areas.
- Install electrical substation and interconnection equipment to link the facility with the existing MECO power transmission system.

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Kaheawa Wind Power II

Prepared By:

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Source:

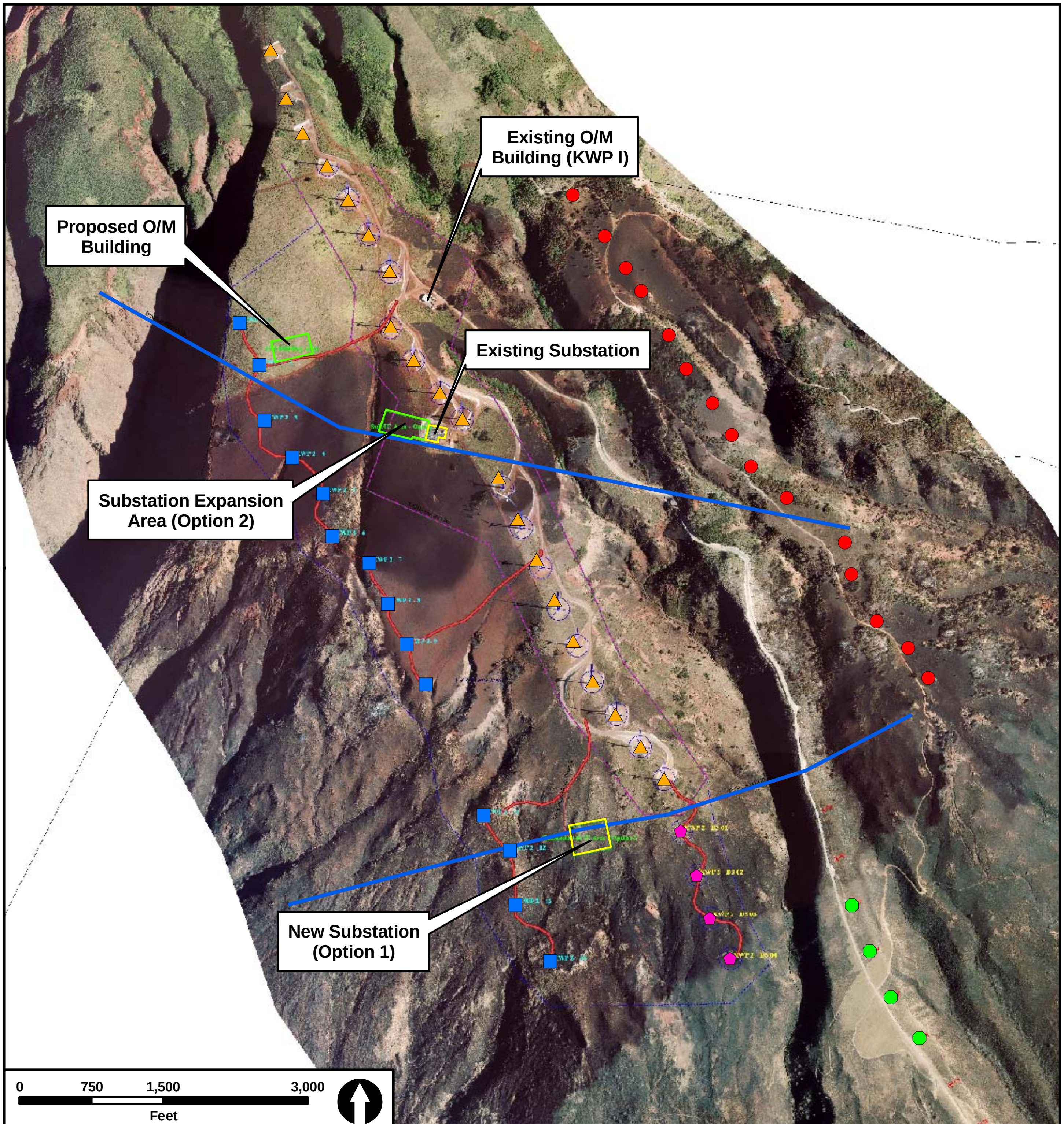
Makani Nui Associates, LLC

Figure 2.1:

Aerial Photo of Project Area

Kaheawa Wind Power II

Figure 2-1 Aerial Photo of Project Area 2007-11-21.cdr



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Source:

UPC Wind Management, LLC

Legend:

Existing KWP I Turbines

Existing MECO Transmission Lines

Proposed KWP II Siting Areas:

Upwind Sites

Downroad Sites

Downwind Sites

Downstring Sites

Figure 2.2:

Siting Areas Being Considered

Kaheawa Wind Power II

Figure 2-2 Siting Areas Being Considered 2007-11-26.mxd

- Install underground cables or an overhead transmission line carrying electrical power from the individual wind generators to the electrical substation. (The overhead line would be needed if KWP elects to use the down-road and/or up-wind siting areas.).
- Construct a new operations and maintenance building to house operations personnel, equipment and facility spare parts.
- Construct a Battery Energy Storage System (BESS) within the footprint of the substation to provide dispatchable energy under various operating conditions. This stored energy will be used to improve the ability of the MECO system to absorb additional as-available wind resources.
- Construct two permanent meteorological towers and a communications tower to support data gathering and control functions.

Installation of the proposed facilities (access roads, WTG pads, substation, and operations and maintenance building) would require disturbance of from 35 to 45 acres. The exact number will depend upon which alternative is implemented. As with KWP I, the property is within the Conservation District and would be leased from the State of Hawaiʻi for wind farm purposes.

Figure 2.3 contains photographs showing conditions on and immediately around the site in early 2006.[9] Access to the site from Honoapiʻilani Highway (State Highway 30) would be from via the existing State-owned road that was improved during construction of KWP I. The proposed 14 to 20-turbine layout would fall within an overall leased area of approximately 400 acres. KWP II LLC would construct improvements on approximately 10 percent of the area it would lease; the remainder would remain undisturbed. Table 2.1 summarizes the area that would be occupied by each of the major components of the proposed project.

Table 2.1. Area Disturbed by Construction of Proposed Facilities

Project Component	***Area Occupied***
14 to 20 turbine foundations, pads, and Service Roads[1]	21 to 30 acres
Operations and Maintenance Facility	3.0 acres
Substation & Interconnection Facility[2]	3.0 acres
Access Roads[3]	8 to 9 acres
TOTAL	35 to 45 Acres

Notes:

(1) Individual foundations occupy approximately 2,500 square feet each; total disturbed area is conservatively estimated as 1.5 acres per turbine.

(2) Estimate assumes a new substation would be constructed. If existing substation is expanded, the disturbance would be less (≤1.5 acre).

(3) Estimate based on 12,000 linear feet of access road and 30-foot wide strip of "disturbance".

Source: KWP II LLC

[9] In September 2006, an extensive brush fire affected a large portion of the West Maui Mountains from the coastal highway to the existing facility, including a large portion of the proposed KWP II site. The existing facility was not the cause of the fire. It was protected from damage by multiple firebreaks and by extensive watering, and the roadways constructed for the project were instrumental in providing firefighting crews access to the fireline.

A. View South across Manawaipueo Gulch.

B. View South down access road towards O/M building.

C. Existing 1.5 MW turbines at KWP I.

D. View South towards proposed KWP II downwind sites.

Prepared For:

Kaheawa Wind Power II

Prepared By:

PLANNING SOLUTIONS

Source:

--Kaheawa Wind Power II (2006-09-09)
--Planning Solutions, Inc. (2006-09-06)
--Makana Nui Associates, LLC

Figure 2.3:

Photographs of Existing Conditions

Kaheawa Wind Power II

Figure 2-3 Photographs of Existing Conditions 2007-11-26.cdr

2.2.2 METEOROLOGICAL MONITORING TOWERS

As previously noted, before settling on the number and exact locations of the WTGs it will construct, KWP II LLC must confirm the wind speed, direction, and persistence within the project area. It will do this using meteorological monitoring equipment similar to that used for KWP I. On July 20, 2007, the State of Hawai‘i Department of Land and Natural Resources approved the Conservation District Use Permit (CDUP) needed to erect four temporary 60-meter guy wire-supported meteorological towers on the KWP II site in order to gather wind speed and direction information (see photograph to left and Figure 2.4). The monitoring towers were erected in September 2007 and are presently collecting data.

In addition, for calibration during normal operations KWP II anticipates erecting two permanent met towers near the new WTGs. The exact location of the permanent towers will depend upon the exact size and layout of the facilities that are eventually constructed. If possible, information concerning the permanent towers will be included in the Final EIS.

2.2.3 WIND TURBINE GENERATORS

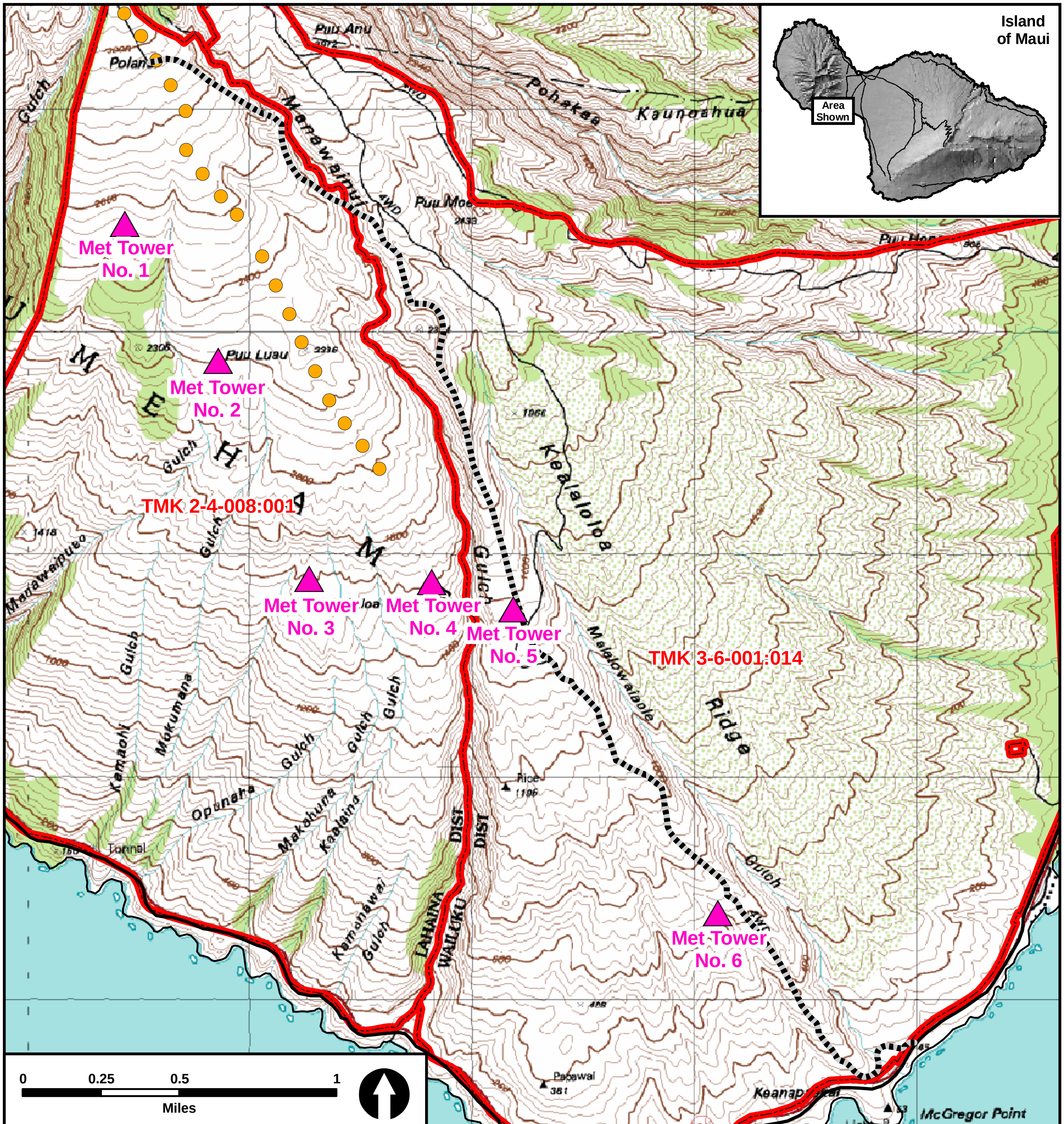
Figure 2.3 contains photographs of the kind of General Electric 1.5 MW WTGs that are proposed. Each of the proposed WTGs has four principal elements. They are 1) a three-bladed rotor which converts the wind's energy into rotational shaft energy; 2) a nacelle that houses a gearbox and a generator; 3) a tower that holds the rotor and drive train above the ground; and 4) electronic equipment at the base of the turbine such as controls, electrical cables, and a transformer.

Rotor. The three-bladed rotor on each WTG has a diameter of approximately 230 feet. When the blade tip is at the top of its arc it extends nearly 300 feet above the ground. The rotors rotate at a rate of between 10 and 21 revolutions per minute depending on wind speed.

Nacelle. The nacelle atop each tower (see Figure 2.5) contains the gear box, low- and high-speed shafts, generator, controller, and brake; it is approximately 12 feet high by 12 feet wide by 27 feet long. The nacelles are mounted on the towers in a manner that enables them to rotate 360-degrees about a vertical axis. Each WTG is equipped with sensors that monitor local wind speed and direction. When the wind speed picks up to within operating range, the sensors cue the WTG to orient itself to face the wind, to switch its rotor from a dormant to an active position, and to commence generating power.

Tower. The conical tubular steel towers supporting each unit will be 180 feet high; they will taper from a diameter of approximately 15 feet at the base to approximately 10 feet at the top. Each tower will contain an internal ladder that allows access to the nacelle and a 450-pound capacity load-lifting system that allows work equipment and parts to be hoisted from the ground to the nacelle. The reinforced concrete foundation supporting each tower is approximately 46 feet square. The exact depth will depend upon the results of geotechnical tests conducted at each of the final tower locations, but will probably on the order of 10 feet below finished grade.

Electronic Equipment. An electronics cabinet inside the base of the tower houses the electric switchgear and related controls. Additionally, a small (approximately 8-foot cube) pad-mounted transformer is located adjacent to the base of each tower to increase the electrical voltage of the energy produced by the generator to 34.5 kilovolts (kV).



Prepared For:

Kaheawa Wind Power II

Prepared By:

PLANNING SOLUTIONS

Sources:

-UPC Wind Management, LLC
-State of Hawai'i GIS
-USGS 7.5' Quad Map

Legend:

- Existing KWP I Turbines
- TMK Boundaries
- Access to Kaheawa Wind Power II Site
- Highways
- Roadways

Figure 2.4:

Temporary Met Tower Locations

Kaheawa Wind Power II

Figure 2-4 Temporary Met Tower Locations 2007-11-26.mxd

Figure 2.5. Schematic Drawing of GE 1.5 MW Wind Turbine Nacelle.

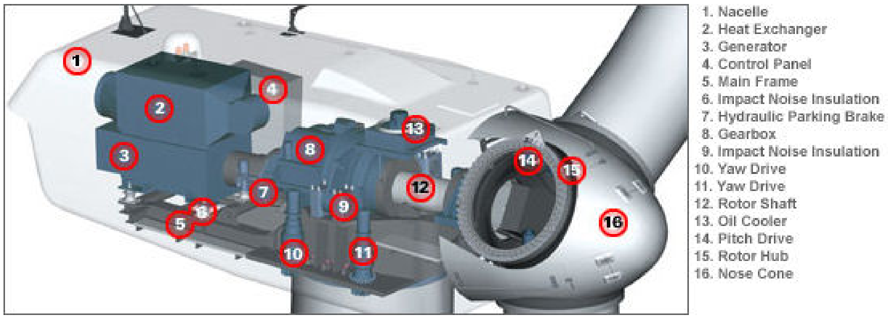


Table 2.2. Characteristics of 1.5 MW Wind Turbine

Power Generation	1.5 MW each
Tower Structure and Height	Tubular; 180 feet
Rotor Diameter	231 feet
Total Height (Tower + ½ Rotor)	296 feet
Rotor Swept Area	50,130
Rotor Speed	10-21 rpm (variable)
Wind Speed at Which Generator Starts	8 miles per hour
Wind Speed at Which Generator Cuts Out	56 miles per hour
Rated wind speed (unit reaches maximum output)	27 miles per hour
Note: Based on GE Model 1.5se on 55 m tower.	
Source: Kaheawa Wind Power LLC (2004).	

2.2.4 OPERATION /MAINTENANCE BUILDING

This prefabricated metal building would be similar to the maintenance building that is part of KWP I. It would be approximately 70 feet wide and 100 feet long. The operation/maintenance building would house the wind farm system controller, which monitors the performance of the overall system and the operational status and performance of individual turbines and wind monitoring equipment. The facility will also provide for an indoor work area and a storage area for spare parts. In addition to providing space to store spare equipment, it would house the office for the site manager and maintenance workers.

2.2.5 SITE ACCESS AND INTERNAL ROAD NETWORK

The proposed KWP II facility will utilize the existing State-owned access road from Honoapi‘ilani Highway to KWP I. It will seek an easement from the State for that purpose. In addition, KWP II LLC will obtain an easement from KWP I LLC in order to cross its leased property en route to the new facility.

KWP II LLC will construct an internal road network within the land that it leases to connect the new WTGs to the existing access road and to one another. The extent of that network will depend upon the number and location of WTGs that are eventually approved. The options being considered are shown on Figure 2.2. The fourteen potential WTG sites in the *Downwind WTG Siting Area* to the west of the existing wind farm will require new connector roads from the KWP I facility to be constructed; two steep gulches cross-cutting the row mean that excessive earth disturbance would be required to construct a continuous road that connects all fourteen turbine sites, so this approach will be avoided. The two to four turbines that could be constructed in the *Down-String WTG Siting Area makai* of the existing KWP I facility would be served by extending the existing road down to them. The two to four potential sites within the *Down-Road WTG Siting Area* could be served by short driveways extending off of the existing wind farm access road. The *Up-Wind WTG Siting Area* would utilize a new short connector road from the existing access roadway.

All the main access roads within the leased area would be approximately 16 feet wide and have gravel surfaces.[10] The roads would be graded and maintained with gravel only where necessary. The road bed will be wide enough to support the road surface and provide for drainage/erosion control. Roads interconnecting the turbines will be the same with the additional width of a dirt shoulder to accommodate the large crawler crane that is used in erecting and periodically maintaining the equipment. Individual spurs will branch off from the main connector roads to each turbine site.

2.2.6 ELECTRICAL SYSTEM COMPONENTS

Electrical Transmission Lines. Three electrical transmission lines presently cross the site. The upper two transmission lines cross the Kaheawa Pastures at an elevation of approximately 2,300 feet, and electrical power from the KWP I substation is fed into the uppermost of these. The lower line crosses the pastures about a mile *makai* of the upper two lines at an elevation of about 1,800 feet. The transmission line that KWP II feeds into will largely depend upon the results of the interconnection requirements study for the project. Accordingly, KWP II has included two potential substation options in its preliminary plans (see Figure 2.2). Option 1 entails constructing a new substation adjacent to the lowermost set of transmission lines; the new substation's final location would depend on the turbine layout that is ultimately selected. Option 2 adds the needed equipment adjacent to the existing electrical substation.

Electrical Substation. The purpose of the substation is to interconnect the electrical output from KWP II's intrasite electrical power collection network with MECO's transmission system. The 34.5 kV output is first transformed to 69 kV at the substation and then delivered via overhead conductors to the interconnection point. The interconnection point includes the primary metering equipment and the disconnect breakers. If Option 1 (a new and separate substation) is chosen, it would have a layout similar to the existing substation. If Option 2 (expansion of the existing substation) is selected, the additional equipment would be accommodated by extending the existing substation approximately 500 feet to the west.

Transformers and WTG Interconnections. As previously noted, a transformer at the base of each tower will boost the lower-voltage electrical power produced by the nacelle-mounted generator to 34.5 kilovolts (kV). The 34.5 kV power will be carried by underground or overhead cable from the transformers to the on-site electrical substation. Underground cables would be utilized for the WTGs in the Down Wind and/or Down-String Siting Areas. The cables would be direct-buried in four-foot deep trenches. If the Up-Wind and/or Down-Road siting area is used, an overhead transmission line would be required. It would extend across Manawainui Gulch to the substation.

Battery Energy Storage System (BESS). Because of the size and operating characteristics of its system, MECO has requested that the next increment of wind energy generation that is added include provisions for storing some of the electrical energy that is generated for brief periods of time. Such storage would allow KWP II to provide power that has more of the characteristics of "firm" power, even though it is dependent upon a highly variable resource. In response to this request, KWP II LLC is exploring a variety of methods of providing the requested storage. Its analysis is not complete, but the concepts being explored include paying for traditional spinning reserve provided by MECO or

[10]During construction the access routes would be graded to a greater width (typically about 30 feet) to accommodate the tracks of the Liebherr LR1280 crawler crane used for erection of the turbines.

possibly a commercial scale Battery Energy Storage System (BESS). The latter seems to hold the most promise, having many of the attributes desired by MECO. The design of these facilities cannot be completely determined until KWP II LLC and MECO complete the interconnect requirements study. However, preliminary plans call for a BESS to be housed in a 15-foot-high warehouse-like structure within the boundaries of the on-site substation.

2.2.7 WATER SUPPLY/WASTEWATER DISPOSAL

KWP II, like the existing KWP I facility, has a very low on-site water requirement. Consequently, there will be no direct connection to the municipal water supply. Water will be stored in a 60,000-gallon tank at the base of the access road for emergency purposes and for irrigating native plants that are being reestablished in the area. This water is fed by a metered line from Maui's municipal supply and will be trucked to the site by contractors hired by KWP II LLC. In addition, small amounts of bottled potable water and an eye wash station will be provided in the operations building. A septic tank will collect domestic waste from restrooms in the maintenance building. In addition the facility may include one or more on-site holding tanks of several hundred to 2,000 gallons each to provide water for re-establishing vegetation cover in areas disturbed during construction.

2.2.8 PROPOSED LAND USE AGREEMENT

In September 2006 the Board of Land and Natural Resources authorized its Land Division to negotiate a lease with KWP II LLC. This negotiation includes rent as a percentage of total revenue generated, conditions for granting access to the site for certain types of visitors, and restoration of the site or replacing the equipment at the end of the lease period.

2.2.9 PROPOSED POWER PURCHASE AGREEMENT (MECO/KWP II)

KWP II LLC has submitted a Non-Utility Generator Application to Hawaiian Electric Company (HECO), the parent company of MECO, for the proposed project. If the application is accepted, an interconnect requirement study will follow and in parallel KWP II LLC will negotiate a power purchase agreement (PPA) with HECO/MECO. The proposed term for the agreement is 20 years with provisions for an extension to 25 years. In general, MECO is obligated under State and Federal rules to purchase energy and capacity from Qualifying Facilities (QF) at the utility's avoided cost rate.[11] Specifically, if the QF can provide firm power, the QF receives both a capacity payment (based on the number of MW of capacity that it commits to guarantee) and an energy payment (based on the number of kilowatt-hours that it actually provides to the utility). For non-firm or as-available generators such as the proposed wind generators, the utility would make only the energy payment.

KWP II LLC expects to propose a fixed payment rate that is based on its costs to develop, finance, construct, earn a rate of return on its investment and operate the project; its proposed rate will include a fixed annual escalation factor. The proposed start point will be based on the cost of constructing and operating the facilities. This will not be known until a final size and configuration is determined and a contract is negotiated. However, as a point of reference it can be noted that the contract for power from KWP I uses a combination of fixed prices and avoided cost prices, which will approximate a payment of 11 cents per kilowatt-hour during 2007. MECO's actual avoided costs for all of 2007 will significantly exceed this rate, and over the term of the PPA avoided costs may be above or below the rate in the PPA. The actual avoided cost is expected to continue to track the fuel oil price for the specific fuels used by the MECO system. It should be noted, however, that once the contract is signed, the future price for the wind power is fixed and known. Current fuel price

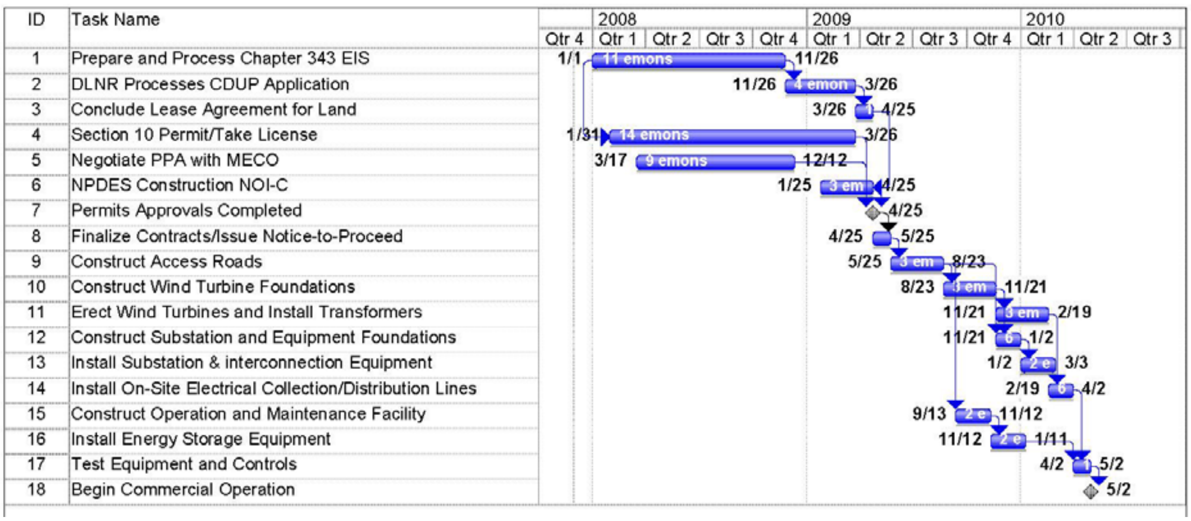
[11] A "Qualifying Facility" (QF) is a generating facility which meets certain requirements under the Public Utility Regulatory Policies Act of 1978 (PURPA) and part 292 of the Federal Regulatory Commission's Regulations (18 CFR Part 292), and which has obtained certification of its QF status. There are two types of QFs: cogeneration facilities and small power production facilities. As a generating facility whose primary energy source is renewable and that otherwise meets the requirements of 18 CFR §§ 292.203(a), 292.203(c) and 292.204, the proposed project falls into the second of these categories.

forecasts strongly suggest that wind power will provide energy at a cost well below that which MECO would experience if it had to rely on fossil fuels for generating electricity.

Furthermore, KWP II LLC assumes all risks associated with the escalation of its costs to operate the wind farm and/or potential lost revenues. With respect to cost escalation, the PPA escalation factor could be at or less than inflation as represented by the CPI. With respect to potential lost revenues, actual wind availability or turbine availability may fall short of expectation or there may be operational circumstances on MECO's system that require the wind farm to be shutdown or curtailed. The PPA will identify the terms and conditions under which the wind farm output would be shutdown or curtailed by MECO and the circumstances for resumption of output to MECO.

2.3 SCHEDULE

The proposed permitting and construction sequence is shown in the following timeline.



2.4 ANTICIPATED COSTS

Table 2.3 summarizes KWP II LLC's preliminary estimates of the anticipated costs.

Table 2.3. Estimated Construction Costs

Item	*Order-of Magnitude Cost (in million 2006$)*
Access Road/Site Development	$3
Wind Turbine Equipment	$27
Wind Turbine Installation/Balance of Plant	$10
Transportation and Logistics	$10
Electrical Substation, Collection Lines, and Interconnect	$12
Operation and Maintenance Facility	$5
Source: KWP II LLC	

2.5 ALTERNATIVES

2.5.1 FRAMEWORK FOR CONSIDERATION OF ALTERNATIVES

Hawai‘i Administrative Rules (HAR), §11-200-17 (a section in the Office of Environmental Quality Control's Environmental Impact Statement Rules) addresses the content requirements of draft and final environmental impact statements (EIS). Subsection §11-200-17(f) states:

> *(f) The draft EIS shall describe in a separate and distinct section alternatives which could attain the objectives of the action, regardless of cost, in sufficient detail to explain why they were rejected. The section shall include a rigorous exploration of the environmental impacts of all such alternative actions. Particular attention shall be given to alternatives that might enhance environmental quality or avoid, reduce, or minimize some or all of the adverse environmental effects, costs, or risks. Examples of alternatives include:*
>
> *(1) The alternative of no action;*
>
> *(2) Alternatives requiring actions of a significantly different nature which could provide similar benefits with different environmental impacts;*
>
> *(3) Alternatives related to different designs or details of the proposed action which would present different environmental impacts;*
>
> *(4) The alternative of postponing action pending further study; and*
>
> *(5) Alternative locations for the proposed project.*
>
> *In each case the analysis shall be sufficiently detailed to allow a comparative evaluation of the environmental benefits, costs, and risks of the proposed action and each reasonable alternative.*

The objectives listed in Section 1.3 of this report were used in identifying the alternatives described below for inclusion in this evaluation. Section 2.5.2 describes the alternatives that will be evaluated in detail in the *Environmental Impact Statement (EIS)*. These include: 1) the proposed action; and 2) omission of four of the proposed turbines (i.e., reduced scale action). Section 2.5.3 lists the alternatives that KWP II LLC considered but rejected during early planning phases and describes the reasons why they were excluded from further consideration in this impact analysis.

2.5.2 ALTERNATIVES TO BE EVALUATED IN THE EIS

2.5.2.1 <u>Alternative 1: Construct 30 MW Facility Using Four Areas at Kaheawa Pastures</u>

Alternative 1 consists of KWP II LLC's constructing 30 MW of wind energy generating capacity distributed across all four siting areas described above. Implementation of this alternative involves:

- Obtaining a lease from the State Department of Land and Natural Resources for approximately 400 acres of land contiguous to the existing area leased by KWP I.
- Creating new internal service roads that connect the facility to the main KWP I access road.
- Erecting twenty General Electric (GE) 1.5 MW wind turbine generators (WTG), two to fourteen in the Downwind WTG Siting Area, two to fifteen WTGs in the up wind locations, two to four WTGs in the Down-String WTG Siting Area *makai* of the existing KWP I facility, and two to four WTGs within the Down-Road WTG Siting Area.
- Installing an underground electrical distribution network or a new overhead transmission line connecting all of the turbines with an electrical substation and with the existing MECO power transmission system.

- Constructing a Battery Energy Storage System (BESS) within the boundaries of the electrical substation.
- Constructing a new operations and maintenance building to house operations personnel, equipment and facility spare parts.

The expected life span of the facility is 20 years, after which time the facility will either be re-powered (i.e., by replacing the old facilities with new ones), or KWP II LLC will remove all facilities from the site.

This alternative would meet all the project objectives listed in Section 1.3.

2.5.2.2 Alternative 2: 24 to 27 MW Wind Power Facility at Kaheawa Pastures (Omit Down-String WTGs)

This Alternative differs from Alternative 1 in that it omits the down-string site and the two to four WTGs that could be constructed there. Construction of the foundations and access roads for those units and the access road to them requires above-average ground disturbance especially the lowest two WTGs. Eliminating the effects of that disturbance (and the fact that the reduced output might be easier to integrate into MECO's system) is the basis for this reduced-scale alternative. On the other hand, because elimination of this siting area would cut the generating capacity of the KWP II wind generating complex, it would reduce the extent to which the facility could lessen the use of fossil fuels and tend to increase the per-MW costs.

2.5.2.3 Alternative 3: 24 to 27MW Wind Power Facility at Kaheawa Pastures (Omit Down-Road Siting Area)

This Alternative differs from Alternative 1 in that it does not include the Down-Road Siting Area and the two to four WTGs that could be constructed there. Because of the relatively rugged terrain in this location, construction of the foundations and access driveways there would likely require above-average ground disturbance (especially the lowest two WTGs of this option). Eliminating the effects of that disturbance (and the fact that the reduced output might be easier to integrate into MECO's system) is the basis for this reduced-scale alternative. Additionally, this alternative eliminates the need for a transmission line across Manawainui Gulch.

2.5.2.4 Alternative 4: 21MW Wind Power Facility at Kaheawa Pastures (Omit Down-String, Up-Wind and Down-Road WTGs)

This Alternative differs from Alternative 1 in that it involves development only on the down-wind siting area. This alternative involves the fewest WTGs that KWP II believes it is economic to construct at this location. It also concentrates the wind farm development in the siting area that has the least challenging terrain and is farthest from existing viewpoints in central and eastern Maui. This alternative would have the least direct impact on the immediate surroundings at the cost of providing the least reduction in fossil fuel use and its attendant impacts.

2.5.2.5 Alternative 5: 21 MW Wind Power Facility at Kaheawa Pastures Without Down-Wind Siting Area

This Alternative differs from Alternative 1 in that it does not include the down-wind siting area, instead distributing 14 turbines (21 MW total) between one or more of the remaining three siting areas. Because it would require an overhead transmission line and development on steeper terrain, this alternative has some negatives compared to Alternative 4. However, until the meteorological data that are now being collected confirm the down-wind area to be suitable KWP II would like to retain it as an option. Consequently, it will be analyzed in the EIS as an Action Alternative.

2.5.2.6 Alternative 6: 10.5MW Wind Power Facility at Kaheawa Pastures per MECO IRP

As previously noted, MECO submitted its latest Integrated Resource Management Plan to the State of Hawai‘i Public Utilities Commission on April 30, 2007. Its "Preferred Plan" calls for the addition of another 10.5 MW of as-available wind generating capacity in 2011 (the output of seven 1.5MW machines of the type that KWP II contemplates). The limited amount of new wind generating capacity that is included in the Preferred Plan is largely a function of MECO's present assessment of its system's ability to integrate a variable source such as wind into the islandwide system.

KWP II does not believe that the potential revenue from such a limited generating capacity justifies the cost of developing the needed support infrastructure. The only possible exception to this is if the proposed WTGs could be integrated into the existing system in such a way as to avoid the need for constructing an entirely new electrical substation, extensive new access roads, and new operations and maintenance facilities. High fixed costs of transportation, logistics, mobilization and other factors make this option undesirable from a cost-of-energy standpoint.

2.5.2.7 Alternative 7: No Action

The EIS will evaluate the "No Action" alternative in compliance with HAR, §11-200-17(f)(1). This alternative assumes that neither KWP II nor other developers will install additional wind generating capacity at Kaheawa for the foreseeable future. This could leave Maui without additional wind energy generation capacity and would not satisfy the objectives listed in Section 1.3. It is evident that the community and government officials are supportive of commercial alternative energy production, which makes the No Action alternative undesirable. Consequently, it will be evaluated in the EIS solely to fulfill the requirements of HAR 11-200.

2.5.3 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

The action alternatives described above will be evaluated in detail in the environmental impact statement being prepared for the proposed project. Many other action alternatives were considered, but were eliminated from detailed consideration. Those alternatives, and the reasons for their elimination, are summarized below.

2.5.3.1 Develop Wind Power Generating Facility on Another Site

As discussed in Chapter 3, the wind regime at Kaheawa Pastures is extremely favorable in its consistency and strength. In addition, the site's proximity to KWP I allows the proposed new facilities to share infrastructure such as the main access road, some equipment storage and parts, and to a smaller extent, personnel, with the existing wind project. Other wind-rich sites on Maui are mostly located in areas that either lack adequate transmission capability or are close to populated areas. Other things being equal, KWP II believes that duplicating this infrastructure at another site would likely result in greater costs and environmental impacts than the proposed facility. Moreover, other sites suitable for wind development on Maui present comparable challenges in terms of topography, visibility, natural resources, flora and fauna without having comparable benefits. Therefore, KWP II LLC has concluded that the proposed site is superior to the alternatives that are available for its project. It understands that other developers may have a different opinion, but expects that any competitors will lay out the arguments for and against other sites in their applications and permitting documents. Should such alternatives be offered, KWP II anticipates that the PUC will choose among the alternatives when it approves a power purchase agreement between a wind energy developer and MECO.

2.5.3.2 Greater or Smaller Number of 1.5 MW Wind Turbine Generators

The alternatives described above cover a range of generating capacities, including the 10.5 MW that MECO's IRP-3 identifies as being appropriate for development by 2011. KWP II LLC feels that further reducing the size of the facility would decrease the benefits of further wind power development without providing off-setting environmental benefits. Moreover, lowering the number of wind generators does not produce an equivalent reduction in the cost of the support facilities and permitting. Consequently, the cost per megawatt of capacity increases as the number of turbines decreases, and this makes smaller facilities less economical. For these reasons, at this time KWP II

LLC is not actively investigating a wind farm with fewer than 14 1.5 MW units and would not consider a facility with fewer than seven 1.5-MW WTGs.

There is sufficient room to construct more than 20 additional wind generators in the area. However, in order to limit visual effects and engineer a successful utility integration design KWP II LLC does not believe it would be appropriate or practical to install more than twenty 1.5MW wind generators at this site. MECO's recently submitted IRP-3 supports this belief, noting the extent to which the intermittent and variable nature of wind can make it difficult to control system frequency and power fluctuations with MECO's current mix of generating units and control system, concluding that too much reliance on this source can impact the reliability of power provided to customers. While the research discussed in IRP-3 and elsewhere suggests that it may be possible to accommodate more wind generating capacity than the 10.5 megawatts included in MECO's Preferred Plan, nothing indicates that it will be possible to accommodate more than the 30 MW in Alternative 1.

2.5.3.3 Different Wind Turbine Size or Design

KWP I uses GE 1.5 MW wind turbines. These have been proven to be a good match for the wind regime at the proposed site. Moreover, while sufficiently large to take advantage of economies of scale and higher wind speeds present at the heights that can be reached by smaller/lower wind turbine generators, they are considerably shorter and less massive than the larger wind generators WTGs now being put into service in some areas.[12] Using the same type and size of wind energy generators in KWP II as have been used in KWP I ensures visual and logistical continuity for the wind farm. This would decrease the overall visual impact of the facilities and streamline the delivery and exchange of parts between them. KWP II LLC's economic analyses indicate that the 1.5 MW GE turbines are likely to be the most cost effective choice for this site. Finally, the GE 1.5 turbines can meet the requirements of the Interconnect Requirement Study that MECO will conduct as part of the PPA negotiations.

2.5.3.4 Adding a Longer-Term Energy Storage Component

A wind plant is "fueled" by the wind, which blows steadily at times and not at all at other times. At present, few technologies are available and/or economically feasible that allow energy generated by wind (which is inherently highly variable) to provide power as consistently as fossil fuel generating units. This limitation has discouraged utilities from relying on it for a large part of their capacity because it has meant that they have had to keep fossil fuel fired generating units on standby so that they could continue to meet the needs of their customers if the electricity coming from wind and other variable energy sources is unavailable.

Various means have been used for storing wind energy, each of which is best-suited for certain situations. Technologies which have been employed or are being seriously studied include: pumped water storage, compressed air storage, thermal energy storage, battery storage, flywheel storage, superconducting magnetic energy storage, and hydrogen fuel cells.[13] The suitability of these for use in conjunction with the proposed KWP II project is summarized below. Readers should note that even the best of these technologies does not come close to making wind-based power as reliable as existing fossil-fuel fired capacity. Hence, at least for the time being all require on-going use of conventional generating capacity, albeit at a reduced scale.

- ***Pumped Water Storage***. Pumped water storage (often called "pumped hydro") is probably the best known large-scale technology. This consists of pumping water to a high storage reservoir using power that is available but not immediately needed and then releasing it through turbo generators to produce electricity when it is needed (in this case when the wind is not blowing). Pumped storage recovers 80 to 90 percent of the energy consumed by the pumps, i.e., the generator that is driven by

[12] Examples include General Electric's 2.5 MW series and 3.6 MW machines (which have overall heights reaching up to 500 feet) and the 3.0 MW Vestas V90, whose overall height is about the same as that of the large GE Unit.

[13] Additional information can be found at www.electricitystorage.org/pubs/2004/EPRI-DOE%20Storage%20Costs-ESA.pdf.

the water that is released produces 80 to 90 percent as much electricity as is consumed pumping water into the storage reservoir. The chief challenge with pumped storage is that it usually requires two nearby reservoirs at considerably different heights and an adequate water supply, for which there are few suitable locations on Maui, and often requires considerable capital expenditure. Because of this, pumped hydro is most suitable for storage periods of a few hours, or a few days at most if the power output is greatly reduced. The lack of an available fresh water source combined with the steep topography, and the fact that this is State conservation land precludes the use of pumped storage at the KWP II site. In theory, electrical energy from the WTGs could be used in a pump/reservoir system located elsewhere. However, the challenge of obtaining the permits and land/water rights needed for this introduces a high degree of uncertainty that KWP II believes makes it unviable.

- ***Battery Storage.*** Many small "off-the-grid" domestic systems rely on battery storage, but an economical means of storing large amounts of electricity for commercial applications has not been widely deployed. As battery technology continues to improve and fossil fuel costs continue to rise, battery storage is expected to be put into general use. Batteries are generally expensive, require maintenance, and have limited life spans as compared to other mechanical storage systems. One emerging technology for large-scale storage is large-scale flow batteries; another is a solid state power cell technology that was originally developed for military applications.[14] Vanadium redox batteries and other types of flow batteries are beginning to be used for energy storage including the averaging of generation from wind turbines.[15] KWP II will be proposing to use the Power Cell technology recently made commercially available. This technology offers several environmental advantages, such as a small foot print and use of non-toxic materials. Electrical advantages are an instantaneous response time and a reasonably long cell life allowing thousands of charge and discharge.
- ***Superconducting Magnetic Energy Storage (SMES)***. SMES systems store energy in the magnetic field created by the flow of direct current in a superconducting coil which has been cooled to a temperature below the point at which it becomes a superconductor. A typical SMES system includes three parts: (i) a superconducting coil, (ii) a power conditioning system, and (iii) a cryogenically cooled refrigerator. Once the superconducting coil is charged, the current will not decay and the magnetic energy can be stored indefinitely. The stored energy can be released back to the network by discharging the coil. SMES wastes less electricity in the energy storage process than other methods of storing energy (less than 5%). However, SMES is not suitable for the KWP II project due to very high costs, the energy requirements of refrigeration, and the limits in the total energy able to be stored.
- ***Compressed Air Storage***. Another grid energy storage method is to use electricity to compress air and store it in airtight underground caverns; when the air is released from storage, it expands through a combustion turbine to create electricity. This technology is not suitable for Maui because of the absence of suitable underground storage conditions.
- ***Thermal Storage***. Several technologies are available that can store energy in a thermal reservoir for later reuse. The thermal reservoir may be maintained at a temperature above (hotter) or below

[14] A flow battery is a form of battery in which electrolyte containing one or more dissolved electroactive species is flowed through a power cell / reactor in which chemical energy is converted to electricity. A flow battery has a number of characteristics in common with fuel cells, but differs in that at least some of the electrolyte (generally the majority in weight and volume terms) is flowed through the reactor. Flow batteries are also distinguished from fuel cells by the fact that the chemical reaction involved is often reversible.

[15] The large capacities possible from vanadium redox batteries make them well suited to use in large power storage applications such as helping to average out the production of highly variable generation sources such as wind. Currently installed vanadium batteries include: (i) a 275 kW output balancer in use on a wind power project in the Tomari Wind Hills of Hokkaido, Japan (see http://www.electricitystorage.org/pubs/2001/IEEE_PES_Summer2001/Miyake.pdf); (ii) a 200 kW, 800kWh output leveler in use at the Huxley Hill Wind Farm on King Island, Tasmania; and (iii) a 250 kW, 2MWh load leveler in use at Castle Valley, Utah.

(colder) than that of the ambient environment. The principal application today is the production of ice or chilled water at night which is then used to cool environments during the day. Thermal energy storage technologies are most useful for storing energy that originates as heat in an insulated repository for later use for space heating or for domestic or process hot water heating. They are not well suited for storing electrical energy.

- ***Flywheel Storage.*** This form of storage uses electricity from the wind energy generator to power an electric motor that accelerates a heavy rotating disc, which acts as a generator on reversal, slowing down the disc and producing electricity. Electricity is stored as the kinetic energy of the disc. Mechanical inertia is the basis of this storage method. The ranges of power and energy storage technically and economically achievable, however, tend to make flywheels unsuitable for general power system application such as KWP II.

None of the storage technologies that are presently available provide a cost-effective means of storing energy produced by wind energy sources for long periods (meaning days) of time at the Kaheawa site. Battery storage systems do however provide a means of mitigating energy output fluctuations from variable wind resources on the order of minutes and hours. This ability greatly increases the predictability of the energy output to the utility, thus allowing higher as-available penetrations in a small island electrical grid than would otherwise be feasible. Beyond that, other, firm energy sources (such as the existing fossil fuel-fired generating units on the island) are still needed.

2.5.3.5 Delayed Action/Slower Implementation

Because of the substantial benefits that substituting wind energy for fossil fuel use has for the natural environment and for Maui’s economy, KWP II LLC has concluded that postponing development of the project is not advantageous. It believes that the sooner that additional wind energy is brought online and replaces fossil fuels, the sooner the economic and environmental benefits described in Chapter 1 can be realized. Consequently, it is not considering a slower development schedule at the present time. Similarly, slowing development tends to increase costs and extends the time during which the site has been disturbed and increases the potential for erosion and other adverse effects on the natural environment.

2.5.3.6 Third KWP Increment (KWP III)

KWP II LLC considered proposing the construction of a third increment of KWP (KWP III) in the vicinity of KWP I and II that could take further advantage of the infrastructure that would already be in place (e.g., transmission lines, road access, substation). KWP II decided against proposing a third increment at the present time due to the lack of available electrical power storage technologies and the absence of a large enough market on Maui to justify wind energy development beyond the 21 to 30 MW that is now proposed. The available information suggests that these conditions may not arise for at least a decade, if ever.

Should a better storage/buffering system, or an advancement in generator control technology become available at some time in the future and/or if greater than anticipated load growth should occur on Maui to allow room for additional wind power on the grid, then the option of constructing a third increment (i.e., KWP III) would be revisited.

2.5.3.7 Other Renewable Energy Sources

The principals of KWP II LLC specialize in wind energy generation and have extensive experience implementing it in a cost-effective and environmentally friendly manner. The wind facility being proposed is not intended to exclude or replace the use of other renewable energy sources; rather it will make a contribution to a diversified renewable energy portfolio on Maui. The Integrated Resource Plan (IRP) that MECO submitted to the PUC on April 30, 2007, includes 10.5 MW of wind capacity in its Preferred Plan, and the governor has expressed strong support for the development of wind energy. Hence, KWP II LLC did not choose to pursue other forms of renewable energy in depth.

Table 2.4. Advantages and Disadvantages of Various Storage Technologies.

Storage Technology	*Main Advantages (relative)*	*Disadvantages (relative)*	*Energy Application*
Pumped Storage	High Capacity, Low Cost	Special Site Requirement	•
CADES	High Capacity, Low Cost	Special Site Requirement., Need Gas Fuel	•
Flow Batteries; PSB VRB ZnBr	High Capacity, Independent Power and Energy Ratings	Low Energy Density	•
Metal-Air	Very High Energy Density	Electric Charging is Difficult	•
NaS	High Power & Energy Densities, High Efficiency	Production Cost Safety Concerns (addressed in design)	•
Li-ion	High Power S. Energy Densities, High Efficiency	High Production Cost, Requires Special Charging Circuit	
Ni-Cd	High Power & Energy Densities, Efficiency		
Other Advanced Batteries	High Power & Energy Densities, High Efficiency	High Production Cost	
Lead – Acid	Low Capital Cost	Limited Cycle Life when Deeply Discharged	
Flywheels	High Power	Low Energy density	
Superconducting Magnetic Energy Storage	High Power	Low Energy Density, High Production Cost	
E,C, Capacitors	Long Cycle Life, High Efficiency	Low Energy Density	

Source: Electricity Storage Association Website
http://www.electricitystorage.org/tech/technologies_comparisons.htm

3.0 OVERVIEW OF THE EXISTING ENVIRONMENT

This chapter briefly describes the existing environment of the area that would be affected by the alternatives described above. In most instances, this is limited to the area on and immediately around the proposed site at Kaheawa Pastures. However, the description broadens to a wider geographical scope where applicable.

The discussion is organized by topic (e.g., topography, hydrology, noise, etc.). The information is intended primarily as a means of orienting readers to the general characteristics of the project area and to outline the general kinds of resources that will be examined in the impact analysis. More detailed information will be provided in the Environmental Impact Statement (EIS) as needed to evaluate the project's potential impacts.

3.1 PHYSIOGRAPHY AND TOPOGRAPHY

The dominant topographic features in the project area are Manawainui Gulch, which borders the site on the east; Kealaloloa Ridge, which lies between the Kaheawa pastures area and the isthmus of Maui to the east; Malalowaiaole Gulch, which is southeast and *makai* of the site; Pāpalaua Gulch which is west of the site; and several *pu'u* (peaks or outcrops). The *pu'u* include Pu'u Lū'au, which is near the existing MECO transmission lines at an elevation of about 2,300 feet, and Pōhakuloa at about 1,600 feet elevation at the lower end of the project area.

KWP II would be located on a narrow band of land running *mauka* to *makai* between the Manawainui Gulch and the Pāpalaua Gulch, and on the ridge between Manawainui Gulch and Malalowaiaole Gulch where the current access road lies The WTGs would be installed between and above MECO transmission lines that extend from the Mā'alaea Power Plant to Lahaina. The downwind WTGs would be aligned roughly parallel to the existing KWP I WTGs; the alternate locations are described in Section 2.2. The ground slope along the length (i.e., the *mauka-makai* axis) of the project area varies, but averages about 14%. The ground slope across the width of the area is also variable, but is typically no more than two to three percent.

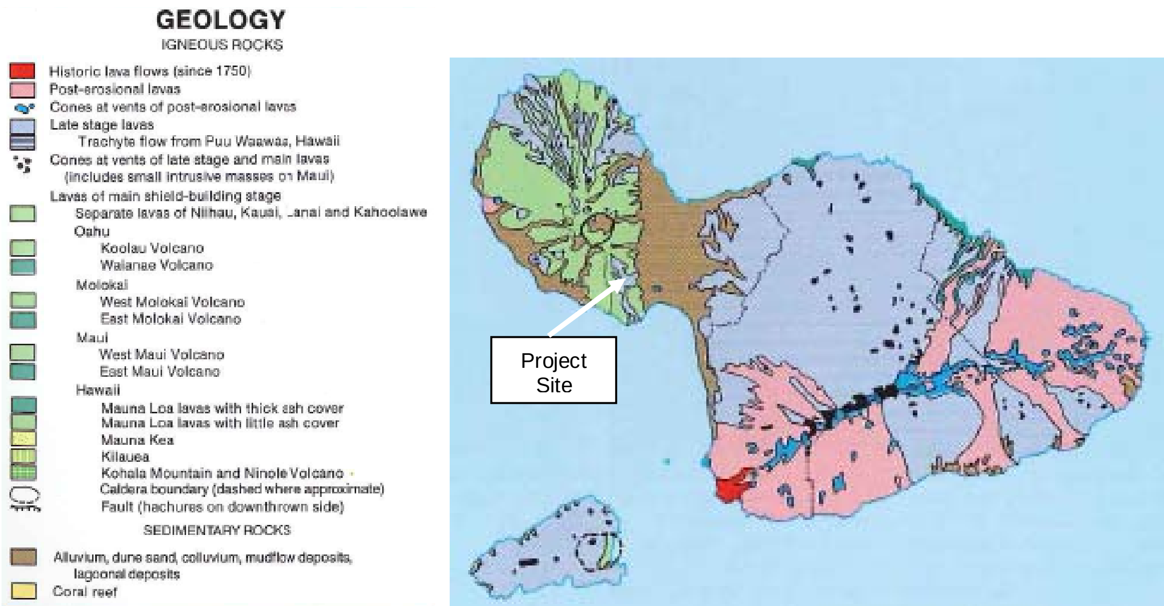
3.2 GEOLOGY AND SOILS

3.2.1 GEOLOGY

Figure 3.1 shows the generalized geology of the island. The present Island of Maui is part of "Maui Nui", which consisted of six or seven coalesced volcanoes, including Haleakalā, West Maui, Kaho'olawe, Lāna'i, East Moloka'i, West Moloka'i, and Penguin Bank, which is believed to have been separate from West Moloka'i.[16] At its largest, Maui Nui probably had a maximum size of about 6,200 square miles, some 2,150 square miles larger than present-day Hawai'i Island. About 300,000 to 400,000 years ago, Maui Nui, which grew from west to east, subsided to form two islands, one consisting of Penguin Bank, Moloka'i, and Lanai, and the other consisting of Maui and Kaho'olawe. Kaho'olawe then separated from Maui, and finally Lāna'i separated from Moloka'i, both within the last 100,000 to 200,000 years. Penguin Bank probably became submerged within the last several hundred thousand years. With continued subsidence at the present-day rates, Haleakalā and West Maui will become separate islands in about 15,000 years.

[16] Based on information from Volcano Watch by the U.S. Geological Survey / Hawaiian Volcano Observatory --- September 8, 1995; September 15, 1995; September 22, 1995; and September 29, 1995. http://users.bendnet.com/bjensen/volcano/eastpacific/hawaii-hawaii.html

Figure 3.1. Geological Setting



Source: Atlas of Hawai‘i, Second Edition (1983).

The extinct West Maui volcano where the proposed project is located evolved through shield (1.6 to 2.0 million years old), post-shield (1.5-1.2 million years old), and rejuvenated stages creating volcanic layers thousands of feet deep. Nearly 500,000 years passed between the post-shield and rejuvenated phases with no evidence of volcanic activity. The rejuvenated stage is represented by only a handful of vents and flows. All the eruptions in the rejuvenated phase were from small cinder cones that grew briefly and then died. Lava flows were extruded from each, but the area covered by lava was generally only a few acres). West Maui's rejuvenated-stage eruptions ended about 385,000 years ago. The oldest of the small cones is Kīlea, which lies a short distance inland from Olowalu on the southwest side of West Maui. The youngest cone, Pu‘uhele lies 2.5 km (1.6 mi) north of Mā‘alaea along the road to Wailuku. No lava flows issued outward from Pu‘uhele cone, and it has been quarried so extensively that the mound of the cinder cone is gone. The great age and limited extent of lava from these late-phase eruptions indicate that even if the volcano is not extinct, it poses little danger on the site of the proposed wind farm.

3.2.2 SOILS

The primary soil types on Maui belong to the Lahaina Volcanic Series, the Honolua Volcanic Series, and the Wailuku Basaltic Series. Kaheawa Pastures is mostly underlain by deep, well-drained volcanic soils, transitioning into the steep, rocky gulches to the east and west of the project site. Table 3.1 lists the characteristics of the major soil types found at the proposed KWP II site.

Table 3.1. Characteristics of Soil Types within the Project Area

Soil Type	*Slope %*	*Permeability*	*Runoff*	*Erosion Hazard*	*Land Uses*
Nāʻiwa silty clay loam	3-20	Moderately Rapid	Medium	Moderate to Severe	Pasture, woodland, & wildlife habitat
Oli silt loam	3-10	Rapid	Medium	Moderate	Pasture and wildlife habitat
Source: General Soil Survey of Hawaiʻi, Foote et al. 1972 (U.S. Soil Conservation Service).					

3.3 CLIMATE

The climate of the Hawaiian Islands is characterized by a two-season year, mild and uniform temperatures everywhere (except at high elevations), marked geographic differences in rainfall, high relative humidity, extensive cloud formations (except on the driest coasts and at high elevations), and dominant trade-wind flow (especially at elevations below a few thousand feet). Maui itself has a wide range of climatic conditions and weather patterns that are influenced by several different factors in the physical environment. Among the most important of these are elevation, position on the windward or leeward side (relative to the prevailing northeast trade winds) of the island, and local terrain features (such as valleys and ridges).

3.3.1 TEMPERATURE

Due to the tempering influence of the Pacific Ocean and their low-latitude location, the Hawaiian Islands experience extremely small diurnal and seasonal variations in ambient temperature. Average temperatures in the coolest and warmest months at Honolulu International Airport are 72.9° Fahrenheit (F) (January) and 81.4°F (July), respectively. These temperature variations are quite modest compared to those that occur at inland continental locations. Additional temperature data from Honolulu International Airport are summarized in Table 3.2. Figure 3.2 illustrates temperature and rainfall averages on Maui.

3.3.2 RAINFALL

In Hawaiʻi very light showers are extremely frequent in most localities. On the windward coasts of the islands, it is common to have as many as 10 brief showers in a single day, not one of which is heavy enough to produce more than one-hundredth of an inch of rain. This is because the usual run of trade wind weather yields many light showers in the lowlands, whereas the torrential rains are associated with a sudden surge in the trade winds or with a major storm. Hāna, on the eastern tip of Maui, has had as much as 28 inches of rain in a single 24-hour period.

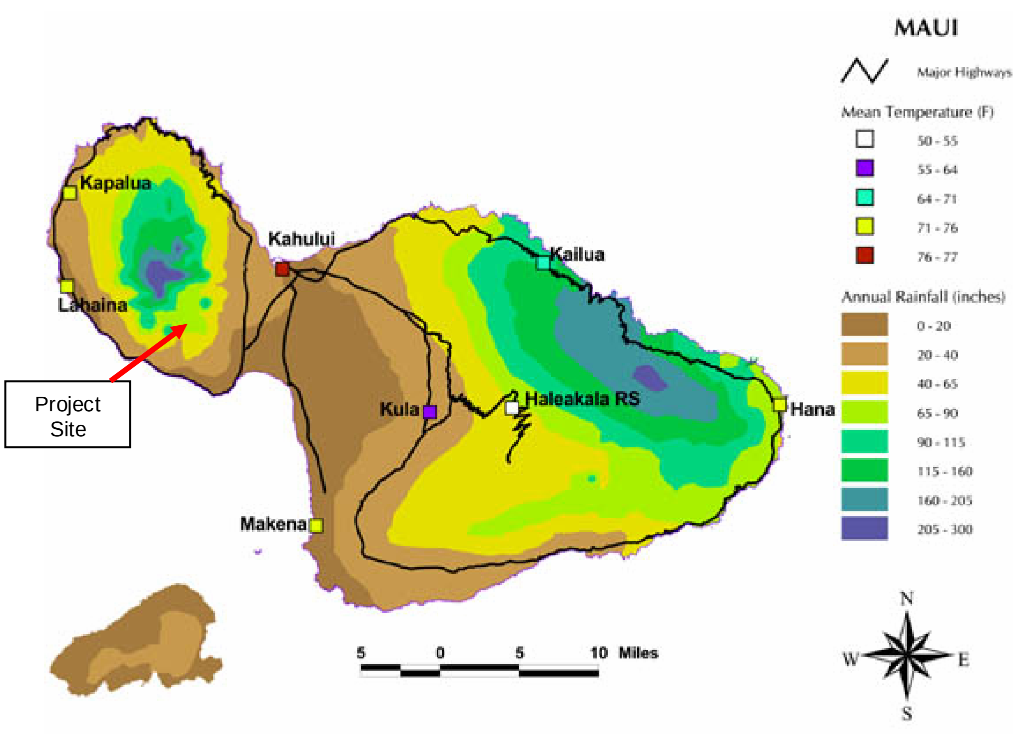
Rainfall variability is far greater during the winter, when occasional storms contribute appreciably to rainfall totals, than during summer, when trade-wind showers provide most of the rain. Major storms occur most frequently between October and March, including "kona" storms, so named because they often generate winds coming from the kona or leeward direction. During these months, there may be as many as six or seven major storm events in a year. Such storms bring heavy rains and are sometimes accompanied by strong local winds. The storms may be associated with the passage of a cold front – the leading edge of a mass of relatively cool air that is moving from west to east or from northwest to southeast.

Annual rainfall in West Maui varies from about 20 inches at the coast to up to 400 inches in the higher elevations. Most of the rainfall occurs during winter months. Over 80 percent of the annual rainfall occurs during a six-month period between November and April. Rainfall averages 15 inches per year at the lower reach of the project area and increases to 40 inches per year at the higher elevations (Armstrong 1983).

Table 3.2. Average Monthly Temperature, Rainfall, and Humidity

Month	*Normal Ambient Temperature, °Fahrenheit*		*Average Monthly Rainfall (inches)*		*Average Relative Humidity (%)*
	Daily Minimum	*Daily Maximum*	*Monthly Minimum*	*Monthly Maximum*	
January	65.7	80.4	0.18	14.74	71.0
February	65.4	80.7	0.06	13.68	69.0
March	66.9	81.7	0.01	20.79	65.0
April	68.2	83.1	0.01	8.92	62.5
May	69.6	84.9	0.03	7.23	60.5
June	72.1	86.9	T	2.46	59.0
July	73.8	87.8	0.03	2.33	60.0
August	74.7	88.9	T	3.08	60.0
September	74.2	88.9	0.05	2.74	61.5
October	73.2	87.2	0.07	11.15	63.5
November	71.1	84.3	0.03	18.79	67.0
December	67.8	81.7	0.04	17.29	74.7
Note: "T" signifies a trace amount of rainfall (i.e., less than 0.01 inch).					
Source: State of Hawai'i Data Book 2003 (Data from Honolulu International Airport).					

Figure 3.2. Mean Temperatures and Annual Rainfall on Maui



Source: Spatial Climate Analysis Service, Oregon State University (http://www.medb.org/communityprofile/geographic.cfm)

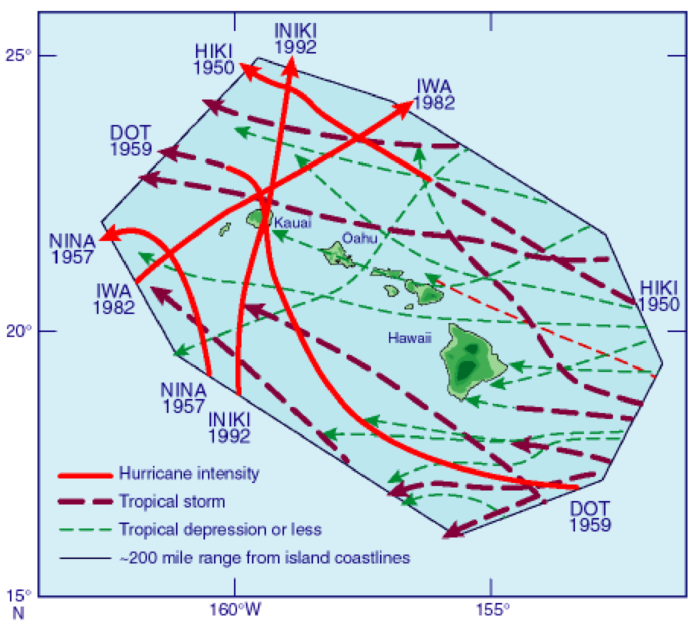
3.3.3 WIND PATTERNS

Prevailing surface winds in the project area are the northeasterly trade winds, which occur over 70 percent of the time; however, during “Kona” storm conditions the prevailing winds change to a south/southwesterly direction. Wind patterns vary on a daily basis, with trade winds generally being stronger in the afternoon. When the trade winds are weak or absent, a land-sea breeze pattern sometimes develops. When this occurs, during the day, winds blow on shore toward the warmer land mass. In the evening, the reverse occurs, as breezes blow toward the relatively warm ocean.

The topography of Maui and the West Maui Mountains is largely responsible for the heightened wind velocity and power at Kaheawa Pastures. The prevailing northeasterly trade winds tend to be split by Haleakalā, and the northern stream whips over the southwest flank of the West Maui mountains while attempting to regain uniform flow, making that location the best wind resource on the island. The deep gulches and ravines that exist in the area can create additional acceleration of the wind speeds in the downslope direction, thereby increasing wind velocity on the ridges immediately above these gulches. Figure 3.3 and Figure 3.4 illustrate wind speed and power patterns in Maui County, respectively.

3.3.4 HURRICANES & TROPICAL STORMS

True hurricanes are very rare in Hawai‘i, as indicated by the fact that only four have affected the islands during the past 65 years. Tropical storms are more frequent. These are similar to hurricanes but with more modest winds, below 74 MPH. Because weak tropical storms resemble some Kona storms in the winds and rains they produce, and because early records do not distinguish clearly between them, it has been difficult to estimate the average frequency of tropical storms. A tropical storm will pass sufficiently close to Hawai‘i every year or two to affect the weather in some part of the Islands. Unlike cold front and Kona storms, hurricanes and tropical storms are not limited to the winter season. They are most likely to occur during the last half of the year, from July through December.

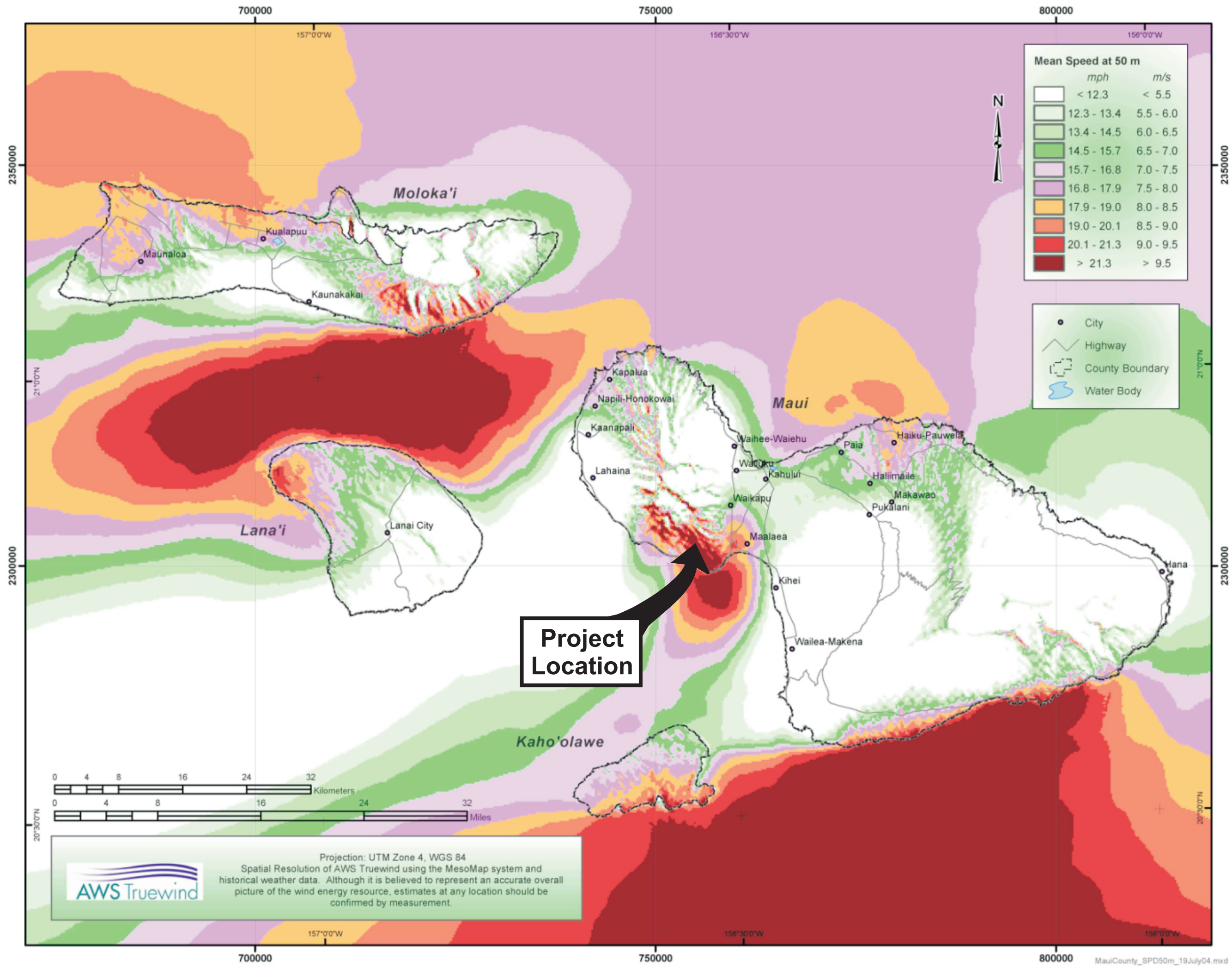


Source: www.soest.hawaii.edu/MET/Faculty/businger/poster/hurricane/Fig2_tracks.gif

3.4 AIR QUALITY

3.4.1 AIR QUALITY STANDARDS

The U.S. Environmental Protection Agency has set national ambient air quality standards (NAAQS) for ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, and 2.5-micron and 10-micron particulate matter ($PM_{2.5}$ and PM_{10}), and airborne lead. These ambient air quality standards establish the maximum concentrations of pollution considered acceptable, with an adequate margin of safety, to protect the public health and welfare. The State of Hawai‘i Department of Health (DOH) has also adopted ambient air quality standards for some pollutants. In some cases, these are more stringent than the Federal standards. At present, the State has set standards for five of the six criteria pollutants (excluding $PM_{2.5}$) in addition to hydrogen sulfide (DOH 2005).



Prepared For:

Kaheawa Wind Power II

Prepared By:

PLANNING SOLUTIONS

Source:

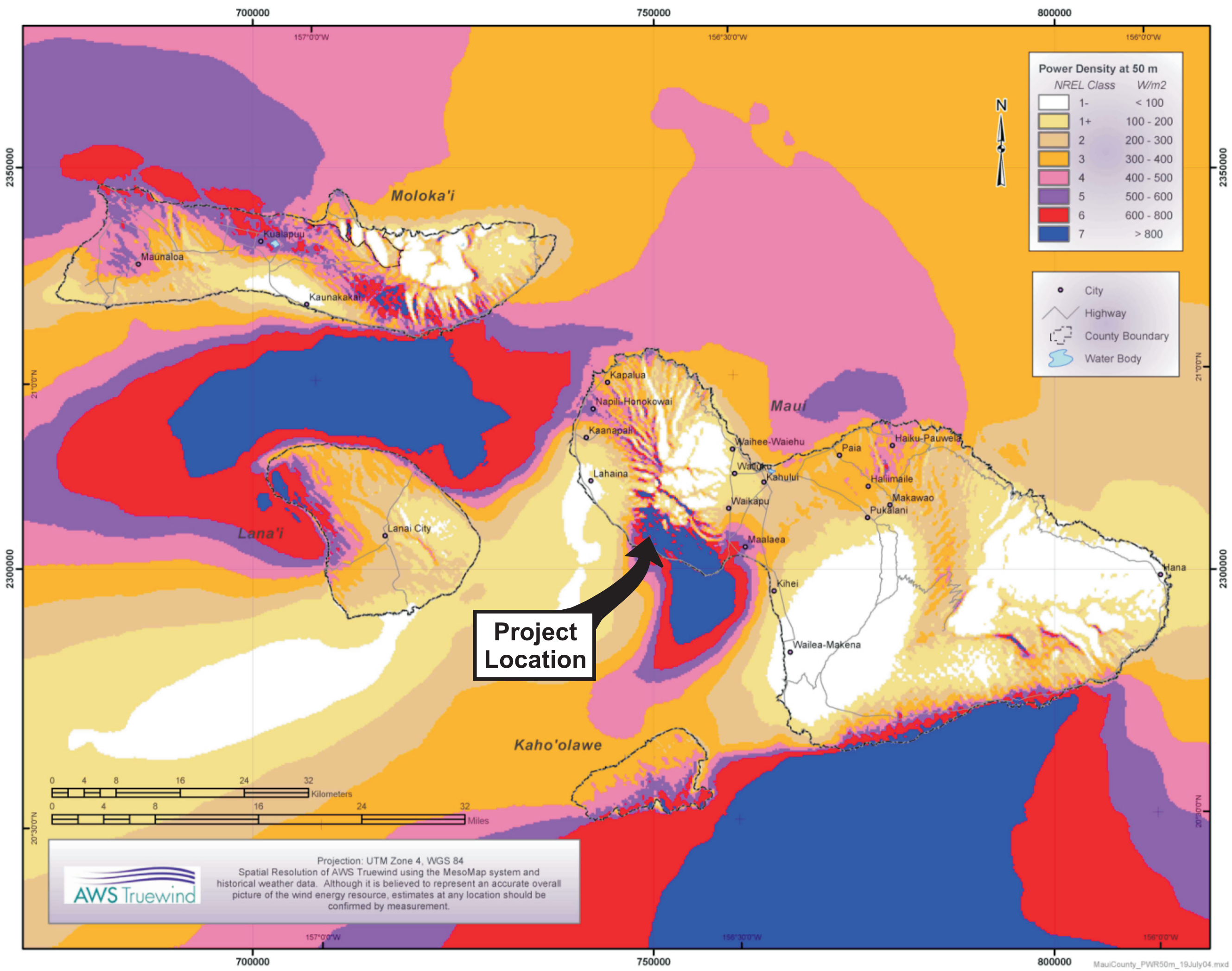
Hawaiian Electric Co., Inc.

Figure 3.3:

Wind Speed Patterns for Maui County

Kaheawa Wind Power II

Figure 3-3 Wind Speed 2006-09-29.cdr



Prepared For:

Kaheawa Wind Power II

Prepared By:

PLANNING SOLUTIONS

Source:

Hawaiian Electric Co., Inc.

Figure 3.4:

Wind Power Patterns for Maui County

Kaheawa Wind Power II

Figure 3-4 Wind Power 2006-09-12.cdr

Both State and national air quality standards consist of two parts: (i) an allowable concentration of a pollutant and (ii) an averaging time over which the concentration is measured. The allowable concentrations are based on the results of studies of the effects of the pollutants on human health, crops, and vegetation, and, in some cases, damage to paint and other materials. The averaging times are based on whether the damage caused by the pollutant is more likely to occur during exposure to a high concentration for a short time (one hour, for instance), or to a lower average concentration over a longer period (e.g., 8 hours, 24 hours, or a year). For some pollutants there is more than one air quality standard, reflecting both its short-term and long-term effects. Table 3.3 presents the State and national ambient air quality standards for selected pollutants.

Table 3.3. State and National Ambient Air Quality Standards

Pollutant/Averaging Period	*Standard, $\mu g/m^3$*		
	State Standard	*Federal Primary Standard* [1]	*Federal Secondary Standard* [2]
Nitrogen Dioxide (NO_2) Annual	70	100	100
Sulfur Dioxide (SO_2) 3-hour	1300	---	1300
24-hour	365	365	---
Annual	80	80	---
Carbon Monoxide (CO) 1-hour	10,000	40,000	40,000
8-hour	5,000	10,000	10,000
2.5-micron Particulate Matter ($PM_{2.5}$) 24-hour	---	65	65
Annual	---	15	15
10-micron Particulate Matter (PM_{10}) 24-hour	150	150	150
Annual	50	50	50
Ozone 1-hour	---	235	235
8-hour	157	157	157
Hydrogen Sulfide (H_2S) 1-hour	35	---	---
Lead 3 months	1.5	1.5	1.5

[1] Designated to prevent against adverse effects on public health.
[2] Designated to prevent against adverse effects on public welfare, including effects on comfort, visibility, vegetation, animals, aesthetic values, and soiling and deterioration of materials.

Source: State of Hawaiʻi Department of Health (2005)

3.4.2 EXISTING AIR QUALITY

The State DOH maintains monitoring stations throughout the State in order to measure ambient air concentrations of the six criteria pollutants regulated by the NAAQS. The monitoring station nearest to the KWP II site is at Kīhei, Maui. This station monitors $PM_{2.5}$ and PM_{10} only. During 2005, the only exceedance of 24-hour PM_{10} standards occurred in July; DOH attributed this occurrence to agricultural tilling and flagged it as an exceptional event (DOH 2005). In general, the State of Hawai‘i was in attainment for all NAAQS during 2005.

There are few sources of air pollutants near the project site. The most significant is the dust that naturally arises when strong winds sweep across the open fields or exposed slopes during dry weather. Other sources of airborne contaminants on or near the project site include vehicle exhaust, intermittent fugitive dust and “Maui snow” from agricultural cultivation and construction activities. Emissions from Maui Electric Company’s power plants also affect air quality, but they are sufficiently far away that they do not have a strong effect on ambient concentrations of the pollutants. Particulate and other emissions from such activities are required to meet Federal and State air quality standards.

3.5 HYDROLOGY & WATER RESOURCES

The land on which the proposed facilities would be developed consists of a grassy ridge that contains no wetlands or other aquatic habitat (Hobdy 2004a, 2004b, and 2006). No perennial streams flow through the area, though storm runoff is present in the Malalowaiaole Gulch and Manawainui Gulch during rainy periods.

The State of Hawai‘i Commission on Water Resource Management (CWRM, October 27, 2004) has determined that Manawainui Gulch does not have sufficient water to support instream uses and is therefore not considered a stream. Consequently it is not subject to CWRM regulation. Similarly, the Department of the Army (DA), Corps of Engineers, concluded that the KWP I project site is located entirely within an upland area and does not contain or convey waters of the United States subject to authorization by DA permit (Young, November 8, 2004). Because the KWP II site is located on the same ridge as the KWP I project, it is expected that these same determinations will be reached for the proposed project. Both agencies are being provided a copy of this *EISPN* for review and comment.

The project site is located over the Ukumehame Sector of the Lahaina Aquifer (Aquifer Code 60206 as designated by the State of Hawai‘i Water Use Commission). The absence of groundwater-fed streams in the nearby gulches indicates that the water table at the site is well below ground surface. Consequently, none of the excavations required for the KWP II turbines is expected to encounter groundwater.

3.6 NATURAL HAZARD DESIGNATIONS

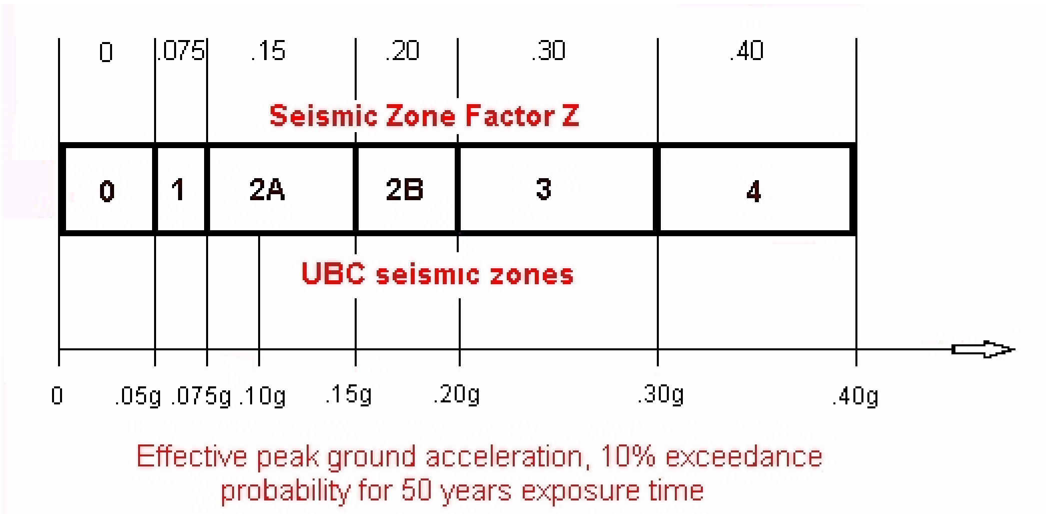
3.6.1 FLOODING & TSUNAMI

The proposed KWP II site is entirely within Flood Zone X, an area that is determined to have less than 0.2% annual risk of flood inundation. There are no 100-year flood zones identified on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps at or near the mouths of either of the gulches bordering the site. There are no tsunami inundation zones in the project area; neither are there any reservoirs or irrigation ditches.

3.6.2 SEISMIC HAZARDS

Seismic hazards are those related to ground shaking; they include landslides, ground cracks, rockfalls, and tsunami. Scientists and engineers have devised a system of classifying seismic hazards on the basis of the expected strength of ground shaking and the probability of the shaking actually occurring within a specified time.

The results are incorporated into the Uniform Building Code (UBC) seismic provisions, which establish minimum design criteria for structures to address the potential for damages due to seismic disturbances. These establish six seismic zones, ranging from "0" (where there is considered to be no chance of severe ground shaking) to "4" (10% chance of severe shaking in a 50-year interval). The shaking is quantified in terms of g-force the earth's gravitational acceleration as indicated in the following diagram:



The entire island of Maui is in Seismic Zone 2B, in which a force of from, 0.15 to 0.20 g is expected to occur once every 50 years (USGS 1997). This designation was the governing seismic code for KWP I, and is within the design envelope of the GE 1.5 se turbine utilized on that project and proposed to be used at KWP II.

3.7 BIOTA

3.7.1 TERRESTRIAL FLORA

In pre-contact times the area on which the proposed facilities would be constructed is believed to have been entirely covered with native vegetation. The vegetation is thought to have been of low stature, with dry grass and shrublands below and mesic to wet windblown forests above. The Hawaiians made some uses of forest resources here and had a cross-island trail cresting the ridge at 1,600 feet elevation. This trail was upgraded during the mid-1800s and used as a horse trail to Lahaina. It was reopened in recent years and is the present Lahaina Pali Trail (Hobdy 2006).

Cattle ranching in the area began in the late 1800s and continued for over 100 years. During this time the grazing animals consumed most of the native vegetation, which was gradually replaced by hardy weed species. During the 1950s Maui Electric Co. installed high voltage transmission lines and maintenance roads through this area. Increased traffic brought more disturbances and weeds. Fires became more frequent, further eliminating remnant native vegetation (Hobdy 2006).

With the cessation of cattle grazing a number of grass and weed species have proliferated, creating a heightened fire hazard. A large fire swept across the mountain in 1999 consuming more than 2,500 acres including most of the project area. In September 2006 another fire burned the same area scorching about 75% of the 400 acre project area, leaving only about 100 acres untouched.

Hobdy conducted a botanical survey of most of the area that would be leased for the KWP II project in October 2006, noting that the 80% of the project area that burned has only bare, blackened ground with a few charred stumps.[17] Hobdy (2006) describes the vegetation within unburned portions of the project area as a diverse array of grasses and low shrubs with a scattering of small trees. The most abundant species is molasses grass (*Melinis minutiflora*) which began taking over following the 1999 fire. Also common are broomsedge (*Andropogon virginicus*), Natal redtop (*Melinis repens*), hairy horseweed (*Conyza bonariensis*), kilau (*Pteridium aquilinum var. decompositum*), fire weed (*Senecio madagascariensis*), narrow-leaved plantain (*Plantago lanceolata*) and ’ūlei (*Osteomeles anthyllidifolia*). He recorded a total of 57 plant species during the course of the survey; these are listed in Table 3.4.

Eighteen native plant species are found scattered within the grassland/shrubland. Ten species are endemic only to the Hawaiian Islands: kilau, (*Carex wahuensis* subsp. *Wahuensis*) no common name, ko‘oko‘olau (*Bidens micrantha*), nehe (*Melanthera lavarum*), ‘akoko (*Chamaesyce celastroides var. amplectens*), naio (*Myoporum sandwicense*), ‘ōhi’a (*Metrosideros polymorpha var. glaberrima*), ‘iliahi alo’e (*Santalum ellipticum*), ‘akia (*Wikstroemia oahuensis*) and orange-flowered naupaka (*Scaevola gaudichaudii*). An additional eight species are indigenous to Hawaii as well as to other countries: pili (*Heteropogon contortus*), koali awahia (*Ipomoea indica*), pukiawe (*Leptecophylla tameiameiae*), ‘ilima (*Sida fallax*), huehue (*Cocculus orbiculatus*), ‘ūlei, ‘a’ali’i (*Dodonaea viscosa*) and ‘uhaloa (*Waltheria indica*). The remaining 39 species are non-native plants.

None of the plant species encountered during the survey are protected as Threatened or Endangered under the Endangered Species Act (ESA). None are candidates for Federal listing or species of concern.

[17] The October 2006 survey did not cover the potential down-road and up wind WTG sites. Information on those areas will be presented in the Draft Environmental Impact Statement.

Table 3.4. Plant Species Observed in KWP II Downwind/Down-String Areas.

SCIENTIFIC NAME	***COMMON NAME***	***STATUS***	***ABUNDANCE (at project site)***
FERNS			
DENNSTAEDTIACEAE (Bracken Family)			
Pteridium aquilinum (L.) Kuhn. *var. decompositum* (Gaudich.) R.M. Tryon	kilau	endemic	common
MONOCOTS			
CYPERACEAE (Sedge Family)			
Carex wahuensis C.A. Mey. subsp. *wahuensis*	--------------	endemic	rare
POACEAE (Grass Family)			
Andropogon virginicus L.	broomsedge	non-native	common
Axonopus fissifolius (Raddi) Kuhlm.	narrow-leaved carpetgrass	non-native	rare
Cynodon dactylon (L.) Pers.	Bermuda grass	non-native	uncommon
Digitaria ciliaris (Retz.) Koeler	Henry's crabgrass	non-native	rare
Heteropogon contortus (L.) P.Beauv. ex Roem.&Schult.	pili	indigenous	rare
Melinis minutiflora P. Beauv.	molasses grass	non-native	abundant
Melinis repens (Willd.) Zizka	Natal redtop	non-native	common
Panicum maximum Jacq.	Guinea grass	non-native	rare
Paspalum conjugatum Bergius	Hilo grass	non-native	rare
Paspalum dilatatum Poir.	Dallis grass	non-native	rare
Pennisetum clandestinum Chiov.	Kikuyu grass	non-native	uncommon
Rhytidosperma pilosum (R.Br.) Connor &Edgar	hairy oatgrass	non-native	rare
Sporobolus africanus (Poir.) Robyns & Tournay	smutgrass	non-native	rare
Stenotaphrum secundatum (Walter) Kuntze	St.Augustine grass	non-native	rare
DICOTS			
ANACARDIACEAE (Mango Family)			
Schinus terebinthifolius Raddi	Christmas berry	non-native	rare
ASTERACEAE (Sun Flower Family)			
Bidens micrantha Gaud.	ko'oko'olau	endemic	rare
Conyza bonariensis L. Cronq.	hairy horseweed	non-native	common
Conyza canadensis (L.) Cronq. *var. pusilla* (Nutt.) Cronq.	little horseweed	non-native	rare
Erigeron karvinskianus DC.	daisy fleabane	non-native	rare
Heterotheca grandiflora Nutt.	telegraph weed	non-native	uncommon
Hypochoeris radicata L.	gosmore	non-native	rare
Melanthera lavarum (Gaud.) Wagner &Rob	Nehe	endemic	rare
Pluchea carolinensis (Jacq.) G. Don.	sourbush	non-native	rare
Senecio madagascariensis Poir.	fireweed	non-native	common
CACTACEAE (Cactus Family)			
Opuntia ficus-indica (L.) Mill.	Panini	non-native	rare
CASUARINACEAE (She-oak Family)			

SCIENTIFIC NAME	***COMMON NAME***	***STATUS***	***ABUNDANCE (at project site)***
Casuarina equisetifolia L.	common ironwood	non-native	uncommon
Casuarina glauca Siebold ex Spreng.	longleaf ironwood	non-native	rare
CONVOLVULACEAE (Morning Glory Family)			
Ipomoea indica (J. Burm.) Merr.	koali awahia	indigenous	rare
EPACRIDACEAE (Epacris Family)			
Leptecophylla tameiameiae (Cham.& Schlectend.) C.M. Weiller	Pukiawe	indigenous	uncommon
EUPHORBIACEAE (Spurge Family)			
Chamaesyce celastroides (Boiss.) Croizat&Degener *var. amplectens* (Sherff) Degener&I.Degener	‘akoko	endemic	rare
FABACEAE (Pea Family)			
Acacia farnesiana (L.) Willd.	Klu	non-native	uncommon
Chamaecrista nictitans (L.) Moench	partridge pea	non-native	uncommon
Desmodium sandwicense E. Mey.	Spanish clover	non-native	rare
Indigofera suffruticosa Mill.	iniko	non-native	uncommon
Leucaena leucocephala (Lam.) de Wit	koa haole	non-native	uncommon
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe	non-native	rare
GENTIANACEAE (Gentian Family)			
Centaurium erythraea Raf.	bitter herb	non-native	rare
GOODENIACEAE (Goodenia Family)			
Scaevola gaudichaudii Hook. & Arnott	orange naupaka	endemic	rare
LAMIACEAE (Mint Family)			
Salvia coccinea B. Juss. ex Murray	scarlet sage	non-native	rare
MALVACEAE (Mallow Family)			
Sida fallax Walp.	‘ilima	indigenous	uncommon
MENISPERMACEAE (Moonseed Family)			
Cocculus orbiculatus (L.) DC.	huehue	indigenous	rare
MYOPORACEAE (Myoporum Family)			
Myoporum sandwicense A. Gray	naio	endemic	rare
MYRTACEAE (Myrtle Family)			
Metrosideros polymorpha Gaud. *var. incana* (H. Lev.) St. John	‘ohi‘a	endemic	rare
Psidium guajava L.	guava	non-native	rare
PLANTAGINACEAE (Plantain Family)			
Plantago lanceolata L.	narrow-leaved plantain	non-native	common
POLYGALACEAE (Milkwort Family)			
Polygala paniculata L.	----------	non-native	rare
SCIENTIFIC NAME	***COMMON NAME***	***STATUS***	***ABUNDANCE (at project site)***
PRIMULACEAE (Primrose Family)			
Anagallis arvensis L.	scarlet pimpernel	non-native	rare

SCIENTIFIC NAME	***COMMON NAME***	***STATUS***	***ABUNDANCE (at project site)***
PROTEACEAE (Protea Family)			
Grevillea robusta A. Cunn. ex R.Br.	silk oak	non-native	rare
ROSACEAE (Rose Family)			
Osteomeles anthyllidifolia (Sm.) Lindl.	‘ulei	indigenous	common
SANTALACEAE (Sandalwood Family)			
Santalum ellipticum Gaud.	‘iliahi alo‘e	endemic	rare
SAPINDACEAE (Soapberry Family)			
Dodonaea viscosa Jacq.	‘a‘ali‘i	indigenous	uncommon
STERCULIACEAE (Cacao Family)			
Waltheria indica L.	‘uhaloa	indigenous	uncommon
THYMELAEACEAE (‘Akia Family)			
Wikstroemia oahuensis (A.Gray) Rock.	‘akia	endemic	rare
VERBENACEAE (Verbena Family)			
Lantana camara L.	lantana	non-native	uncommon
Verbena littoralis Kunth.	‘owi	non-native	rare

3.7.2 AVIAN AND TERRESTRIAL FAUNA

The mixed grassland/shrubland vegetation on the project site is habitat to several endemic, indigenous and migratory birds and a number of resident mammals.

Several ornithological surveys were conducted during the development of KWP I to identify avian species present in the project area and to determine that project’s potential to impact them negatively Nishibayashi 1997 & 1998). The first of these (Nishibayashi 1997) focused on the identification of downed birds near the six meteorological towers that were installed prior to the construction of KWP I. While no downed birds were found, a number of non-native, introduced species were identified opportunistically in the project vicinity (see Table 3.5 below). None of the species observed during that survey is listed as endangered, threatened or protected by USFWS or the State of Hawai‘i.

Cooper & Day (1999, 2004a) conducted nighttime radar and night-vision surveys of the project area with the goal of detecting the presence of four Federally listed species (Hawaiian Petrel, Newell’s Shearwater, Nēnē, and Hawaiian Hoary Bat). Radar stations were set up near the present-day locations of KWP I turbines 5 and 12. Radar surveys conducted in 1999 and 2004 detected a total of 77 targets flying over the site that matched the criteria for Petrels and Shearwaters. Petrels, Shearwaters, and Nēnē were also visually confirmed near the site in low numbers during the 1999 and 2004 surveys. No Hawaiian Hoary Bats were observed during either survey, and it was concluded that this species probably occurs in the proposed wind farm infrequently and in very low numbers (Cooper & Day 2004a). Once it was determined that the KWP I facilities had the potential to affect these endangered species, its owner prepared, and is now implementing, a Habitat Conservation Plan (HCP) for the project. The HCP serves as the basis for the incidental take permit from the U.S. Fish and Wildlife Service and the license from the State of Hawai‘i Department of Land and Natural Resources under which the existing WTGs are operating. The following paragraphs provide additional information about the four species addressed under the HCP.

Table 3.5. Avian Species Identified in the Project Area (Nishibayashi 1997).

Common Name	***Scientific Name***	***Detections****	***Status***
Eurasian Skylark	*Alauda arvensis*	22	MBTA
Ring-Necked Pheasant	*Phasianus colchicus*	18	None
Black Francolin	*Francolinus francolinus*	7	None
House Finch	*Carpodacus mexicanus*	9	MBTA
Common Myna	*Acridotheres tristis*	7	None
Pu‘eo or Hawaiian Short-eared Owl	*Asio flammeus sandwichensis*	5	MBTA, HI Species of Concern (informal)
Nutmeg Manikin	*Lonchura punctulata*	4	None
Gray Francolin	*Francolinus pondicerianus*	3	None
Northern Cardinal	*Cardiinalis cardinalis*	1	MBTA
Spotted Dove	*Streptopelia chinensis*	1	None
Kolea or Pacific Golden Plover	*Pluvialis fulva*	1**	MBTA

Number of days (out of 26 total) on which species was detected by Nishibayashi (1997).

Source: Nishibayashi (1998).

<u>Hawaiian Petrel</u>. Until recently, the endangered Hawaiian Petrel or ‘Ua‘u (*Pterodroma sandwichensis*) was believed to nest primarily on Maui, with relatively small populations on Kaua‘i and Lāna‘i. On Maui, the petrels nest on Haleakalā Crater on East Maui; however, it is not known with certainty whether they also nest in the mountains of West Maui where the project site lies. Recently, scientists have identified a sizeable population of Hawaiian Petrel on the forested slopes of the island of Lana‘i. Researchers said that the Lāna‘i population might be even larger than the estimated 1,200 petrels that nest in Haleakala Crater on the island of Maui (Haleakala National Park), the other major nesting site for the birds. The Lanai population is expanding on the ridge that runs across the eastern half of Lanai, just below Lāna‘ihale peak, the highest point of Lana‘i (3,370 feet above sea level). Scientists are not yet certain of the cause of the apparent increase, but they tentatively attribute it to several possible factors. One is habitat restoration, particularly the eradication of feral goats which disturbed native vegetation, most notably uluhe fern (false staghorn); when the habitat began recovering the bird population increased. Other factors are thought to be Lānai’s minimal level of urbanization and the absence of light pollution. One source (Duvall 2006) believes another factor may be Lāna‘i’s minimal level of urbanization.

<u>Newell’s Shearwater</u>. The threatened Newell’s Shearwater or ‘A‘o (*Puffinus auricularis newelli*) breeds on several of the main Hawaiian islands, with indications that the species may also nest on Maui, although little is currently known about the status of the species on Maui (KWP 2006). Cooper & Day (2004a) observed that the habitat on the KWP I site is not suitable for nesting by the Shearwater or Petrel, but it does appear to be suitable at higher elevations on West Maui Mountain.

<u>Nēnē</u>. As part of the State and Federal plans for endangered Nēnē (*Branta sandvicensis*) recovery, Nēnē have been re-introduced onto the islands of Kaua‘i, Maui, Moloka‘i and Hawai‘i; this recovery program includes a captive-release pen in the Hana‘ula area of the West Maui mountains, near the upper end of the project site. As of 2003, 87 Nēnē had been released from this pen since 1994, but little is known about their present distribution and movements (Cooper & Day 2004a).

Hawaiian Hoary Bat. Little is known about the distribution or habitat use of the endangered Hawaiian Hoary Bat. While it has been recorded on several islands, it is believed to be most abundant on Hawai‘i and present in low numbers on Maui (Cooper & Day 2004a).

Information concerning the occurrence of these species and their potential interactions with the existing wind project continues to be gathered by KWP I biologists under the provisions of the HCP. This information represents the best available recent empirical assessment of the potential for impacts to result from the proposed facility, and will be included in the Draft EIS for KWP II.

Based upon project-related site visits, as well as information provided by Maui DLNR staff, other wildlife occurring in the vicinity of the project site includes mice (*Mus musculus*), rats (*Rattus* sp.), mongooses (*Herpestes auropunctatus*), feral cats (*Felis silvestris*), and feral dogs (*Canis lupus*).

3.8 NOISE

Undesirable sound is generally referred to as *noise*, however, the terms *sound* and *noise* are commonly used interchangeably. The effects of sound depend on its frequency (or pitch), decibel level, and duration, particularly in relationship to changes in existing sound levels.

There are several ambient sound (or noise) sources in the project area. These include the turbines at the existing KWP I facility, vehicles traveling along the facility access road, rain, wind, birds and mammals. The wind turbines do not operate at wind speeds below 3 meters per second (6.7 mph). Thus, during periods of light or calm winds at hub height, sound level emissions from the wind farm are virtually non-existent.

Sound level performance specifications for the GE 1.5sle wind turbine represent the wind turbine as a point source at the hub (rotor center) and were determined in accordance with IEC International Standard 61400-11, Wind Turbine Generator Systems – Acoustic Noise Measurement Techniques. The maximum sound *power* level for the 1.5sle wind turbine is 104 dBA. Because the sound *pressure* level at 50 feet is approximately 32 dBA less than the sound power level of a point source, this is equivalent to a sound pressure level of 72 dBA at 50 feet[18]. The GE 1.5sle reaches its maximum sound power level at an electric power output of approximately 60% of full generating capacity. This level of operation is achieved with a wind speed of 9 meters per second (20.1 mph) at the hub height of the wind turbine. The sound level specification indicates that the sound emissions do not increase once this wind speed and electric power output level are reached.

The Final EIS for KWP I estimated that noise from one of the GE turbines would decay to 45dB within less than 600 feet. Sound levels resulting from multiple sound sources, such as an arrangement of wind turbines, are calculated by combining the decibel levels from each source. Decibels are logarithmic and therefore are added exponentially. As a result, when two sounds of equal decibel levels are combined, the resulting sound level is 3 dB higher than the individual sound levels (e.g. 50 dBA + 50 dBA = 53 dBA), assuming they are at equal distances. Sound levels at the KWP II turbine string are expected to be similar to those that currently occur at KWP I. Due to the decay of sound pressure levels over distance, the sound from one string is expected to have little if any measurable effect on sound levels at the neighboring string. Hence, existing sound levels at the locations being considered for the additional wind turbine generators are believed to be low.

Table 3.6 presents the results of noise measurements made at the base of one of the KWP I turbines in September 2006 during a period of low wind speed. It is not meant to represent noise levels under a full range of operating conditions.

[18] From attenuation due to hemispherical radiation = 10 log ($2pR^2$) where R is the distance in meters.

Table 3.6. Baseline Sound Levels in dBA at the KWP I Site on September 6, 2006

Station Description	***Baseline Sound Levels in dBA***[1]		
Existing KWP I Site at the Base of a Turbine	***Leq***[2]	***MaxP***[3]	***MaxL***[4]
	47.5	99.8	69.1

[1] A person's ability to hear a sound depends greatly on its frequency. Young, healthy people can hear frequencies as low as about 20 Hertz (Hz) and as high as about 20,000 Hz (one hertz is equivalent to one wave per second, or cycle, per second). People hear sounds best when the predominant sound energy is between 1,000 and 6,000 Hz. To measure sound on a scale that reflects the way people perceive it, more weight must be given to the frequencies that people hear more easily. The U.S. EPA recommends the A-weighting scale for environmental noise because it is convenient to use, accurate for most purposes, and is used extensively throughout the world.

[2] Equivalent Sound Level (Leq). This variable is the root-mean square (RMS) average of the time-varying sound energy measured during the 10-minute measurement interval. Leq correlates reasonably well with the effects of noise on people, even for wide variations in environmental sound levels and time patterns.

[3] Maximum Peak Level (MaxP). This is the instantaneous maximum sound level measured during the measurement interval.

[4] Maximum Sound Level (MaxL). This is the maximum sound level (1-second integrated value) recorded during the measurement interval.

Source: Planning Solutions, Inc. Sound levels were recorded continuously over a ten-minute period using a Brüel & Kjær Type 2239A Integrating meter. The meter was set to integrate data every second using the A-weighting scheme.

Hawai‘i Administrative Rules §11-46, "Community Noise Control" establishes maximum permissible sound levels (see Table 3.7) and provides for the prevention, control, and abatement of noise pollution in the State from stationary noise sources and from equipment related to agricultural, construction, and industrial activities. The noise standards are also intended to protect public health and welfare, and to prevent the significant degradation of the environment and quality of life.

Table 3.7. Maximum Permissible Sound Levels in dBA.

Zoning Districts	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Class A	55	45
Class B	60	50
Class C	70	70

Table Notes:

(1) Class A zoning districts include all areas equivalent to lands zoned residential, conservation, preservation, public space, open space, or similar type.

(2) Class B zoning districts include all areas equivalent to lands zoned for multi-family dwellings, apartment, business, commercial, hotel, resort, or similar type.

(3) Class C zoning districts include all areas equivalent to lands zoned agriculture, country, industrial, or similar type.

(4) The maximum permissible sound levels apply to any excessive noise source emanating within the specified zoning district, and at any point at or beyond (past) the property line of the premises. Noise levels may exceed the limit up to 10% of the time within any 20-minute period. Higher noise levels are allowed only by permit or variance issued under sections 11-46-7 and 11-46-8.

(5) For mixed zoning districts, the primary land use designation is used to determine the applicable zoning district class and the maximum permissible sound level.

(6) The maximum permissible sound level for impulsive noise is 10 dBA (as measured by the "Fast" meter response) above the maximum permissible sound levels shown.

Source: Hawaii Administrative Rules §11-46, "Community Noise Control"

Because the KWP II site is in the State Conservation District, the Class A noise limits are applicable. HAR §11-46-7 grants the Director of the Department of Health the authority to issue permits to operate a noise source which emits noise levels in excess of the maximum permissible sound levels specified in Table 3.7 if it is in the public interest and subject to any reasonable conditions. Those conditions can include requirements to employ the best available noise control technology.

3.9 ARCHAEOLOGICAL, HISTORIC, AND CULTURAL RESOURCES

3.9.1 PRE-HISTORIC AND HISTORIC LAND USES IN THE PROJECT AREA

3.9.1.1 Ukumehame Ahupuaʻa

The project area is located at the upper reaches of the traditional land area of the Ukumehame, the easternmost *ahupuaʻa* in the district of Lahaina. The *ahupuaʻa* includes Ukumehame valley, a steep mountainous area, and several inter-valley tablelands. Archaeological evidence shows that taro was formerly cultivated in irrigated fields on the lowland plains and gulch bottom.

Because there is no reliable source of water, traditional wetland taro cultivation was not possible on the upland tablelands, such as the present-day Kaheawa Pastures area. However, the tablelands may have been a resource area for the collection of native birds and an access route to the higher elevations of the West Maui Mountains (Tomonari-Tuggle 1998). If pili grass (*Heteropogon contortus*), common to leeward lowlands, had grown in this area, it would have been a prime resource since this was the most desired material for house thatching. In general, the tablelands were relatively inhospitable for intensive settlement or agriculture because of their steep and rugged terrain, lack of water sources, and limited access to the ocean. Similarly, although coastal trails once ringed much of Maui, no coastal trail was present fronting the KWP II project area because of the rough terrain, so "from Olowalu [to the west of the current project area] travelers were ferried by canoe to Māʻalaea [to the east of the current project area], thence to Mākena" (Handy et al. 1991).

By the 1850s, portions of Ukumehame *ahupuaʻa* were being leased for various enterprises, primarily cattle ranching (Tomonari-Tuggle 1998). In 1886, the western half of Ukumehame *ahupuaʻa* was listed as being leased to Olowalu Plantation Company, for sugarcane cultivation and sugar production, and the eastern half (including the KWP II project area) is listed as leased to John Richardson and Kahahawai for cattle ranching (Clark & Rechtman 2006). Cattle ranching continued in the area until the mid-1990s, while lower portions of the wetter, western half of Ukumehame *ahupuaʻa* continued to be used for sugarcane cultivation (Clark & Rechtman 2006).

3.9.1.2 Kaheawa Pastures

Clark and Rechtman (2006) synthesized information from archival resources and archaeological studies conducted in the project area in preparing their summary of prehistoric and historic uses of the entire Kaheawa Pastures area (extending from above the proposed KWP II site down to the coast). They concluded that Pre-Contact use of the project area centered on coastal habitation and the exploitation of marine resources.

Devereux et al. (1999) described a network of trails that may once have connected the coastal habitation area with inland resource areas. If a pre-contact *mauka/makai* trail route traversed Kaheawa Pastures, then it likely accessed inland resource areas, and may have connected to trails leading to other areas of West Maui. At some point in the mid-1940s the McGregor Point jeep road was bulldozed through the Kaheawa Pastures area, allowing vehicular access to the *mauka* land. This may account for the fact that Clark and Rechtman did not observe evidence of a pre-contact trail during their 2006 survey. Once constructed, the *mauka-makai* road was maintained by ranchers, Maui Electric Company (for construction and maintenance of the transmission lines that it installed in the 1970s), and the State Department of Land and Natural Resources (DLNR), with newer bulldozer routes approximating the older ones. Portions of the road were subsequently improved as part of the construction of KWP I. Athens (2002) reported that trails likely ran to Site 5232, an inland *heiau* located on Pu‘u Luau, in late pre-contact times. He conjectured that isolated marine shell fragments and an adze fragment observed in the area may have been dropped along such a trail route leading to or from the *heiau*.

Historic-period sites in the vicinity of Kaheawa Pastures far outnumber those dated to the pre-contact period. The majority of these were relatively close to the old Honoapi‘ilani Highway alignment. The date (1908) embedded in concrete stairs on the ridge to the west of Malalowaiole Gulch (Site 5654) indicates that the area was being used in the early part of the 20th century. Other features (e.g., a terraced roadbed, a possible privy, and a Hoist location) were also located in the area. All of these sites may relate to cattle ranching, which was ongoing in the area from the late 1850s to the early 1990s (Tomonari-Tuggle 1998). The only historic period site recorded close to the existing wind farm facilities is a concrete watering trough constructed in 1943 (Site 5402).

In addition to these sites the Lahaina Pali trail crosses the Kaheawa Pastures area. This historic-period trail was constructed around 1841 for horse travel between Wailuku and Lahaina. The trail fell into disuse approximately fifty years later with the construction of a carriage road (Site 4696) along the coast (Tomonari-Tuggle and Tuggle 1991). The old trail brought numerous Historic travelers across the lower slopes of the West Maui Mountains, and it continues to bring modern day visitors to the area as part of the Na Ala Hele Statewide Trail and Access System.

3.9.2 ARCHAEOLOGICAL AND HISTORIC FEATURES AT THE PROPOSED KWP II SITE

Eight previous archaeological studies were conducted in the Kaheawa Pastures area for the KWP I facility. These studies included a reconnaissance survey of twenty-seven wind turbine locations (Tomonari-Tuggle 1998), a study of an upland *heiau* site (Site 5232; Athens 2002) and a preservation plan for that *heiau* (Tomonari-Tuggle and Rasmussen 2005), a supplemental survey of the KWP I wind turbine pad alignments (Magnuson 2003), a supplemental survey for the proposed KWP I access road (Athens 2004), a reconnaissance survey of the southern portion of an alternative road route (Rasmussen 2005a), a supplemental reconnaissance survey within the SMA zone for the proposed KWP I staging area (Rasmussen 2005b), and an inventory survey of the entire proposed KWP I development area (Clark and Rechtman 2005). Three of these studies included portions of the KWP II project area (Athens 2002; Magnuson 2003; Tomonari-Tuggle and Rasmussen 2005). In addition to these studies, an archaeological survey report (Tomonari-Tuggle and Tuggle 1991) and a cultural resource management plan (Tomonari-Tuggle 1995) were prepared for the Lahaina Pali trail, a portion of which crosses *makai* of the KWP II project area, and an inventory survey was conducted for the MECO transmission lines that cross the current project area (Hammatt et al. 1996; Robins et al. 1994).

In 2006, Rechtman Consulting conducted an archaeological inventory survey of most of the proposed KWP II project area (Clark and Rechtman 2006).[19] The survey team relocated SIHP Site 50-50-09-5232, an upland *heiau* previously recorded by Athens (2002). The survey also recorded five new sites. These included a windbreak shelter (SIHP Site 50-50-09-6218), three cairns (SIHP Sites 50-50-09-6219, 50-50-09-6220, and 50-50-09-6221), and a historic ranching area containing the remains of a concrete trough and two recently burned wooden structures (possible troughs; SIHP Site 50-50-09-6222). The study noted two segments of an old metal waterline associated with Site 6222 crossing the project area from north to south. In addition to the recorded archaeological sites, a single, isolated piece of branch coral was found on ground surface to the west of Site 6218 and the old metal waterline.

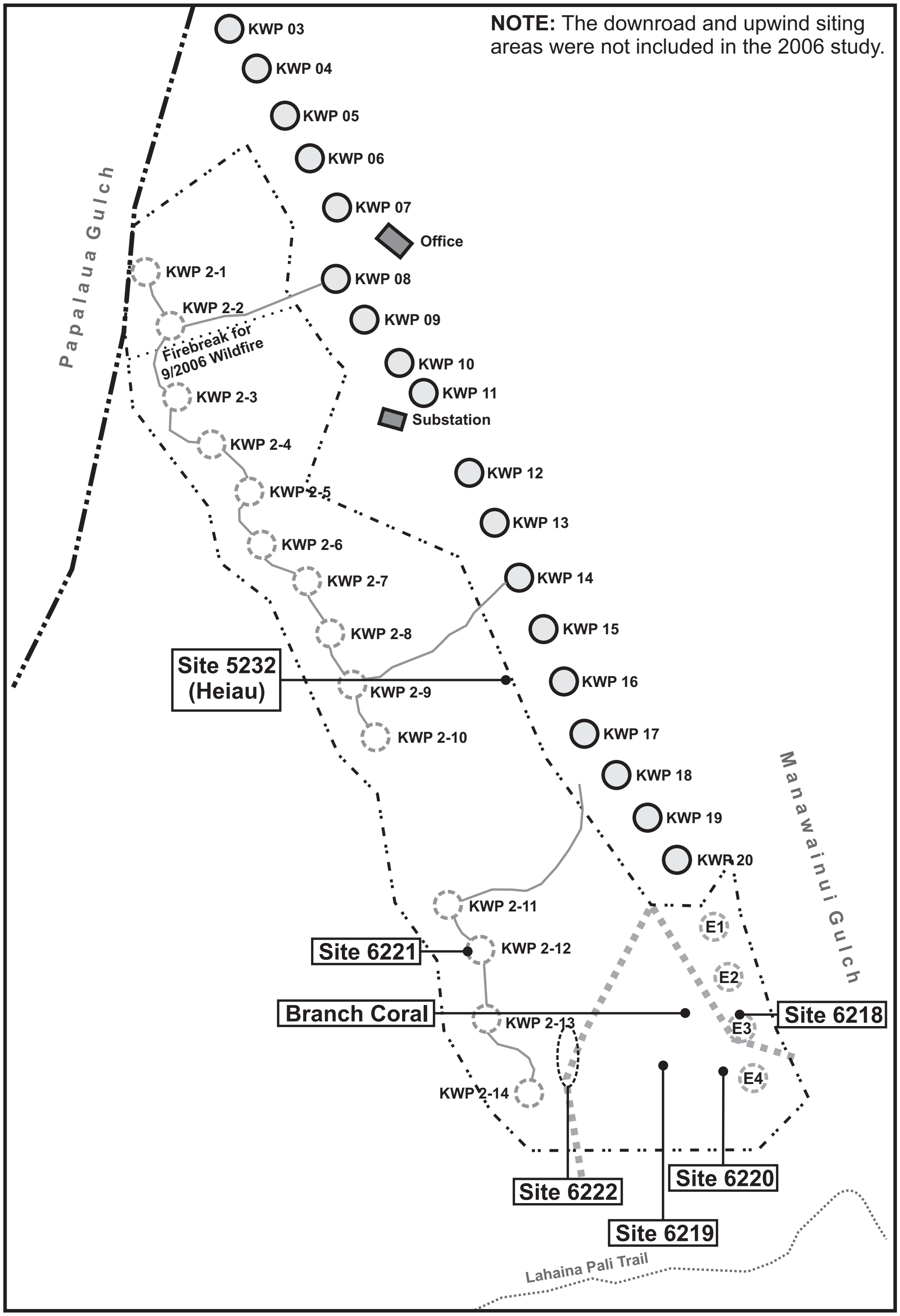
[19] The study did not include the down-road siting area, which was previously surveyed by Tomonari-Tuggle (1998) and Rechtman Consulting (2005). It also did not include the up wind siting area. Data on that area is being collected and will be included in the Draft EIS.

With the exception of the previously identified *heiau*, all of the newly recorded archaeological sites are within the southern portion of the KWP II project area *makai* of the existing KWP I facility. The *heiau* (Site 5232) is located along the southwestern flank of Pu‘u Luau near the western boundary of the existing wind farm. The Lahaina Pali Trail crosses the hillside several hundred feet south of the proposed KWP II project area. Each of these features is described in Table 3.8, and their locations are depicted on Figure 3.5.

Table 3.8. Archaeological Sites Identified in the Project Area

SIHP Site No.	***Time Period***	***Description***
50-50-09-6218	Unknown (probably historic)	A crude windbreak shelter constructed of cobbles and small boulders. May have been a rest area constructed by the ranch hands working on a metal waterline that was laid nearby in the 1940s. No indication of time or duration of use, although it would have taken very little effort to construct.
50-50-09-6219	Unknown	A cairn consisting of two boulders stacked one on top of the other on top of a natural bedrock boulder. Small stones exist beneath the two stacked boulders to balance them. The boulders are fairly large and would have required two people to lift. The cairn could have been erected at any time, perhaps to marks the route of a former trail, although no such route is apparent on the site.
50-50-09-6220	Unknown (probably modern)	A cairn constructed of three small cobbles stacked on top of a large bedrock boulder. This cairn could have been erected at any time, but it is likely that it was constructed during recent times, as the cobbles are rather precariously balanced and would fall over easily if disturbed. It is possible that the cairn marks the route of a former trail, although no such route is apparent.
50-50-09-6221	Unknown	A cairn constructed of approximately fifteen medium-sized cobbles that are loosely stacked/piled on and against two small bedrock boulders. It could have been erected at any time. Again, it is possible that the cairn marks the route of a former trail, although no such route was observed.
50-50-09-6222	Historic	A concrete water trough (Feature A) and the remnants of two recently burned wooden structures (Feature B), possibly troughs. The features are connected by an old metal waterline. An inscription in the concrete of Feature A reveals that construction of the concrete portion of the trough was completed on December 17, 1943. This water system was likely part of Hono‘ula Ranch, which was operating in Ukumehame in the 1940s.
50-50-09-5232	Pre-contact	An upland *heiau* (religious site or temple) approximately 400 feet to the west of the KWP I facility at an elevation of about 2,250 feet MSL. The *heiau* is thought to date from the late prehistoric period, between 1660 and 1760. Excavation inside the notched enclosure revealed a dense deposit of charcoal associated with use of the *heiau* (Athens 2002). Several pieces of branch coral were recovered from the charcoal deposit, further confirming the religious nature of the site (branch coral was commonly brought to *heiau* as offerings). No food or tool remains were found during

		the extensive survey of the site (Athens 2002). The *heiau* is thought to be connected with Manawaipueo Gulch and is thereby associated with owls (pueo). The *heiau* does not appear to have a recorded traditional or common name (Tomonari-Tuggle and Rasmussen 2005). Clark and Rechtman (2006) also noted that the southwestern corner of the *heiau* is oriented toward the tallest point on the Island of Kaho‘olawe, suggesting that it perhaps functioned as a navigation *heiau* (Kaho‘olawe has known associations with Hawaiian navigation).
50-50-09-2946 and 50-50-09-2950	Historic	The Lahaina Pali Trail (Site Nos. 50-50-09-2946 and 50-50-09-2950) runs east-west across the Kaheawa area, approximately 3,000 feet down slope of the southernmost existing KWP I turbine. Evidence suggests that “the Lahaina Pali Trail was constructed for horse traffic around 1841 and was used for some fifty years as the shortest route between Lahaina and the isthmus of Maui. It fell out of use around the turn of the 20th century following construction of a carriage road along the base of the *pali*” (Tomonari-Tuggle, 1991, as cited in Tomonari-Tuggle and Rasmussen, 2005). Tomonari-Tuggle (1991) further states that “The terrain crossed by the Lahaina Pali Trail is relatively inhospitable for settlement or agriculture. Surface water is virtually nonexistent and there are few fresh water sources. The slopes are steep and rugged. Access to the ocean is limited to small, narrow, and rocky gulches.” Old Lahaina Pali Trail was selected as Maui’s Demonstration Trail for the Na Ala Hele Trails and Access Program.
Source: Clark and Rechtman (2006).		



Prepared For:

Kaheawa Wind Power II

Prepared By:

PLANNING SOLUTIONS

Source:
Rechtman Consulting, LLC (2006)

Legend:

Old Waterline

Extent of Survey

Parcel Boundary

0 250 500
Meters

Figure 3-5:

Archaeological Sites Previously Identified in 2006 Survey

Kaheawa Wind Power II

Figure 3-5 Archaeological Sites in KWP II Project Area 2007-11-27.cdr

3.10 EXISTING LAND USE/SOCIOECONOMIC & CULTURAL ENVIRONMENT

3.10.1 LAND USE

3.10.1.1 Existing Land Use Controls

The proposed KWP II project site is in the State Conservation District (see Figure 3.6) as established and regulated by Chapter 205, HRS (see Figure 3.6). Lands within the Conservation District are typically utilized for protecting watershed areas, preserving scenic and historic resources, and providing forest, park and beach reserves [subsection 205-2(e) HRS]. The entire project site is owned by the State of Hawai'i. As with other Conservation District lands, the two parcels comprising the project site are not subject to any County of Maui zoning or community plan designations or restrictions. The site is outside of the Special Management Area.

3.10.1.2 Existing Land Use

In addition to the KWP I wind farm facilities, a few low-intensity uses are present near the area that is being considered for the proposed wind farm.

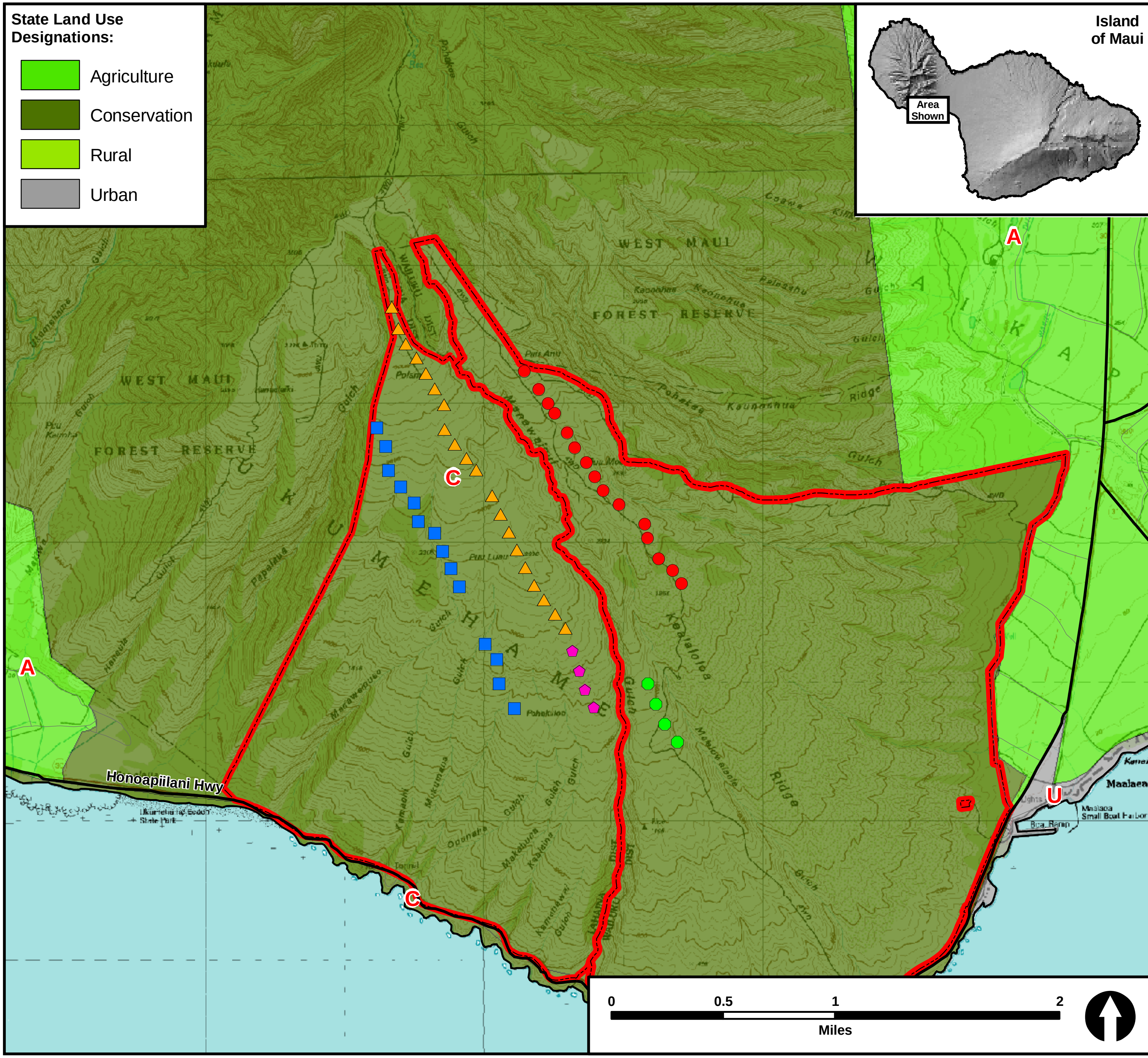
- The area *mauka* and west of the proposed wind farm is used by the State for the release of native Nēnē as part of an ongoing wildlife preservation program.
- The Sierra Club and other organizations utilize the Manawainui Plant Sanctuary *mauka* of the KWP I facility for education, management, and restoration of native plant habitat.
- The Lahaina Pali Trail, traverses the hillside at an elevation of approximately 1,500 feet. If the lowest of the WTG sites under consideration are used (i.e., the down-road sites), WTGs would be present on either side of the trail.
- Two transmission line easements for Maui Electric Company Ltd. (MECO) run through the project area. They cross Kaheawa Pastures in a southwesterly direction from Mā'alaea. The first easement (with two power lines) crosses the pastures at an elevation of approximately 2,300 feet; the second easement (with one power line) crosses about 1,900 feet.

There are no planned land uses identified in the Maui County General Plan or the West Maui Community Plan for the study area.

3.10.2 POPULATION AND HOUSING

No one lives on the parcels on which facilities would be developed or on immediately adjoining parcels. The settlements nearest the proposed KWP II project area are Olowalu, which is over three miles to the southwest) and Mā'alaea, which is approximately two miles to the east. Mā'alaea's year 2000 population was approximately 450, and even fewer people lived in Olowalu.

The County of Maui Planning Department *Socio-Economic Forecast: The Economic Projections for the Maui County General Plan 2030* (County of Maui Planning Department 2006: 11) projects Maui island's de facto population (i.e., the average number of residents and visitor present) will increase from 175,147 in 2005 to 254,448 in 2030, a gain of about 45%. Local development potentials include time-share development, the development of large master-planned communities, and the development of Hawaiian Homelands lands. Proposals include the development of sizeable new residential communities at Olowalu and Mā'alaea.



Legend:

Existing KWP I Turbines

Highways

Roadways

TMK Boundaries

Proposed KWP II Sites:

Upwind Sites

Downwind Sites

Downroad Sites

Downstring Sites

Prepared For:

Kaheawa Wind Power II

Prepared By:

PLANNING SOLUTIONS

Sources:

-UPC Wind Management, LLC
-State of Hawai'i GIS

Figure 3.6:

State Land Use Map

Kaheawa Wind Power II

Figure 3-6 Land Use Map 2007-11-26.mxd

3.10.3 ECONOMY

Maui County Planning Department's 2006 Socio-economic Forecast made the following general predictions about the economy of Maui County to the year 2030:

- Wage and salary jobs are expected to increase by about 1.7% annually;
- Per capita income will increase very little (in constant dollars);
- Visitor counts will increase by about 1.5% annually;
- With high occupancy rates, construction of new units is expected to resume, and the supply of visitor units will likely grow at 1% or more annually; and
- The rates of growth in resident population, housing, and jobs are higher than the rate of growth for visitors. This means the Maui economy has diversified and is less driven by tourism than in the past.

West Maui is considered one of Maui's major centers for the visitor industry. In 2005 the total Maui County visitor expenditures were $3.2 billion. This represents a little more than a quarter of the statewide visitor expenditures of $11.9 billion during 2005 (DBEDT 2006b).

While Maui is very dependent on the visitor industry, the island's agricultural industry, principally sugar and pineapple, provides a vital contribution to the economy. In 2004, Maui County had 34,800 acres of cane fields and generated a $46.2 million sugar crop. Pineapples were grown on 5,500 acres and produced a $28 million crop (DBEDT 2006a).

3.11 SCENIC RESOURCES & VIEWPLANES

The KWP II site is not identified as a scenic vista or viewplane in county or state plans or studies (KWP 2004). The existing wind turbines are visible from portions of the Old Lahaina Pali Trail, which passes below (i.e., to the south of) the nearest existing KWP I turbine, and this is true of the proposed new WTGs as well. The site is not visible from nearby segments of Honoapi‘ilani Highway due to the slope and difference in elevation.

Views of the site do occur from portions of the highway farther to the east as it skirts Mā‘alaea Bay, from the ocean, from numerous locations along the south shore (e.g., Kīhei), and from Haleakalā. These locations are all on the order of five to ten miles, or more, from the project site. The site is also visible to aircraft on approach to Kahului airport (WSB-Hawai‘i 1999).

From the proposed wind farm site, there are broad-sweeping panoramas of Haleakalā, Kīhei and Mā‘alaea Bay to the east, of Kaho‘olawe and Molokini islands to the south, and of the West Maui Mountains to the west. Facing *mauka*, the site (on clear days) offers views of Papalaua and Manawainui Gulches flanking the pasture area.

3.12 HAZARDOUS MATERIALS

Vuich Environmental Consultants, Inc (VEC 2005) conducted a Phase I Environmental Site Assessment of the KWP I project site. VEC concluded that hazardous substances or petroleum products were not likely to be present in that area. The proximity of the proposed KWP II site and the similarity of past uses suggests that conditions there are similar, but a Phase I Environmental Site Assessment has not yet been prepared for the proposed wind farm area.

3.13 PUBLIC INFRASTRUCTURE AND SERVICES

3.13.1 TRANSPORTATION FACILITIES

Roadways. The access road to the existing wind farm facilities begins at Honoapi‘ilani Highway, one of Maui’s major coastal roadways. The highway is heavily traveled by tourists and commuters, especially during daylight hours. It connects via other major highways to the port facilities at Kahului.

Harbors. Kahului Harbor is the only harbor on Maui suitable for unloading heavy equipment and construction materials needed for the proposed project. Construction materials would arrive at the Kahului Harbor and be trucked to the site.

Airports. The KWP II project is located approximately 10 miles from the Kapalua Airport and about 8 miles from Kahului International Airport. Because of the height of the proposed wind turbines, KWP II is required to submit a Notice of Intent to the Federal Aviation Administration for construction of the proposed facility. The FAA reviewed the KWP I turbines on the land adjacent to the project site and determined that, with proper lighting, they would not constitute a hazard to air navigation.

3.13.2 UTILITIES & PUBLIC SERVICES

Electrical service to the site is provided by Maui Electric Company (MECO). As described in Section 3.10.1.2, two MECO transmission line easements containing three transmission circuits cross the project area. The existing KWP I facility uses power from the uppermost of the three lines via step-down transformers located at the existing KWP I Substation. Likewise, power generated by the KWP I facility is fed into the MECO grid via those transmission lines. At MECO’s request, the proposed KWP II facility would utilize the lowermost line for extracting the small amount of power it needs and for distributing the power generated by the proposed turbines. MECO requested that the KWP II facility connect to different transmission lines than KWP I so as to provide greater redundancy and security to its system.

The nearest hospital to the proposed KWP II site is the Maui Memorial Hospital in Wailuku. In case of emergencies, paramedic/ambulance services are available from the Wailuku and Kīhei areas. The Maui Police Headquarters is located on Mahalani Street in Wailuku. The Maui main fire station is in Kahului on Dairy Road, additional fire stations are located in Wailuku, Kīhei and Lahaina.

4.0 POTENTIAL IMPACTS

This Chapter summarizes the kinds of adverse and beneficial effects that are likely to result from the proposed action. It was prepared using information concerning project alternatives presented in Chapter 2 and the preliminary information concerning the existing environment contained in Chapter 3. It is not intended to be an in-depth analysis. Instead, it briefly describes the issues that have been identified to date and outlines the kinds of analysis that KWP II LLC expects to include in the Environmental Impact Statement (EIS). By highlighting the kinds of analysis KWP II LLC believes are needed, it provides reviewers an opportunity to consider whether all issues that are important to them are likely to be addressed and to identify additional areas of concern that they believe should be included in the EIS.

4.1 IMPACTS TO PHYSIOGRAPHY & TOPOGRAPHY

Grading will be required for the turbine pads, internal access roads, substation, and control building associated with the proposed KWP II facility. While the earthwork is designed to avoid impacts to the major topographic features named in Section 3.1 and is much more limited than that required for KWP I, it will still result in noticeable localized topographic changes. The EIS will address this in further detail.

4.2 IMPACTS TO GEOLOGY AND SOILS

There are no known unique or unusual geologic resources or conditions at the proposed KWP II site. The EIS will discuss the effect that the proposed project would have on agricultural uses of the soils that are present.

4.3 EFFECTS ON CLIMATE AND AIR QUALITY

Construction Period. The EIS will summarize the potential air quality impacts associated with construction activity. The discussion will identify the mitigation measures that KWP II proposes to use to ensure that construction-related emissions are kept to the lowest level practicable.

Operational Period. The EIS will present a detailed analysis of the effect that the proposed new wind generating facility would have on air quality. As discussed in Chapter 1, cumulative air quality impacts are expected to be beneficial, as the facility would reduce emissions of several gases that contribute to global climate change and air pollution.

4.4 HYDROLOGIC EFFECTS

There are no streams, springs or ponds on the proposed WTG sites and no other hydrologic or water resources to be affected directly. During construction and operation of the wind farm, all water used on site would be trucked in. Hence, potential effects are limited to localized alterations in drainage patterns resulting from the construction of building pads and roads and changes in water quality associated with development of presently undisturbed areas.

The EIS will discuss how alterations of the site drainage patterns due to construction of the facility and internal roadways would be minimized. It will also describe the measures that KWP II LLC will take to prevent sediments and pollutants from being entrained in stormwater runoff while construction is underway and after the additional facilities are operational. Finally, it will discuss the likelihood that contaminated soils will be encountered during construction and the measures that KWP II LLC will take to handle and dispose of them should they be found.

4.5 NATURAL HAZARD RISKS

The proposed KWP II site is not in a flood zone. Neither is it in a tsunami inundation zone. There are no elevated risks of seismic or volcanic activity at the site. The proposed project would not change any of these designations. The EIS will describe the sources and analyses that support these conclusions. It will also explain why the facility will not change any existing risks of natural hazards in the project area. As part of the discussion it will review the fire hazard that is present in the area and the reasons why the proposed use is reasonable despite that hazard.

4.6 BIOLOGICAL EFFECTS

4.6.1 TERRESTRIAL FLORA

Of the 18 native plants thus far identified on the KWP II property, none are Federally listed Threatened or Endangered species (USFWS 1999) nor were any candidates for such status or identified as Species of Concern (Hobdy 2006). All are widespread and fairly common in Hawai‘i.

Due to the general condition of the habitat and the specific lack of any environmentally sensitive native plant species on the project site, the proposed KWP II project is not expected to result in any significant negative impact on the botanical resources in this part of Maui. The EIS will characterize the extent to which vegetation will be affected by the facility and describe the measures that KWP II will implement during construction and operation in order to protect and maintain vegetation on and around the project site. This information will be drawn from the Wild Land Fire Contingency Plan that is in place for KWP I.

4.6.2 AVIAN AND TERRESTRIAL FAUNA

The EIS will characterize the types of impacts that construction and operation of the proposed project could have on fauna in the project area. In particular, it will include an analysis of the potential for incidental take of four species protected under the Federal Endangered Species Act (Hawaiian Petrel, Newell’s Shearwater, Nēnē, and Hawaiian Hoary Bat). In this regard, KWP II LLC anticipates that it will seek an amendment to the Habitat Conservation Plan (HCP) and permits under which the KWP I facility is operating to allow the enlarged facility.

In addition, the EIS will also discuss potential impacts to non-protected species in the project area. This information will be based on the data collected during previous surveys of the project area and on new surveys commissioned specifically for the proposed project.

4.7 NOISE IMPACTS

Construction Period. Construction of the KWP II facility will involve the use of excavators, trucks, and other heavy equipment, some of which is inherently noisy. The EIS will identify the activities associated with construction and operation of the various facilities that have the potential to cause significant amounts of noise. It will outline measures that would be taken to minimize unnecessary noise from these activities, and it will discuss the extent to which construction activities can comply with applicable noise limits.

Operational Period. The EIS will provide a general description of noise from operation of the wind generating equipment proposed for KWP II. The EIS will identify the major noise sources that would be installed and characterize the noise that they would produce. It will compare the forecast noise levels with applicable noise standards and will describe any necessary noise mitigation measures, as appropriate.

4.8 EFFECTS ON HISTORIC, CULTURAL, & ARCHAEOLOGICAL RESOURCES

Section 3.9 above describes the historic, cultural, and archaeological resources present in the KWP II project area. The majority of these (with the exception of the *heiau* and the Lahaina Pali Trail to the south) have been subject to data collection by qualified archaeologists and have been recommended for no further work or preservation, pending SHPD's concurrence.

The EIS will include copies of correspondence with SHPD and describe any anticipated impacts of the KWP II facility on these archaeological and historic features. It will also outline the measures that KWP II will take to avoid impacting the *heiau* and to mitigate effects on the Lahaina Pali trail and its users.

No burials were encountered during construction of the KWP I facility and access road, indicating a low probability of encountering human burials during construction of KWP II. However, the EIS will discuss the possibility that unexpected remains may be encountered and will outline the steps that will be taken should this occur. Cultural issues will be addressed in the EIS following the consultation that is undertaken as part of the public review of this EISPN.

4.9 LAND USE AND SOCIO-ECONOMIC EFFECTS

Land Use. The proposed KWP II facility would be located in open meadows and adjacent to existing roadways on a remote ridge-top. It is close to an existing wind-generating facility. There are no existing uses of the pasture area other than wind generation, and thus land use would not significantly change. The potential for effects on uses of immediately adjacent areas will be investigated during preparation of the EIS, and the results will be included in that document. Similarly, the EIS will discuss the potential for the appearance and visibility of the proposed facilities to affect existing uses of more distant areas.

Socio-Economic Effects. As discussed in Chapter 1, direct socio-economic effects of the proposed facilities include: (i) construction employment and business activity; (ii) State revenues in the form of excise taxes, lease revenues, and property taxes; (iii) substantial fuel cost savings to MECO, which translate into ratepayer savings; (iv) ongoing employment of facility staff (which would be relatively limited); and ongoing expenditures for materials and outside services.

The EIS will enumerate project-related expenditures and employment, as well as the implication that the reduction in MECO fuel cost will have on the cost of electricity to its Maui customers. It will also discuss the extent to which each alternative would directly affect employment and the level of business activity.

4.10 VISUAL IMPACTS

The EIS will describe public vantage points on the island from which the facility will be visible and include an analysis of how the addition of the wind generating equipment to the Kaheawa Pastures site will incrementally affect views from those vantage points. At present, the analysis is expected to include views from the following locales:

- The Lahaina Pali Trail;
- Kīhei Town;
- Mā‘alaea Bay; and
- The summit of Haleakalā.

Additional vantage points may be added to this list depending upon comments that are received as a result of the public review of this document.

4.11 SPECIAL HAZARDS

The project is well outside designated flood hazard and tsunami inundation areas, and the EIS will note this. The impact analysis will briefly discuss the potential consequences of seismic events and other natural disasters on the proposed facilities given the features that are incorporated in the proposed design. The analysis will consider only those facilities that would be newly constructed for the project or whose operational mode would be altered substantially. It will not consider the existing wind power generating facilities at KWP I, which would continue to be used in their present manner.

Hazards associated with the proposed project include such things as fire (from the electrical equipment at the substation) and equipment failure. The EIS will discuss the potential for these low-probability events and the effects that they could have on the biological, physical, and human environment. It will also provide information on the measures that KWP II will take to avoid such failures and to provide security for the equipment that would be constructed.

4.12 IMPACTS ON PUBLIC INFRASTRUCTURE AND SERVICES

The proposed wind generating facility would have little potential to affect public infrastructure and services adversely.[20] All of the water needed for the facility would be trucked up to the site. Similarly, no impacts on telecommunications or other utilities are expected to occur. However, the most significant potential benefit of the proposed action would be its contribution to renewable energy generation on Maui and all of its ancillary environmental and economic benefits, as discussed in Chapter 1. The EIS will discuss this in further detail.

Vehicular Traffic. Construction and operation of the KWP II facility under the proposed alternative would not significantly affect existing road rights-of-way. At most, there would be temporary disruptions and increased traffic along segments of Honoapi‘ilani Highway during the construction period as large pieces of equipment are transported to the site. The EIS will discuss the implications that this would have for traffic movement within the affected area.

Air Traffic. The proposed wind turbines are of a height that requires KWP II to submit a construction Notice of Intent to the Federal Aviation Administration. The results of the FAA’s analysis will be incorporated in the EIS. KWP II will also provide copies of this document and the Draft EIS to the FAA for review and comment.

[20] The need for public agencies to respond in the event of an accident is an exception to this general rule. However, this responsibility already exists and would minimally alter any of the action alternatives being considered.

5.0 DETERMINATION

5.1 DETERMINATION CRITERIA

Chapter 343, Hawai‘i Revised Statutes (HRS), and Hawai‘i Administrative Rules (HAR) §11-200 establish certain categories of action that require the agency processing an applicant's request for approval to prepare an environmental assessment (EA). HRS §343-5(2) lists *"any use within any land classified as a conservation district by the State land use commission under chapter 205"* as requiring an environmental assessment. Since the proposed KWP II facility is within the Conservation District, compliance with Chapter 343 is required.

HAR §11-200-11.2 establishes procedures for determining if an environmental assessment is sufficient or if an environmental impact statement (EIS) should be prepared for actions that may have a significant effect on the environment. HAR §11-200-12 lists the following criteria to be used in making such a determination. An EIS is required if the proposed project:

- Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;
- Curtails the range of beneficial uses of the environment;
- 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;
- Substantially affects the economic or social welfare of the community or State;
- Substantially affects public health;
- Involves substantial secondary impacts, such as population changes or effects on public facilities;
- Involves a substantial degradation of environmental quality;
- Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;
- Substantially affects a rare, threatened, or endangered species, or its habitat;
- Detrimentally affects air or water quality or ambient noise levels;
- 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;
- Substantially affects scenic vistas and view planes identified in county or state plans or studies; or
- Requires substantial energy consumption.

5.2 CHAPTER 343 HRS DETERMINATION

In accordance with the potential impacts outlined in Chapter 4, the provisions of Chapter 343, Hawai‘i Revised Statutes and the significance criteria described above, the Department of Land and Natural Resources has determined that the proposed action could have potentially significant impacts and that these should be evaluated and discussed by preparing an environmental impact statement in accordance with Chapter 343, Hawai‘i Revised Statutes and HAR 11-200.

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6.0 DISTRIBUTION

KWP II LLC will distribute this EISPN to the individuals and organizations listed in Table 6.1 and request their comments on the proposed scope of the analysis and on the completeness of the alternatives that KWP II LLC proposes to evaluate. It will provide a limited number of loan copies of this document to libraries.

Table 6.1. EISPN Distribution List

Maui County	**Libraries and Depositories**
Department of Water Supply	DBEDT Library
Department of Public Works & Environmental Mgmt.	Hawai‘i State Library Hawai‘i Documents Center
Department of Parks and Recreation	Legislative Reference Bureau
Department of Planning	Maui Community College Library
Department of Transportation Services	UH Hamilton Library
Department of Fire Control	Lahaina Public Library
Police Department	Kahului Regional Library
	Elected Officials
State Agencies	Governor Linda Lingle
Commission on Water Resource Management	U.S. Representative Mazie Hirono
Department of Defense	U.S. Senator Daniel K. Inouye
Department of Hawaiian Homelands	U.S. Senator Daniel Akaka
Hawai‘i State Civil Defense	State Representative Angus McKelvey
Office of Environmental Quality Control	State Senator Rosalyn Baker
Office of Hawaiian Affairs	Mayor Charmaine Tavares
Department of Accounting and General Services	Councilmember Jo Anne Johnson
Department of Agriculture	
Department of Business, Economic Development, and Tourism (DBEDT) Office of Planning	**Local Utilities**
DBEDT Energy, Resources & Technology Division	Hawaiian Telcom
Department of Health, Environ. Planning Office	Maui Electric Company
Department of Land and Natural Resources (5 copies)	
Department of Transportation	**Other Parties**
DLNR Historic Preservation Division	Sierra Club, Maui Group
UH Environmental Center	Maui Tomorrow
Federal Agencies	**News & Media**
Environmental Protection Agency (PICO)	Honolulu Advertiser
National Marine Fisheries Service	Honolulu Star-Bulletin
US Army Engineer Division	Maui News
US Fish and Wildlife Service	
US Federal Aviation Administration	
US Natural Resources Conservation Service	
US Geological Survey	
Source: Compiled by Planning Solutions, Inc.	

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