FINAL

AUWAHI WIND FARM PROJECT
HABITAT CONSERVATION PLAN

Prepared for
Auwahi Wind Energy, LLC

Prepared by

TETRA TECH EC, INC.

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TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

PAGE

TABLE OF CONTENTS
(Continued)

PAGE

LIST OF TABLES

LIST OF FIGURES

APPENDICES

ABBREVIATIONS AND ACRONYMS

agl	above ground level
asl	above sea level
ATST	Advanced Technology Solar Telescope
BESS	battery energy storage system
BLNR	Hawai‘i Department of Land and Natural Resources, Board of Land and Natural Resources
CFR	U.S. Code of Federal Regulations
cm	centimeter
DHHL	Department of Hawaiian Home Lands
DOE	U.S. Department of Energy
DOFAW	Hawai‘i Department of Land and Natural Resources/Division of Forestry and Wildlife
DLNR	Hawai‘i Department of Land and Natural Resources
EA	environmental assessment
EIS	environmental impact statement
EISPN	Environmental Impact Statement Preparation Notice
ESRC	Endangered Species Recovery Committee
ESA	Endangered Species Act
F	Fahrenheit
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement
FONSI	finding of no significant impact
ft	foot or feet
GE	General Electric
ha	hectare
HCP	Habitat Conservation Plan
HECO	Hawaiian Electric Company
HELCO	Hawai‘i Electric Light Company
HCP	Habitat Conservation Plan
HRS	Hawai‘i Revised Statutes
HVNP	Hawai‘i Volcanoes National Park
ITL	Incidental Take License
ITP	Incidental Take Permit

km	kilometer
kph	kilometers per hour
kV	kilovolt
KWP	Kaheawa Wind Power
KWP I	Kaheawa Wind Power Facility No. 1
LHWRP	Leeward Haleakalā Watershed Restoration Partnership
m	meter
MBTA	Migratory Bird Treaty Act of 1918
MECO	Maui Electric Company
met	meteorological
MGD	million gallons per day
mg/L	milligrams per liter
MOU	Memorandum of Understanding
mph	miles per hour
MW	megawatt
MWh	megawatt-hours
NARS	Natural Area Reserve System
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NMFS	National Marine Fisheries Service
NPS	National Park Service
NRCS	Natural Resource Conservation Service
O&M	operations and maintenance
PCMP	Post-Construction Monitoring Plan
rpm	rotations per minute
RPS	Renewable Portfolio Standards
SCADA	supervisory control and data acquisition
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS-BRD	U.S. Geological Survey Biological Resources Division
V	volt
WTG	wind turbine generator

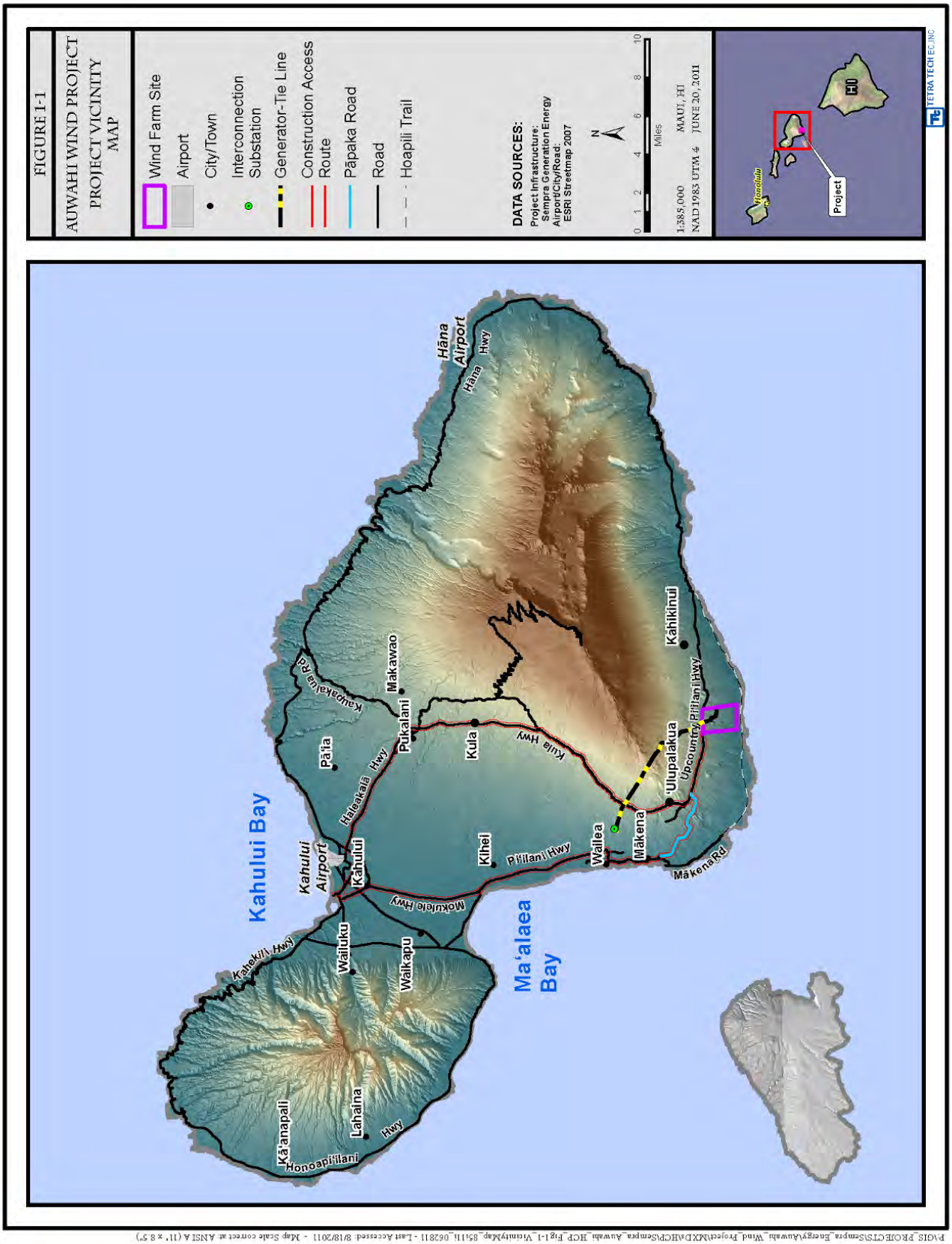
1.0 INTRODUCTION AND PROJECT OVERVIEW

1.1 INTRODUCTION

Auwahi Wind Energy LLC (Auwahi Wind or Applicant) proposes to construct and operate a wind farm (the Project) with a net generating capacity of 21 megawatts (MW), augmented with a battery energy storage system (BESS) in east Maui, Hawai'i. In addition to the wind turbine generators (WTGs) and the BESS, the proposed Project would include an electrical collection system, an operations and maintenance (O&M) facility and related infrastructure, an approximately 9-mile (15-kilometer [km]) 34.5-kilovolt (kV) generator-tie line, an interconnection substation, and an approximately 27-mile (44-km) construction access route from the Port of Kahului to the Project site (Figures 1-1 and 1-2). Construction is expected to begin in March 2012, and the Project is expected to be operational in December 2012. The Project will be located on 'Ulupalakua Ranch in the southern half of the Auwahi Ahupaua'a. The 'Ulupalakua Ranch has a long history of environmental stewardship and has proactively worked with state and federal agencies and local conservation groups to implement preservation and restoration projects on ranch lands. Based in part on the benefits expected from the Project, 'Ulupalakua Ranch was able to donate an easement to the Maui Coastal Land Trust to preserve 12,000 acres in perpetuity as agricultural lands.

Construction and operation of the Project has the potential to result in incidental take of species listed under the federal Endangered Species Act (ESA) of 1973, as amended, and the State of Hawai'i endangered species statutes, including the 'ua 'u or Hawaiian petrel (*Pterodroma sandwichensis*); nēnē or Hawaiian goose (*Branta sandvicensis*); ōpe'ape'a or Hawaiian hoary bat (*Lasiurus cinereus semotus*); and Blackburn's sphinx moth (*Manduca blackburni*). Individuals of these species have the potential to be killed or injured if they collide or otherwise interact with WTGs or other Project facilities. The Blackburn's sphinx moth could be negatively affected during construction through disturbance as a result of ground clearing or other construction activities, such as by collision with construction equipment. Indirect take could also occur; it is possible that the death of an adult seabird or bat colliding with a WTG or associated structures could result in loss of eggs or dependent young. Other federal- or state-listed animal species that occur on Maui do not reside within nor are expected to transit through the Project area. .

Due to the potential for incidental take of these species, Auwahi Wind has consulted with the U.S. Fish and Wildlife Service (USFWS) and the Hawai'i Department of Land and Natural Resources (DLNR)/Division of Forestry and Wildlife (DOFAW) to acquire an Incidental Take Permit (ITP) and an Incidental Take License (ITL) issued by these agencies, respectively. These permits are issued in accordance with ESA Section 10(a)(1)(B) and Hawai'i Revised Statutes (HRS) Section 195 D, respectively, and require the preparation of a Habitat Conservation Plan (HCP). To satisfy National Environmental Policy Act (NEPA) requirements resulting from the issuance of the ITP, the USFWS has prepared an environmental assessment (EA). To satisfy HRS Chapter 343, the County of Maui was the accepting agency for an environmental impact statement (EIS) which describes and analyzes the environmental impacts of this HCP and the associated ITL (Tetra Tech 2011). The listed species covered by this HCP are collectively referred to as Covered Species.



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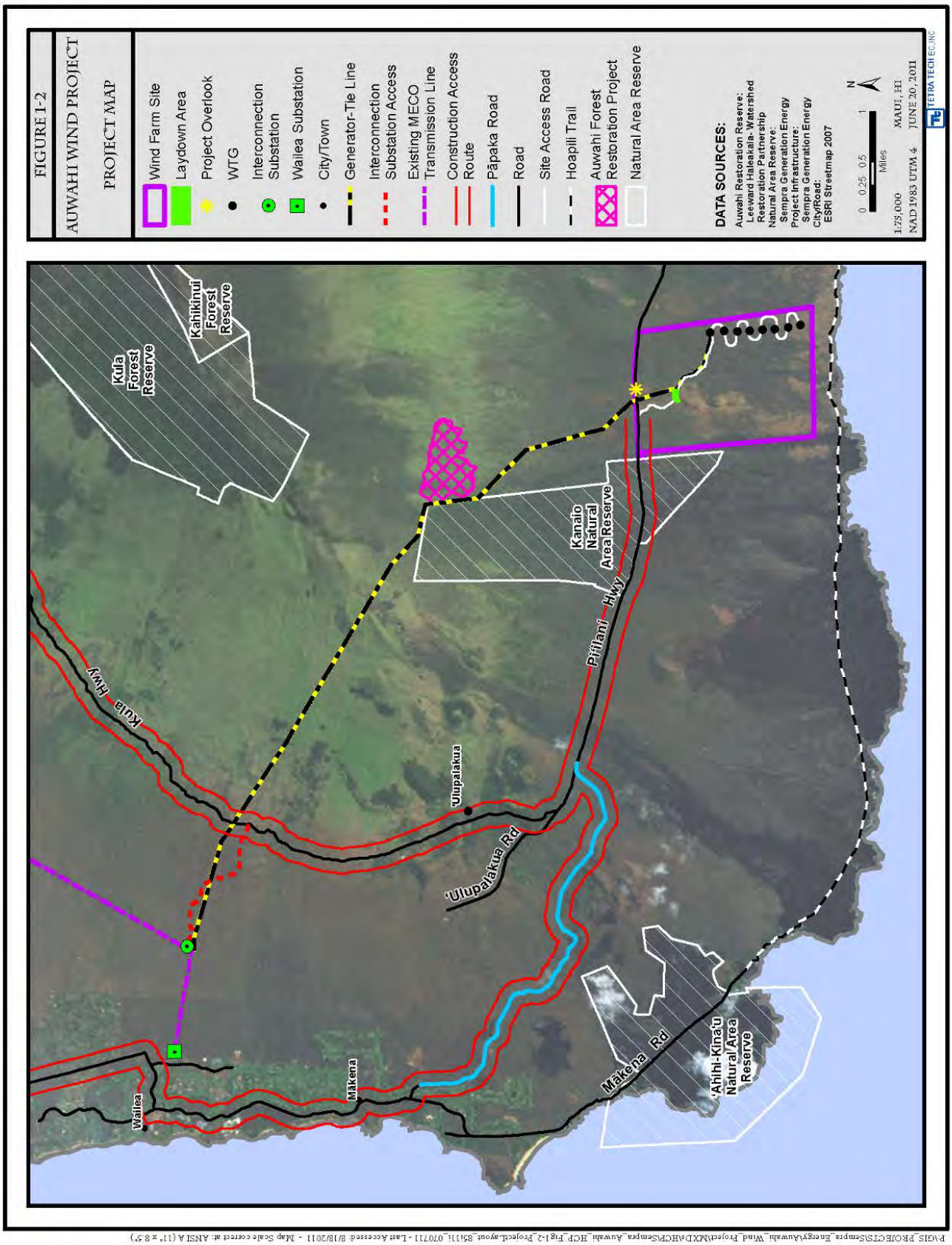
FIGURE 1-2
AUWAHI WIND PROJECT
PROJECT MAP
Wind Farm Site
Laydown Area
Project Overlook
WTG
Interconnection Substation
Wailea Substation
City/Town
Generator-Tie Line
Interconnection Substation Access
Existing MECO Transmission Line
Construction Access Route
Pāpaka Road
Road
Site Access Road
Hoapili Trail
Auwahi Forest Restoration Project
Natural Area Reserve
DATA SOURCES:
Auwahi Restoration Reserve: Leeward Haleakala Watershed Restoration Partnership
Natural Area Reserve: Sempra Generation Energy
Project Infrastructure: Sempra Generation Energy
City/Road: ESRI Streetmap 2007
0 0.25 0.5 1 Miles
N
1:75,000
NAD 1983 UTM 4
MAUI, HI
JUNE 20, 2011
TETRA TECH EC INC
Kula Forest Reserve
Kahikinui Forest Reserve
Kanaio Natural Area Reserve
Piilani Hwy
Kula Hwy
'Ulupalakua
'Ulupalakua Rd
Makena
Makena Rd
'Āhihi-Kīna'u Natural Area Reserve
Wailea
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1.2 APPLICANT HISTORY AND INFORMATION

Auwahi Wind, a subsidiary of Sempra Generation, was purchased from Shell Wind Energy, Inc., in October 2009. Sempra Generation is a subsidiary of Sempra Energy, a Fortune 500 energy services holding company based in San Diego, California. Sempra Generation acquires and develops power plants and renewable energy projects that generate electricity for the competitive market. In total, Sempra Generation has more than 2,700 MW of generating capacity in operation, including natural gas, wind, and solar photovoltaic projects.

1.3 PROJECT DESCRIPTION

The proposed Project is located almost entirely on the Auwahi Parcel of the ʻUlupalakua Ranch, approximately 10 miles (16 km) south of Kula, in the Hāna, Kula, and Kihei Districts of Maui. It consists of three major components (Figures 1-1 and 1-2):

- A 1,466-acre (5.9 square km) wind farm site, located on the southern portion of the Auwahi Parcel that is bordered by the Pacific Ocean to the south and Upcountry Piʻilani Highway to north with state-owned undeveloped lands adjacent to the west and east of the site.
- An approximately 9-mile (15-km), 34.5-kV generator-tie line and an interconnection substation that will facilitate the connection of the wind farm to the Maui Electric Company's (MECO's) electrical grid system. The generator-tie line would originate within the wind farm site and extend north and west on ʻUlupalakua Ranch property, crossing both Upcountry Piʻilani Highway and Kula Highway to connect to the existing MECO Wailea-Kealahou 69-kV transmission line at the proposed point of interconnection located approximately 1 mile (1.6 km) east of MECO's Wailea substation.
- An approximately 27-mile (44-km) construction access route for the transportation of equipment from Kahului Harbor to the proposed wind farm site. The construction access route would primarily follow existing state and county highways as well as approximately 4.6 miles (7.4 km) of pastoral roads between Mākena Alanui Road and Upcountry Piʻilani Highway. These pastoral roads are collectively referred to as Pāpaka Road and are located on ʻUlupalakua Ranch and several other private and publicly owned parcels.

The wind farm site and generator-tie line corridor are active agriculture and ranch lands that would continue to be used as pasture following construction of the Project. Construction and O&M activities associated with each of these Project components are described in detail below.

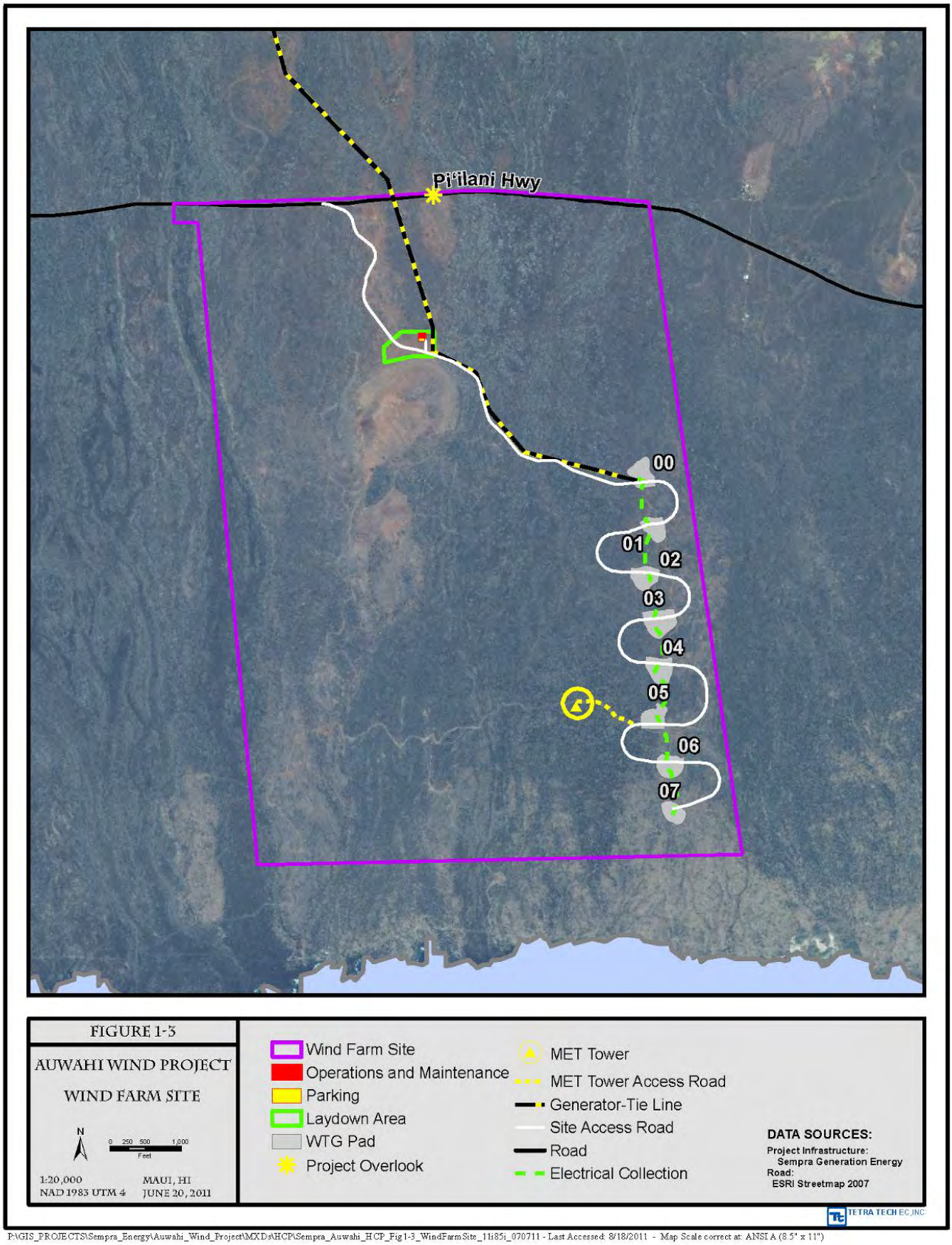
1.3.1 Project Design and Components

1.3.1.1 Wind Farm Site

The wind farm site would include the following facilities: turbine pads and access roads, construction staging and equipment laydown area, WTGs, underground and overhead electrical collection systems, an O&M building, and one permanent meteorological (met) tower (Figure 1-3).

Turbine Pads

Auwahi Wind considered three different WTG models for constructability, reliability, performance, and availability: the 1.5-MW General Electric (GE), the 2.3-MW Siemens, and the 3.0-MW Siemens. The dynamic nature of the turbine market (e.g., ongoing changes in supply, demand, pricing, and


Pi'ilani Hwy
00
01
02
03
04
05
06
07
FIGURE 1-3
AUWAHI WIND PROJECT
WIND FARM SITE
N
0 250 500 1,000
Feet
1:20,000
NAD 1983 UTM 4
MAUI, HI
JUNE 20, 2011
Wind Farm Site
Operations and Maintenance
Parking
Laydown Area
WTG Pad
Project Overlook
MET Tower
MET Tower Access Road
Generator-Tie Line
Site Access Road
Road
Electrical Collection
DATA SOURCES:
Project Infrastructure:
Sempra Generation Energy
Road:
ESRI Streetmap 2007
TETRA TECH EC, INC
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potential environmental impacts) resulted in deferral of the final WTG model selection until the permitting process was underway. Each WTG model has a different generating capacity and therefore would require a different number of turbines (15 1.5-MW GE turbines, 10 2.3-MW Siemens turbines, or 8 3.0-MW Siemens turbines). As a result, the layout and configuration of the wind farm site would vary by manufacturer and model. Therefore, site surveys were conducted for the maximum build-out scenario (i.e., greatest number of turbines) plus an additional turbine pad to allow flexibility in case one or more turbine pads became unfeasible for constructability reasons or natural resource-related issues. Ultimately, Auwahi Wind selected the Siemens 3.0-MW WTG for the Project primarily because it would reduce impacts to natural resources (see Chapter 8 for additional discussion). The 3.0-MW Siemens WTG is a gearless direct-drive machine with a hub height of 263 feet (ft; 80 m) and a rotor diameter of 331 ft (101 m), resulting in a maximum height (height to the top of the blade) of 428 ft (130.5 m). This model is more efficient and would require less ground disturbance than the 1.5-MW GE or 2.3-MW Siemens models.

- **Construction Activities.** At the WTG locations, an average area of approximately 2.4 acres (1.0 hectare [ha]) would be required for a crane pad and for off-loading, storage, and assembly of the tower sections, nacelle, rotor hub, and blades. These crane pad and laydown areas would be cleared and graded to provide a level and stable surface for the tower components and erection crane. The WTGs would be assembled at each laydown area immediately before installation utilizing a combination of forklifts, medium-size cranes (90 to 130 tons [82 to 118 metric tons]) and a main erection crane (as large as 600 tons [544 metric tons]), located on a compacted gravel crane pad. Medium-size cranes (130 tons [118 metric tons]) will also be utilized for off-loading and erection or setting of the various tower and WTG generation components. Construction equipment requiring access to these areas would include both wheeled and tracked vehicles.

- **Operation and Maintenance Activities.** Following construction, the cleared and leveled areas at the WTG pads would be reseeded with natural vegetation. An average area of approximately 0.3 acre (0.1 ha) would be required for the operating turbines. The graveled areas around the WTG pads would be maintained by grading and compacting to minimize naturally occurring erosion.

  During the operations phase of the Project, preventative maintenance and troubleshooting activities would be routinely performed on each WTG. These activities would typically include an inspection and servicing of all major mechanical components, lubrication systems, generators, blades, electrical and transformer components, communication and supervisory control and data acquisition (SCADA) components, and meteorological instrumentation. Routine servicing typically does not require heavy equipment, such as large cranes, but does require service vehicle access. However, in the event of a major component replacement (e.g., blades or generators), heavy equipment similar to that used during construction, would be required. If a major component replacement were necessary, the access road, crane pad, and staging area would be used in a similar manner as for the original assembly area, with similar disturbance and mitigation.

Access Roads

- **Construction Activities**. A series of internal access roads would be constructed within the wind farm site to accommodate construction and maintenance activities (Figure 1-3). The internal access roads would be approximately 20 ft (6 m) wide with 9-ft-wide (3-m-wide) shoulders on each side (38 ft [12 m] total width) during construction. Shoulders may be

expanded to 16 ft (5 m) wide in certain defined areas to allow for adequate passage for the crawler crane and transport trucks, and would include turn-around areas at certain WTG pad locations. The total temporary disturbance required during construction of the road would depend on the amount of cut-fill in any one area but would be greater than the width of the road and could expand to 138 ft (42.1 m) wide in certain defined areas. In total the access roads would be approximately 3.6 miles (5.8 km) long. All access roads would have a gravel surface, as discussed below, stormwater collection and erosion control features, and would be maintained as such throughout Project construction and operation.

The proposed WTG access road layout includes several switchbacks to reduce the overall gradient of the existing slopes. It is also designed to have less than a 2 percent crown or cross-slope. Ditches and culverts would be installed to collect and convey stormwater runoff, as needed.

- **Operation and Maintenance Activities.** During operations, road widths would be maintained at 25 ft (7.6 m) to 38 ft (11.6 m) wide. Access roads would be maintained in good working order by grading and compacting to minimize naturally occurring erosion. Maintenance vehicles and service trucks would continue to use the access roads for routine maintenance of the WTGs.

Construction Staging and Equipment Laydown Area

- **Construction Activities.** A construction staging and equipment laydown area would be built and used during construction for temporary storage of plant equipment, construction materials and equipment, vehicle parking and refueling, water storage, waste disposal and collection receptacles, sanitary facilities, and temporary modular office space. Refueling of construction vehicles would take place onsite using a vendor-supplied fuel truck or skid-mounted tanks on pick-up trucks. Fuel stored onsite would be provided with secondary containment. Ultimately, the permanent O&M building would be constructed in the construction staging and equipment laydown area.

  The construction staging and equipment laydown area would consist of an approximately 4.9-acre (2.0-ha) compacted gravel pad constructed adjacent to the proposed collector switchyard (Figure 1-3). Construction activities consist of clearing and grubbing, topsoil stripping, grading to control stormwater runoff and drainage, compaction, utility trenching, and placement of aggregate surfacing. Following construction, the temporary affected area will be restored and planted with native vegetation or pasture grasses.

- **Operation and Maintenance Activities.** Following construction, gravel will be removed from the temporary construction staging and laydown area and the area will be restored with natural vegetation. A permanent, 0.2-acre (0.08-ha) storage area will be maintained during O&M to store spare WTG components, such as blades. The permanent O&M building providing offices for the plant O&M staff and vehicle parking for plant operations would be in this area. The graveled areas for parking and spare parts will be maintained by the operations staff to minimize erosion and control stormwater runoff and drainage.

Foundations

- **Construction Activities.** The proposed Project would require approximately 3,100 cubic yards (2,370 cubic meters) of concrete for construction of foundations for the WTGs, met tower, the O&M building, and other equipment pads. The use of rock anchors, if selected,

rather than pads for WTG foundations would require substantially less concrete. Existing batch plants on Maui would be able to supply all of the proposed Project's concrete requirements. Staging of concrete trucks will occur within the construction staging area.

Underground Electrical Collection System

- **Construction Activities.** Power generated by each of the WTGs would be collected by a series of underground power cables (electrical collection). These underground power cables would transition to two above ground, pole-mounted circuits at the northernmost WTG location (pad 00) and would become an overhead generator-tie line that would run 9 miles (14.5-km) to the interconnection substation.

- For each WTG, low-voltage (690-volt [V]) cables would deliver power from the generator in each WTG nacelle through the foundation to a pad-mounted transformer located adjacent to each WTG foundation. The transformer would step up the low-voltage power from 690 V to medium voltage power at 34.5 kV in order to connect to the 34.5 kV underground electrical collection cables. The underground electrical cable runs from WTG to WTG. The electrical collection system would consist of up to two separate 34.5-kV feeder circuits, one circuit for the southern four turbines, and one circuit for the northern four turbines. The underground electrical collection cable would "daisy-chain" between each pad-mount transformer. The size of cable would increase as more turbines are added in series due to the larger amount of load the cable would need to carry. The cables would be directly buried in trenches and would terminate at riser structures located adjacent to the northernmost WTG pad locations and transition to an overhead generator-tie line to the interconnection substation. Each of the two riser structures (one for each circuit) would have a manual gang-operated disconnect switch that would allow each 3-phase circuit to be isolated from the generation tie line.

- The trenches for the underground cables would be excavated by rubber tire or tracked equipment to the required burial depth, typically 36 inches (91 centimeter [cm]). Depending on the subsurface conditions, blasting may be required to install the trenches. Each trench would contain three power cables (one for each phase), plus a ground wire and a fiber optic communication cable for the SCADA system (to transmit data from the WTG controllers to the interconnection substation and O&M building). The cable trench would be backfilled with select fill material to protect the cables from damage or possible contact and to provide appropriate media for heat dissipation from the cables. It is estimated that approximately 3 acres (1.2 ha) of temporary ground disturbance would be necessary to construct the underground electrical collection system. Following construction, the collection system trenches would be marked to avoid inadvertent excavation and the surface would be restored and replanted with natural vegetation.

- **Operation and Maintenance Activities.** Using small trucks, qualified personnel would routinely monitor, inspect, and maintain the communication and electrical collector cables throughout the O&M phase of the Project. Heavy construction or excavation equipment would only be required if any underground cables were determined to have failed.

Operations and Maintenance Building

- **Construction Activities.** The proposed Project would incorporate an O&M building located within the proposed laydown area. The building footprint and concrete slab would be approximately 50 ft by 80 ft (15 meter [m] by 24 m), an area of 0.1 acre (0.04 ha). The O&M building would be a pre-engineered, metal building with an operations room, offices, communications and SCADA equipment, a warehouse, storage space, a kitchen area, and bathrooms.

  In addition to the interior facilities, there would be parking and permanent outdoor storage for major components such as replacement WTG blades adjacent to the O&M building. The approximately 0.1-acre (0.04-ha) parking and outdoor storage area would be constructed with compacted gravel and would likely be enclosed by a 7-ft (2-m)-high chain-link fence topped by three strands of barbed wire, with posts set in concrete.

  Utilities for the O&M building would include a septic system, an onsite well or water storage tank, electricity, and communication services. A septic system would be designed based on the results of the percolation test to be completed during future geotechnical studies. This septic system and all utilities would be designed in compliance with all applicable state and county regulations and requirements.

- **Operation and Maintenance Activities.** Activities associated with the O&M building would include basic maintenance and upkeep of the facility. Permanent infrastructure would include water and wastewater systems, potentially an onsite well, and a septic system.

Meteorological Monitoring Tower

- **Construction Activities.** One permanent met tower or two temporary met towers would be installed within the Project to measure and record weather data to track the performance of the WTGs. The met tower would have a height of 262 ft (80 m), guy radius of 208 ft (63 m), and a tower rating of 80 miles per hour (mph) (129 kilometers per hour [kph]) wind speed. Meteorological data include wind speed and direction, barometric pressure, humidity, and ambient temperature. This equipment would be used by the wind farm operator to monitor and actively assess Project performance. Either a lattice tower or a monopole tower would be installed.

  For determining impacts, a conservative approach for the permanent guyed met tower (fitted with bird diverters and white, 1-inch [2.5-cm] poly tape) would be to assume a circular area with a 210-ft (64-m) horizontal radius (guy radius). This would be a maximum total impact area of approximately 3.1 acres (1.2 ha), of which 0.2 acre (0.1 ha) would be permanently impacted. Construction of the met tower would require site preparation (e.g., clearing and grubbing); grading; installation of a foundation, underground electrical and communication lines; and onsite assembly of the tower.

- **Operation and Maintenance Activities.** Met towers require routine monitoring and maintenance activities during their operation, but do not typically require heavy equipment for servicing.

1.3.1.2 Generator-tie Line Corridor

The generator-tie line corridor includes the following two facilities: the 34.5-kV generator-tie line and the 69-kV interconnection substation.

34.5-kV Generator-tie Line

- **Construction Activities.** The 34.5-kV generator-tie line would connect the wind farm site with the 69-kV interconnection substation at the point of interconnection. The generator-tie line facilities would be constructed using wood poles. The poles would support the two three-phase 34.5-kV generator-tie line (i.e., six conductors), associated insulators and accessories, and an optical ground wire. All the required poles would be within the established corridor, approximately 60 ft (18 m) wide and 9 miles (14.5 km) long. The poles are anticipated to be approximately 60 ft (18 m) tall, similar to the existing wood poles supporting MECO's Wailea-Kealahou transmission line. Taller poles may be required along a small section of the generator-tie line (less than 1,000 ft [305 m]) if it is necessary to span a Fresnel (beam) zone along the alignment. These structure heights could approach approximately 100 ft [31 m]. Final structure heights will be determined as part of detailed engineering and design. Poles with guy wires would only be used at inflection points along the generator-tie line and are expected to be less than 10 percent of the overall poles. The exact location of each pole would be determined based on detailed engineering that would take into consideration a variety of factors, including existing access roads, terrain, environmental constraints, and cost. Temporary disturbance associated with the generator tie-line would be approximately 63.0 acres (25.2 ha).

  The generator-tie line would have a height at or below 60 ft (18 m) above the ground (height of the poles with lines sagging between poles). Conductors will be arranged vertically, such that the static ground wire will be positioned above the generator-tie line. This configuration, versus a horizontal arrangement, was selected to maximize efficiency by minimizing the need for an additional transmission line corridor should future users wish to tie-in to the line. The generator-tie line would be designed to minimize the potential for collision by birds by fitting an approximately 1.6 mile (1.0 km) stretch identified as having the highest collision risk with bird flight diverters.

  Generator-tie line construction would utilize standard industry procedures including surveying, corridor preparation, materials hauling, pull sites, staging areas, structure assembly and erection, ground wire, conductor stringing, cleanup, and revegetation. Specific methods of access have not been determined but they would maximize use of existing ranch roads or areas suited for off-road driving to the extent possible to minimize impacts.

- **Operations and Maintenance Activities.** Permanent disturbance associated with generator-tie line structures would be approximately 2.0 acres (0.8 ha). Qualified personnel would routinely monitor, inspect, and maintain the generator-tie line facilities throughout the O&M phase. These maintenance activities would be accomplished with the use of off-road vehicles and light trucks. Heavy construction equipment would only be required if overhead facilities need to be repaired or replaced.

69-kV Interconnection Substation

- **Construction Activities.** An area of approximately 6.4 acres (2.6 ha) would be cleared and graded during construction of the substation pad, below-grade raceway (e.g., the conduit, ductbank, and trench) and ground grid. The fenced dimension of the interconnection substation would be approximately 5.0 acres (2.0 ha). The substation would be shared by Auwahi Wind and MECO.

The substation area would be cleared and graded to control stormwater runoff and the substation pad would be compacted with well-graded material. Foundations would be installed for the components. Below-grade raceway (e.g., the conduit, ductbank, and trench) and ground grid would be installed in the sub-grade. Vehicle access would be provided on the east and north sides of the substation, with a fence line separating the Auwahi Wind and MECO facilities. Following installation of all equipment, a final layer of crushed rock surfacing would be placed and a perimeter fence would be erected and grounded. Substation testing and commissioning would be done before energizing the Project.

The substation area would include the BESS that consists of batteries, inverters, step up transformers, and a control system to meet Hawaiian Electric Company (HECO) performance requirements. MECO control system operators can send signals or commands to the BESS to adjust the voltage at the point of interconnection. Also, the operators can curtail wind farm output during low loading hours typically from 23:00 to 06:00 hrs. The BESS is designed to manage the ramp rate of wind power being injected into the MECO system to keep the ramp rate within specified limits. The BESS will smooth the fluctuations in wind power coming from the wind farm and allow the wind power output to be injected into the MECO electric system. The design life of the BESS is 20 years. The BESS will consist of approximately ten 50-foot (15.2-m) shipping containers of battery cells. A portion of the battery cells may need to be replaced at intervals of approximately five years. The interconnection substation access road from Kula Highway that was improved to build the substation will be used for battery removal and replacement. The removed batteries would be shipped off island as part of the manufacturers recycling program. Depending on the type of battery, the capacity of the BESS can fade over time, so additional capacity will be installed to compensate for the anticipated capacity fade. The facility could add more energy storage to further smooth the wind power output but extra storage would be an additional cost and exceed the utility's performance requirements.

- **Operation and Maintenance Activities.** Qualified personnel would operate and maintain the interconnection substation. Maintenance activities would include routine inspections of each component and monitoring of equipment and electronics according to the manufacturer's recommendations and owner's requirements, and in accordance with regulatory requirements. Routine maintenance of the interconnection substation would not typically require heavy construction equipment. However, if a major component failure occurred (e.g., a failure of a main transformer) then appropriate construction equipment would be required to replace the component.

69-kV Interconnection Substation Access Road

- **Construction Activities.** The proposed interconnection substation site is located approximately 1.7 miles (2.8 km) below Kula Highway. To the maximum extent possible, the access road to the interconnection substation would follow the route of existing ranch roads. The existing ranch roads and proposed newly constructed portions would be 20 ft (6.1 m) wide with a maximum grade of 15 percent and a minimum turning radius of 100 ft (30.5 m) so that a truck similar to a WB-62 carrying transformers could access the site. Approximately 16.3 acres (6.5 ha) would be disturbed during construction of the substation access road, of which 4.2 acres (1.7 ha) would be permanently impacted. The road would have an all-weather graveled surface with adequate compaction to accommodate the specialized transportation equipment. The road would be designed to adequately manage

stormwater runoff and minimize erosion, as required. Drainage measures could include ditches and culverts to collect and convey stormwater. Following construction, any deteriorated roadway surfaces would be repaired and restored.

- **Operation and Maintenance Activities.** Following construction, the access road to the 69-kV interconnection substation would be used for routine O&M activities but it would be closed to the public. The access roads would be maintained in good working order by grading and compacting to minimize naturally occurring erosion.

1.3.1.3 Construction Access Route

Most of the materials and equipment required for the proposed Project, including the turbine components and construction materials and equipment, would be imported to Maui through Kahului Harbor, the island's only commercial port, and then transported to the proposed Project site. The construction access route consists of two routes which will share the traffic burden association with construction of the Project. The Papaka Route (Route A) extends from Kahului to the Mokulele Highway, through Kihei, Wailea, and Makena, and along Upcountry Piilani Highway to the wind farm site. The Kula Route (Route B), a more direct route from Kahului Harbor, uses Haleakalā and Kula highways. Several portions of Route B do not have dimensions or weight limits adequate for the size of transport truck required for hauling turbine components; however, this route is suitable for other construction vehicles such as worker vehicles, dump trucks, and typical semi-trucks.

Because most of the major turbine components are considered "superloads," special transportation equipment (e.g., multi-axle transport trailers, Schnabel trailers with hydraulic lifts, and steerable blade-trailers) would be required. To accommodate these superloads, portions of Kula Highway (referred to as Upcountry Pi'ilani Highway) and Pāpaka Road would require permanent modifications. Approximately nine bumps with a rise greater than 20 inches (50.9 centimeters) over a 100-foot (30.5-meter) length may require modification and possibly two S-curves would need to be widened. The level of modification would depend on a number of factors including selection of the transportation provider (by the construction contractor) and availability of specialized transportation equipment. For example, if it were determined that the removal of a bump was required, the construction contractor could either (1) re-contour the road profile by removing the bump, or (2) temporarily fill in the areas approaching and exiting the bump (i.e., provide a more gradual transition). The affected zones of construction could be 200 to 400 feet (61 to 122 m) long, and would typically be limited to the existing width of the road including the shoulders. Curve widening may be required in one or two locations. If required, the construction contractor would excavate the inside shoulder of the curve to provide a smoother, horizontal transition into and away from the curve. The affected zones of construction could be 200 to 400 feet (61 to 122 m) long and may extend 40 to 50 feet (12 to 15 m) onto the inside shoulder of the curve. Any temporary or permanent road modifications proposed by the construction contractor would be coordinated with the County of Maui. Temporary road improvements would also be necessary at the intersections of Pi'ilani Highway and Wailea Ike Drive, Wailea Ike Drive and Wailea Alanui Drive, and Mākena Alanui Road and Mākena Golf Road. These improvements would all occur within the existing road bed for the Project. A total of approximately 50.6 acres (20.2 ha) would be disturbed in association with construction access route modifications, of which 11.2 acres (4.5 ha) would be permanent. Following construction, the construction access route would continue to be used for normal public traffic and routine O&M activities.

1.3.1.4 Site Clean-Up

All portions of the proposed Project would be maintained in an orderly and clean manner throughout construction. At the completion of the construction phase, a final cleanup of all components of the proposed Project would be done. All construction-related waste would be properly handled in accordance with county, state, and federal policies and permit requirements and removed from the area for disposal or recycling as appropriate. Areas with disturbed soil that would not be used during operations would be stabilized and returned to cattle grazing.

1.3.1.5 Measures to Minimize Environmental Impacts

In addition to the measures detailed in this HCP to avoid and minimize impacts to the Covered Species, Auwahi Wind will also implement certain measures to avoid and minimize impacts to visual, air quality, cultural and other resources. The details of these other avoidance and minimization measures are described in the Final Environmental Impact Statement accepted by the Maui County Planning Commission on August 9, 2011 (Tetra Tech 2011) and published by the Hawai'i Office of Environmental Quality Control in the *Environmental Notice* on August 23, 2011. In addition, the avoidance, minimization, and mitigation measures included in the project associated with cultural resources are described Appendix D.

1.3.1.6 Decommissioning and Restoration

The proposed Project has an estimated life of 20 years based on the projected useful life of the WTGs. After that time, the Applicant would evaluate whether to continue operations of the Project or decommission it. Should the Project be extended, the facility would potentially be upgraded and repowered with renegotiated leases (and any necessary extensions of Project permits and approvals, such as the ITP and ITL, would need to be obtained). If the Project is decommissioned, the goal of decommissioning would be to remove the power generation equipment and return the site to a condition as close to its pre-construction state as possible within 2 years as contractually required in both the Land Lease with 'Ulupalakua Ranch and the PPA with Maui Electric. All decommissioning- and restoration-related waste would be properly handled and disposed of or recycled, as appropriate, in accordance with county, state, and federal laws and permit requirements. Foundations would be removed to a depth below grade, and roads would be left for use by 'Ulupalakua Ranch. Major activities required for decommissioning would typically occur in reverse order to those of construction and are listed below:

- WTG foundation and met tower removal. Concrete and steel would be hauled offsite. Foundations would be filled with native weed-free aggregate and soils;
- Electrical collection system removal for above-ground structures and decommissioning in place for below-ground cables;
- Sale or demolition of the O&M building. The on-site septic system would be abandoned consistent with state and local requirements, unless needed for a future use of the site;
- Generator-tie line removal. Foundation holes would be filled with native weed-free soil;
- Road removal (as required by permit and/or site control agreements by landowners). Road disturbances would be re-graded to original contours where cut and fill made recontouring feasible. Any roads left in place would become the responsibility of the landowner;
- Grading disturbed areas to preconstruction contours where feasible;

- Revegetation with native or pasture grass species to ensure establishment of vegetation. Where applicable, restored areas would be stabilized and returned to cattle grazing; and
- Recycling and disposal of materials, WTG components, and any hazardous and regulated materials and wastes would be conducted per applicable local, state, and federal regulations.

Decommissioning would restore the visual and ecological character of the landscape and also remove effects to other environmental and public resources that may have occurred as a result of Project operations.

1.3.2 Purpose and Need for the Project

Hawai'i is one of the world's most remote island chains, has no fossil fuel resources of its own, and is the most dependent upon imported energy of all the 50 United States. In 2005, approximately 95 percent of Hawai'i's primary energy was derived from imported fossil fuels, such as petroleum and coal (Global Energy Concepts 2006). Consequently, Hawai'i's consumer energy prices are some of the highest in the nation and Hawai'i has been, and is, especially vulnerable to fluctuations in fossil fuel availability and price.

In an attempt to reduce its dependence on imported fuels, Hawai'i has established Renewable Portfolio Standards (RPS) (HRS § 269-92), which require HECO and its affiliates, Hawai'i Electric Light Company (HELCO) and MECO, to generate renewable energy equivalent to 10 percent of their net electricity sales by the year 2010, 15 percent by 2015, 25 percent by 2020, and 40 percent by 2030. In addition, the Global Warming Solutions Act of 2007 requires that Hawai'i's greenhouse gas emissions be reduced to levels at or below 1990 levels by January 2020. On January 28, 2008, Hawai'i also signed a Memorandum of Understanding (MOU) with the U.S. Department of Energy (DOE) that established the Hawai'i Clean Energy Initiative, under which at least 70 percent of Hawai'i's energy needs would be supplied by renewable resources by the year 2030. Hawai'i has identified three priorities that are crucial to meeting this goal: transforming the regulatory environment to facilitate clean energy development, collaborating with island utility companies to increase renewable energy generation, and integrating renewable energy into utility grids (USDOE 2010).

These regulations and initiatives reflect Hawai'i's commitment to reduce petroleum-based energy generation and increase its portfolio of renewable energy projects. Collectively, these directives demonstrate the overwhelming need for the development and implementation of renewable energy projects throughout Hawai'i.

The purpose of the Project would be to provide clean, renewable energy for the island of Maui. Implementation of the Project would contribute to Hawai'i's portfolio of renewable energy projects, as well as provide environmental and economic benefits to Hawai'i and the local community. The Project would also demonstrate how renewable energy can coexist with agricultural and ranching in rural Maui. After the Project is developed, 'Ulupalakua Ranch will continue to use the parcel for cattle pasture as it has done for decades.

Wind energy is an abundant, infinitely renewable resource. The addition of wind-generated energy would diversify Maui's power supply and contribute to Hawai'i's energy independence and security, as well as help to meet the State's regulatory requirements and initiatives. Generation and integration of wind energy into the electric grid will decrease fossil fuel consumption, thereby reducing greenhouse gas emissions, particulate-related health effects, and other forms of pollution associated with coal or diesel fuel generation. As of December 2009, 23.7 percent of MECO's sales

were from renewable energy sources (HECO 2010). As proposed, the Project could provide 78,500 megawatt-hours per year (MWh/year) of electricity to MECO's grid, enough to provide electricity to approximately 6,600 homes, based on the average statistics reported by the American Wind Energy Association (AWEA 2010).

The proposed Project would also result in economic benefits, as it would contribute to the local economy, generate new jobs, and provide a stable, long-term source of tax revenue for Hawai'i and Maui County without disrupting the rural way of life in East Maui. Furthermore, the power generated by the wind farm would be sold under a long-term, set base price contract with fixed annual escalation and, as such, the proposed Project would provide long-term price stability for energy production.

1.3.3 Project Schedule and Timeline

The Project is proposed to begin construction in March 2012 and begin commercial operation by December 1, 2012.

1.3.4 List of Preparers

This HCP was prepared by Alicia Oller, M.S., Brita Woeck, M.S., Laura Nagy, Ph.D., and Jason Jones, Ph.D., of Tetra Tech. Reviews and input were provided by Mitch Dmohowski and Tom Jennings of Sempra Generation; David Moser of Ebbin Moser + Skaggs LLP; and Sumner Erdman of 'Ulupalakua Ranch. Additional input and review was provided by Scott Fretz, Fern Duvall, and Sandee Hufana of DOFAW and Dawn Greenlee, Bill Standley, and Patrice Ashfield of the USFWS, as well as members of the Endangered Species Recovery Committee (ESRC).

1.4 REGULATORY FRAMEWORK AND RELATIONSHIP TO OTHER PLANS, POLICIES, AND LAWS

1.4.1 Endangered Species Act

The ESA and its implementing regulations prohibit the take of any fish or wildlife species that is federally listed as threatened or endangered without prior approval pursuant to either Section 7 or Section 10 (a)(1)(B) of the ESA. Section 9 of the ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." The term harm means an act that actually kills or injures a federally listed wildlife species, and may include significant habitat modification or degradation (50 Code of Federal Regulations [CFR] §17.3). In addition, Section 9 of the ESA details generally prohibited acts and Section 11 provides for both civil and criminal penalties for violators regarding species federally listed as threatened or endangered.

ESA section 4(f) requires the USFWS to develop and implement recovery plans for the conservation and survival of listed species. Recovery plans must describe specific management actions, establish objectives and measurable criteria for delisting, and estimate the time and cost to carry out measures needed to achieve recovery. The USFWS has developed recovery plans for the Hawaiian petrel, Hawaiian hoary bat, nēnē, and Blackburn's sphinx moth (USFWS 1983, 2004, 2005a,b). The biological goals and objectives identified in Section 5.1.1 are consistent with these recovery plans.

In 1982, Congress amended the ESA to allow a private applicant to incidentally take an ESA-listed species that would otherwise be prohibited under Section 9(a)(1)(B). When a non-federal landowner wishes to proceed with an activity that is legal in all other respects, but that may result in the incidental taking of a listed species, an ITP, as defined under Section 10 of the ESA, is required.

Incidental take is defined as take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity" (50 CFR § 17.3). An HCP must accompany an application for an ITP to demonstrate that all reasonable and prudent efforts have been made to avoid, minimize, and mitigate for the effects of the potential incidental take.

Guidance for preparation and required components of an HCP are provided in the USFWS HCP Handbook (USFWS and NMFS 1996). The USFWS and National Marine Fisheries Service (NMFS) issued an addendum to the handbook in 2000 (USFWS and NMFS 2000). Known as the Five-point Policy, this addendum provides additional guidance on: (i) establishing and stating biological goals for HCPs; (ii) clarifying and expanding the use of adaptive management where there is uncertainty about the experimental design and scientific evidence with respect to the HCP's approach to conservation; (iii) clarifying the purpose and means of how to undertake species and habitat monitoring; (iv) providing criteria to be considered by USFWS and NMFS in determining incidental take permit duration; and (v) expanding public participation. Under the Five-point Policy, the USFWS and NMFS afford greater opportunity for public participation in the HCP development process by lengthening the public comment period for most HCPs from 30 to 60 days.

1.4.2 National Environmental Policy Act

Issuance of an ITP is a federal action subject to NEPA compliance. The purpose of NEPA is to promote agency analysis and public disclosure of the environmental issues surrounding a proposed federal action. The scope of NEPA goes beyond that of the ESA by considering the impact of a federal action on non-wildlife resources such as water quality, air quality, and cultural resources. The USFWS will prepare and provide for public review an EA to evaluate the potential environmental impacts of issuing an ITP and approving the implementation of the proposed Project HCP. The purpose of the EA is to determine if ITP issuance and HCP implementation will significantly affect the quality of the human environment. If the USFWS determines significant impacts are likely to occur, an Environmental Impact Statement (EIS) for the proposed action will be prepared and distributed for public review; otherwise, if the USFWS determines no significant impacts are likely, it will issue a Finding of No Significant Impact (FONSI). The USFWS will not make a decision on ITP issuance until after the NEPA process is complete.

1.4.3 Migratory Bird Treaty Act

Under the Migratory Bird Treaty Act of 1918 (MBTA), as amended (16 U.S.C. [United States Code] §§ 703-712), taking, killing or possessing migratory birds is unlawful. Birds protected under this act include most native birds, including their body parts (e.g., feathers), nests, and eggs. A list of birds protected under the MBTA implementing regulations is provided at 50 CFR § 10.13.

Unless permitted by regulations, under the MBTA it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg, or product. The MBTA provides no inherent process for authorizing incidental take of MBTA-protected birds. The Hawaiian petrel is protected under the MBTA. If the HCP is approved and USFWS issues an ITP to Auwahi Wind, the terms and conditions of that ITP will constitute a special purpose permit under 50 CFR § 21.27 for the take of the Hawaiian petrel under the MBTA. Therefore, any such take of the Covered Species will not be in violation of the MBTA.

On July 12, 2011, the USFWS reissued for public review Revised Draft Voluntary Land- Based Wind Energy Guidelines (USFWS 2011). These guidelines will provide recommended approaches for assessing and avoiding impacts to wildlife and their habitats, including migratory birds,

associated with wind energy project development. The USFWS continues to develop the guidelines based on public and agency input.

1.4.4 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §40 *et seq.*), requires federal agencies to take into account the effects of their proposed actions on properties eligible for inclusion in the National Register of Historic Places. "Properties" are defined herein as "cultural resources," which includes prehistoric and historic sites, buildings, and structures that are listed on or eligible to the National Register of Historic Places. An undertaking is defined as a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency; including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; those requiring a federal permit, license or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency. The issuance of an ITP is an undertaking subject to Section 106 of the National Historic Preservation Act. Cultural and archeological resources surveys have been conducted for the Project. The USFWS will coordinate with the State Historic Preservation Office on cultural resources and address any potential issues in the EA.

1.4.5 Hawai'i Revised Statutes (HRS Chapter 195D)

HRS Section 195D-4 states that any species of aquatic life, wildlife, or land plant that has been determined to be an endangered or threatened species under the ESA shall be deemed so under this State chapter, as well as any other indigenous species designated by DLNR as endangered or threatened by rule. The "take" of any endangered or threatened species is prohibited by both the ESA and this state statute (Section 195D-4[e]). Similar to the ESA, section 195D-2 defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect endangered or threatened species of aquatic life or wildlife, or to cut, collect, uproot, destroy, injure, or possess endangered or threatened species of aquatic life or land plants, or to attempt to engage in any such conduct."

The Board of Land and Natural Resources (BLNR) may issue an ITL to permit take otherwise prohibited under subsection 195D-4(e) if the take is incidental to and not the purpose of, the carrying out of an otherwise lawful activity. As part of the ITL application process, an applicant must develop, fund, and implement a BLNR-approved HCP to minimize and mitigate the effects of the incidental take. The HCP must also result in a net environmental benefit, and increase the likelihood that the species will survive and recover. State law created the Endangered Species Recovery Committee (ESRC), an advisory committee created to review all applications and proposals for HCPs and ITLs and make recommendations to the Board whether or not to approve, amend, or reject the HCP or license. ESRC members include representatives of the USFWS, DOFAW, the U.S. Geological Survey Biological Resources Division (USGS-BRD), the University of Hawai'i Environmental Center, and other professionals with expertise in the area of conservation biology. The required components of a state HCP are listed in Section 195D-21. Section 195D-5(i) directs the DLNR to work cooperatively with federal agencies in concurrently processing state and federal HCPs and ITP/ITL applications.

1.4.6 Hawai'i Revised Statutes (HRS Chapter 343)

DOFAW/DLNR has determined that the approval of an HCP and issuance of an ITL under HRS Chapter 195D will be accompanied by environmental review pursuant to HRS Chapter 343. The Project already requires Chapter 343 environmental review because one portion of Pāpaka Road to be widened as part of the Project occurs within the State conservation district.

Auwahi Wind prepared an Environmental Impact Statement Preparation Notice (EISPN), which was released for public comment on March 23, 2010. A Draft EIS was released for public comment on March 8, 2011. The Final EIS (FEIS) was accepted by Maui County on August 9, 2011, and published by OEQC on August 23, 2011. The FEIS describes and analyzes the environmental impacts of this HCP and associated ITL. The FEIS acceptance completes the state environmental review process for the Project.

2.0 DESCRIPTION OF THE HABITAT CONSERVATION PLAN

2.1 PURPOSE AND NEED FOR THE HCP

This HCP has been prepared to meet the requirements of the ESA and the HRS Chapter 195D, which apply to the development and operation of the proposed Project. An HCP is needed because components of the Project have the potential to result in take of endangered and threatened species that inhabit or traverse through the Project area, including Hawaiian hoary bat, Hawaiian petrel, nēnē, and Blackburn's sphinx moth. Pursuant to Section 10(a)(1)(b) of the ESA, incidental take by a non-federal entity may be authorized though the issuance of an ITP. Under HRS Section 195D-4(g), DLNR will authorize take through the issuance of an ITL. An HCP must be prepared in support of the application for both the ITP and ITL. The HCP establishes the measures and means required to meet the conservation needs of endangered and threatened species in the Project area, while at the same time preserving Auwahi Wind's ability to pursue its development objectives with assurances from the USFWS and DLNR that incidental take of Covered Species is authorized.

The purposes of the HCP are to: 1) determine the potential impacts that the Project may have on the listed species or species under consideration for listing; (2) to address the potential incidental take of the listed species by setting forth measures that are intended to ensure that any take caused by the Project will be incidental; 3) ensure that the impacts of the take will, to the maximum extent practicable, be minimized and mitigated; to provide procedures to deal with changed and unforeseen circumstances; 4) ensure that adequate funding for the HCP will be provided; and 5) ensure that the take of the listed species will not appreciably reduce the likelihood of the survival and recovery of these species in the wild. Implementation of the HCP will provide a conservation benefit to the Covered Species.

The need for the HCP is to authorize, pursuant to the ESA and HRS Chapter 195D, the take of threatened or endangered species (or species under consideration for listing) incidental to the construction and operation of the Project. In order to obtain such authorization, Auwahi Wind developed an HCP that meets the USFWS and DLNR issuance criteria for an ITP and ITL. Furthermore, as a business entity, Auwahi Wind requires a stable and predictable operating and regulatory environment. The HCP assists Auwahi Wind with regulatory compliance under the ESA and HRS Chapter 195D, serving as a vehicle for obtaining regulatory stability and predictability.

2.2 SCOPE AND TERM

2.2.1 HCP Scope

The scope of the Project HCP is the area where incidental take authorization would be provided, and includes all areas where construction and operation of the Project and associated facilities (e.g., turbines, roads, operations/maintenance buildings, substation, and generator-tie line facilities) have the potential to result in take of the Covered Species. This generally includes the portion of the 'Ulupalakua Ranch proposed for development, locations of external access routes, generator-tie line facilities, and mitigation areas (Figures 1-1, 1-2, and 1-3).

2.2.2 HCP Term

The Project HCP is a 25-year plan and the relevant authorizations and permits have a term of 25 years. Accordingly, assessments of take made within this HCP are based on a 25-year time period. The HCP identifies provisions for adaptive management and monitoring to allow for flexibility in

implementing and adjusting appropriate mitigation to compensate for Project-related incidental impacts. The adaptive management and post-construction monitoring provisions of this HCP allow flexibility and responsiveness to new information and technology over the life of the Project. Prior to the expiration of the Project HCP permits, and to the extent allowed by then-applicable laws and regulations, Auwahi Wind may apply to renew or amend the HCP and its associated permits and authorizations to extend its term.

2.3 SURVEY AND RESOURCES

The following resources were used during the preparation of the HCP:

- Endangered bird and bat surveys conducted during Fall 2006 and Spring 2010 at the south Auwahi wind resource area, Maui, Hawai'i (Hamer Environmental 2010a);
- Avian Risk of Collision Analysis for the South Auwahi Wind Resource Area, Maui, Hawai'i (Hamer Environmental 2010b);
- Botanical, Avian, and Terrestrial Mammalian Resources Survey for the Auwahi Wind Project, 'Ulupalakua Ranch, Island of Maui (David and Guinther 2008, revised in 2011);
- Draft Survey of Invertebrate Resources for the Shell Wind Energy Inc., Auwahi Parcel, 'Ulupalakua Ranch, Hana District, Island of Maui (Montgomery 2008);
- Botanical and invertebrate surveys conducted by Eric Guinther and Steve Montgomery in March-April 2011 (Guinther 2011; Guinther and Montgomery 2011);
- Anabat acoustic monitoring study (ongoing);
- Initial petrel surveys at Kahikinui Forest Project on the Department of Hawaiian Home Lands (DHHL) parcel in April and June/July 2011;
- Various reports prepared for the Applicant providing information on other resources in the Project area (as cited throughout);
- Personal communications and unpublished data provided by 'Ulupalakua Ranch and LHWRP;
- Personal communications and unpublished data provided by various DOFAW, National Park Service (NPS), and USFWS biologists and current and/or proposed studies; and
- Annual reports and HCPs from existing and proposed wind farm projects in Hawai'i and other locations in the U.S.

3.0 ENVIRONMENTAL SETTING

3.1 REGIONAL LOCATION

Maui is the second largest of the Hawaiian Islands and is 48 miles (77 km) long and 26 miles (42 km) wide, for an area of 728 sq miles (1,886 sq km). The island is composed of two volcanic mountains, Haleakalā and West Maui, separated by a low-lying isthmus that was created as the lava from Haleakalā flowed into West Maui. Haleakalā forms East Maui, and is 10,025 ft above sea level (asl) (3,056 m) and 33 miles (53 km) across. At 570 sq miles (1,476 sq km), it comprises approximately 77 percent of the island (USGS 1996). West Maui is 5,788 ft (1,764 m) asl and 18 miles (29 km) across.

Haleakalā is a shield volcano that is believed to have started forming about 2 million years ago, reaching the ocean surface about 1.5 million years ago (USGS 1996). Subsequently, its flows merged with other nearby volcanoes, including West Maui, Kahoʻolawe, Lanaʻi, East Molokaʻi, West Molokaʻi and Penguin Bank (Stearns 1966), covering at least 6,200 sq miles (16,058 sq km). Over the course of the last 400,000 years, the volcanoes subsided to form four distinct islands: Maui, Molokaʻi, Lanaʻi, and Kahoʻolawe. Haleakalā was formed over three rift (fissure) zones, extending to the northwest, east and southwest, each marked by a series of cinder cones (Stearns 1966). Volcanic activity at Haleakalā in the past 30,000 years has occurred along the southwest and east rift zones, with approximately ten eruptions in the past 1,000 years (USGS 1996).

3.2 LAND USE

The Project is located entirely within the state agricultural land use district and Maui County agricultural zoning boundaries, with the exception of either end of Pāpaka Road (Figure 1-2). The easternmost 2,000 ft (610 m) of the roadway is located in a State conservation district (Resource, Protective, and General subzones) and the westernmost 1,960 ft (597 m) of the roadway is located in a State urban district. The portion within the State conservation district is the only portion of the Project not within the county zoning jurisdiction. The Project is located entirely on land owned by ʻUlupalakua Ranch. The generator-tie line is also located on ʻUlupalakua Ranch property, although it crosses Piʻilani Highway, which is within a county easement, and Kula Highway, which is owned by the state. The proposed Project and generator-tie line occur on actively grazed pastureland.

3.3 TOPOGRAPHY AND GEOLOGY

The geologic profile underlying the proposed Project consists primarily of recent basalt flows of the Hana Volcanic series, which is considered to be suitable substrate for construction of the Project (Black & Veatch 2008). Although no large lava tubes were encountered in the borings during the geotechnical investigation, a subsurface void was observed to the west of Puʻu Hokukano. In addition, a buried soil layer was found between basalt flows at a relatively shallow depth of approximately 6.5 ft to 10 ft (2 m to 3 m), north of Puʻu Hokukano (Black & Veatch 2008). During subsequent field surveys, lava tubes were encountered within the wind farm site footprint. In some locations, the wind farm site access roads may cross over lava tubes. A detailed geotechnical investigation would be conducted prior to construction to confirm the absence of subsurface voids and buried soils in the footprint of the Project facilities.

In general, the topography of this region is steep and rugged, as is common on the slopes of shield volcanoes. The proposed wind farm site ranges in elevation from approximately 1,600 ft (488 m) asl

on the northern edge to 200 ft (61 m) asl on the southern edge, which equates to an approximately 14 percent slope. The slope is fairly uniform across the site, with the exception of Puʻu Hokukano that rises to approximately 1,460 ft (445 m) asl near the center of the site, approximately 250 ft (76 m) above the surrounding terrain. The generator-tie line would extend from the proposed Project to an elevation of approximately 960 ft (293 m) asl at the existing Wailea substation. The generator-tie line would have a maximum elevation of approximately 4,400 ft (1,341 m) asl as it crosses the southwest rift zone. Pāpaka Road ranges from approximately 80 ft (24 m) asl at its western end to approximately 1,780 ft (543 m) asl at its eastern end. The eastern end of Pāpaka Road connects with Upcountry Piʻilani Highway which drops to approximately 1,608 ft (490 m) asl at the entrance to the wind farm site.

3.4 SOILS

According to the US Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Survey (USDA 2010) and the Soil Survey of the Islands of Kauaʻi, Oʻahu, Maui, Molokaʻi and Lānaʻi (Foote et al. 1972), the soils in the Project area consist predominantly of the Oanapuka Series, with some areas of very stony land and lava flows and a small inclusion of cinder land on and directly adjacent to Puʻu Hokukano. The generator-tie line and Pāpaka Road traverse a broad spectrum of habitats over a range of elevations, which is reflected by a variety of soil types (Table 3-1).

Table 3-1. Soil Characteristics

Soil Name	Slope (%)	Description
Oanapuka extremely stony silt loam (OED)	7-25	Well drained, very stony soils on low uplands; developed in volcanic ash and material derived from cinders
Very stony land (rVS)	7-30	Areas where 50-90 percent of the surface is covered with stones and boulders
Lava flows, a`a (rLW)	—	Consists of young lava flows
Cinder land (rCI)	—	Areas of bedded magmatic ejecta; mixture of cinders, pumice and ash
Very stony land (rVS)	7-30	Areas where 50-90 percent of the surface is covered with stones and boulders
Uma rocky loamy coarse sand (URD)	7-25	Excessively drained, sandy soils on intermediate mountain slopes, with rock outcrops over 5-10 percent of the surface
Uma loamy coarse sand (UME)	15-40	Excessively drained, sandy soils on smooth, intermediate mountain slopes
Lava flows, a`a (rLW)	—	Consists of young lava flows
Uma loamy coarse sand (UMF)	40-70	Excessively drained, sandy soils on smooth, intermediate mountain slopes
ʻUlupalakua silt loam (ULD)	7-25	Soil on smooth, intermediate mountain slopes
Io silt loam (ISD)	7-25	Well-drained soils on smooth, low mountain slopes
Kula very rocky loam (KxbE)	12-40	Well-drained soils on uplands with rock outcrops over 10-25 percent of the surface

Table 3-1. Soil Characteristics (continued)

Soil Name	Slope (%)	Description
Kamaole very stony silt loam (KGKC)	3-15	Well-drained soils on uplands; developed in volcanic ash
Kula loam (KxD)	12-20	Well-drained soils; nearly free of cobblestones
Oanapuka extremely stony silt loam (OED)	7-25	Well drained, very stony soils on low uplands
Makena loam, stony complex (MXC)	3-15	Well drained soil on upland; developed in volcanic ash
Lava flows, a`a (rLW)	—	Consists of young lava flows
Very stony land (rVS)	7-30	Areas where 50-90 percent of the surface is covered with stones and boulders
Kula very rocky loam (KxbE)	12-40	Well-drained soils on uplands with rock outcrops over 10-25 percent of the surface
Io silt loam (ISD)	7-25	Well-drained soils on smooth, low mountain slopes

3.5 HYDROLOGY AND WATER RESOURCES

The western half of the proposed Project is in the Kanaiʻo watershed and the eastern half is in the Kipapa watershed (Table 3-2). The generator-tie line spans the Kanaiʻo and Wailea watersheds, with the boundary located along the southwest rift zone. Pāpaka Road crosses through the Kanaiʻo, Ahihi Kinau, Mooloa, and Wailea watersheds.

Table 3-2. Characteristics of Watersheds in the Proposed Project Area

Watershed Name	Watershed Area (acres)	Perennial Streams	Range of Annual Rainfall (inches)
Ahihi Kinau	2986.7	None	15.75 to 29.53
Kanaiʻo	18409.9	None	15.75 to 39.37
Kipapa	20743.4	None	19.69 to 39.37
Mooloa	1212.6	None	9.84 to 29.53
Wailea	21985.5	None	9.84 to 39.37

Source: Hawaiʻi Institute of Marine Biology (2006)

The proposed Project is located in the Lualailua aquifer subunit (aquifer code 60603) of the Kahikinui aquifer unit (aquifer code 606) that has a sustainable yield of 11 and 36 million gallons per day (MGD; 41,640 kL per day), respectively (CWRM 2008). The Lualailua aquifer consists of an upper unconfined aquifer, and lower basal aquifer. The unconfined aquifer consists of perched fresh water (less than 250 milligrams per liter [mg/L] of chlorine [Cl^-]) that has potential use as a drinking water source, and has a high vulnerability to contamination. The basal aquifer is an unconfined flank aquifer with low salinity (250 to 1,000 mg/L Cl^-), is a potential drinking water source, and is moderately vulnerable to contamination (Mink and Lau 1990).

The generator-tie line and Pāpaka Road both cross into the Kamaole aquifer (aquifer code 60304) of the Central aquifer unit (aquifer code 603) that have sustainable yields of 11 and 27 MGD (41,640 kL per day), respectively (CWRM 2008). The Kamaole subunit is composed of an upper dyke impounded aquifer and a lower, basal unconfined flank aquifer. The upper unconfined aquifer has potential drinking water use, has fresh to low salinity (less than 250 to 1,000 mg/L Cl^-), is

irreplaceable, and has a moderate to high vulnerability to contamination. The basal aquifer is not used as a drinking water source, has moderate to high salinity (1,000 to 5,000 mg/L Cl^-), is replaceable, and has a moderate to high vulnerability to contamination (Mink and Lau 1990).

Given the steep terrain and lack of surface water features, it is believed that the groundwater levels are deep below the ground surface throughout the proposed Project site and vicinity. No groundwater was encountered in the borings (ranging from 32 ft to 41 ft [9.8 m to 12.5 m] deep) conducted during the geotechnical investigation (Black & Veatch 2008).

No "waters of the U.S." are in or near the Project that are subject to jurisdiction under Section 404 of the Clean Water Act (David and Guinther 2010).

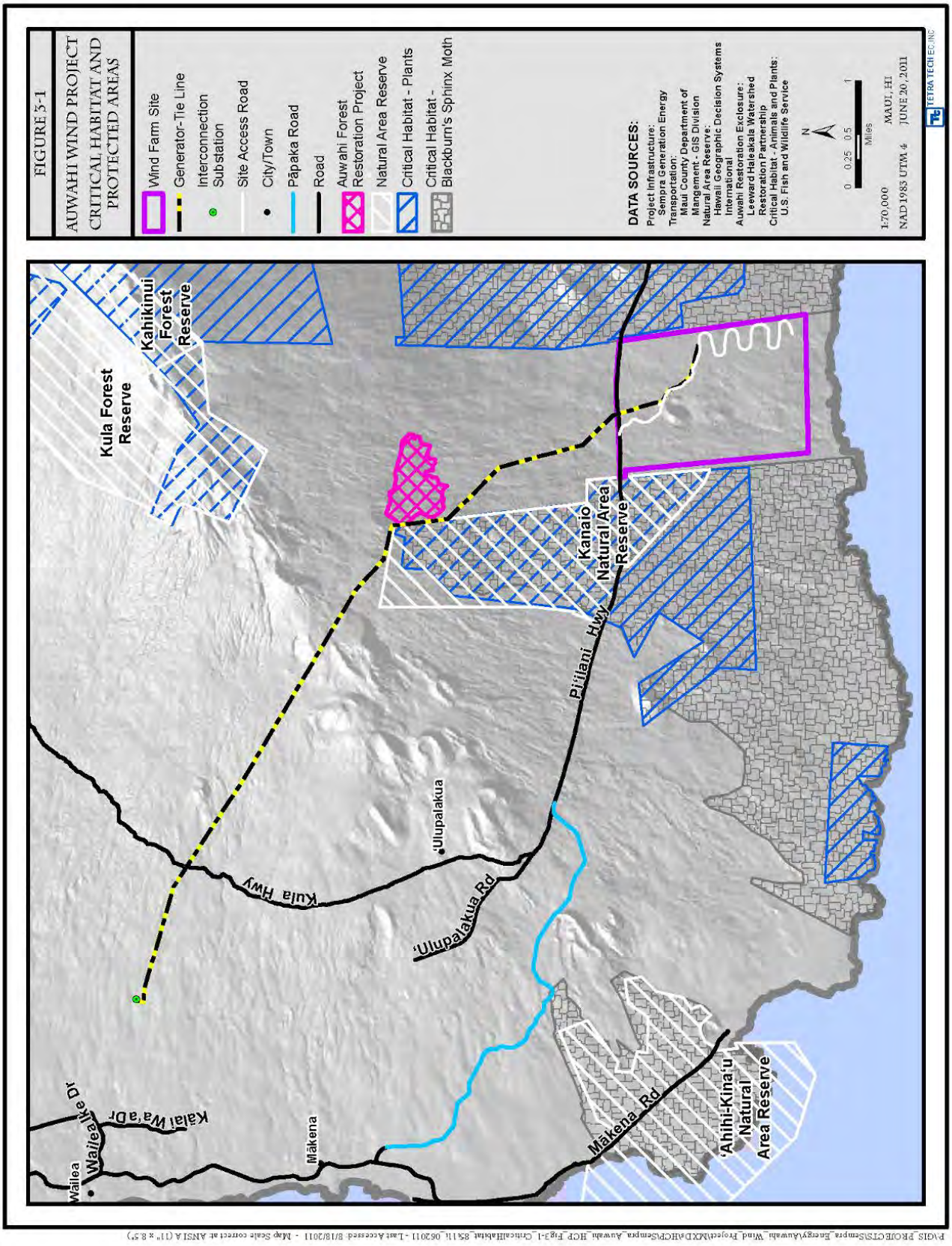
3.6 TERRESTRIAL FLORA

The Project is located on the leeward side of Haleakalā in the Hawaiian dry tropical forest ecoregion. The majority of the Project vegetative communities are dryland grassland, shrubland, and pasture dominated by non-native plant species. The introduction of grazing, fire and non-native species in the region reduced the expanses of native vegetation to remnant patches of wiliwili (*Erythrina sandwicensis)* forest, scattered mature native trees such as hao (*Rauvolfia sandwicensis*) and naio and native vegetation within recent lava flows (David and Guinther 2011).

A list of special status plants that could potentially occur in the Project Area was obtained from the Hawaii Biodiversity and Mapping Database based on known records in the vicinity. Critical habitat for 10 plant species has been identified to the east and west of a portion of the generator-tie line and the Project (Figure 3-1; USFWS 2003a). Other native plant reserves in the vicinity of the Project area include the Auwahi Forest Restoration Project, located east of the generator-tie line corridor. Additionally, the State of Hawai'i's Natural Area Reserve System (Kanaio NARS) is located on the western boundary of the southeastern portion of the generator-tie line. The Project is outside of the boundaries of botanical reserves and critical habitat areas (Figure 3-1).

A reconnaissance-level botanical survey of the proposed Project was conducted in May 2007 and a more in-depth botanical survey, focusing on specific areas where direct disturbance is proposed, was conducted from May to October 2010 (David and Guinther 2011). An additional botanical survey was conducted to capture wet-season conditions in March and April 2011 (Guinther 2011). The objectives of these surveys were to map vegetation communities within the Project and to determine the presence of any federal- or state-listed, other special status, or rare plant species (Figure 3-2). Some species documented during the 2007 surveys, which covered a broader area than the currently proposed Project, were not documented in 2010 or 2011, including the endangered mahōe and the federal species of concern island nesoluma (*Nesoluma polynesicum*). These species still have the potential to occur within the proposed Project vicinity depending on conditions from year to year. Prior to construction, additional botanical surveys would be conducted to document any new occurrences of special status and rare plant species within areas to be disturbed by construction.

Listed plant species are known to occur in the adjacent NARS and Auwahi Forest Restoration Project. During the Project surveys one federally endangered species, Ko'oloa 'ula or red ʻilima (*Abutilon menziesii*), was documented (one plant) within the wind farm site, adjacent to WTG pad 5, but outside of any area of potential disturbance. One candidate for listing, ʻaiea (*Nothocestrum latifolium*), was documented (one plant) in the wind farm site near the met tower, within an area of permanent disturbance. One federal species of concern, maiapilo (*Capparis sandwichiana*), was also documented. Four maiapilo plants were located adjacent to the internal wind farm access road near



P:\GIS_PROJECTS\Sempra_Energy\Auwahi_Wind_Project\MXD\AHCP\Sempra_Auwahi_HCP_Fig3-1_CriticalHabitat_8511i_062011 - Last Accessed: 8/18/2011 - Map Scale correct at ANSI A (11" x 8.5")

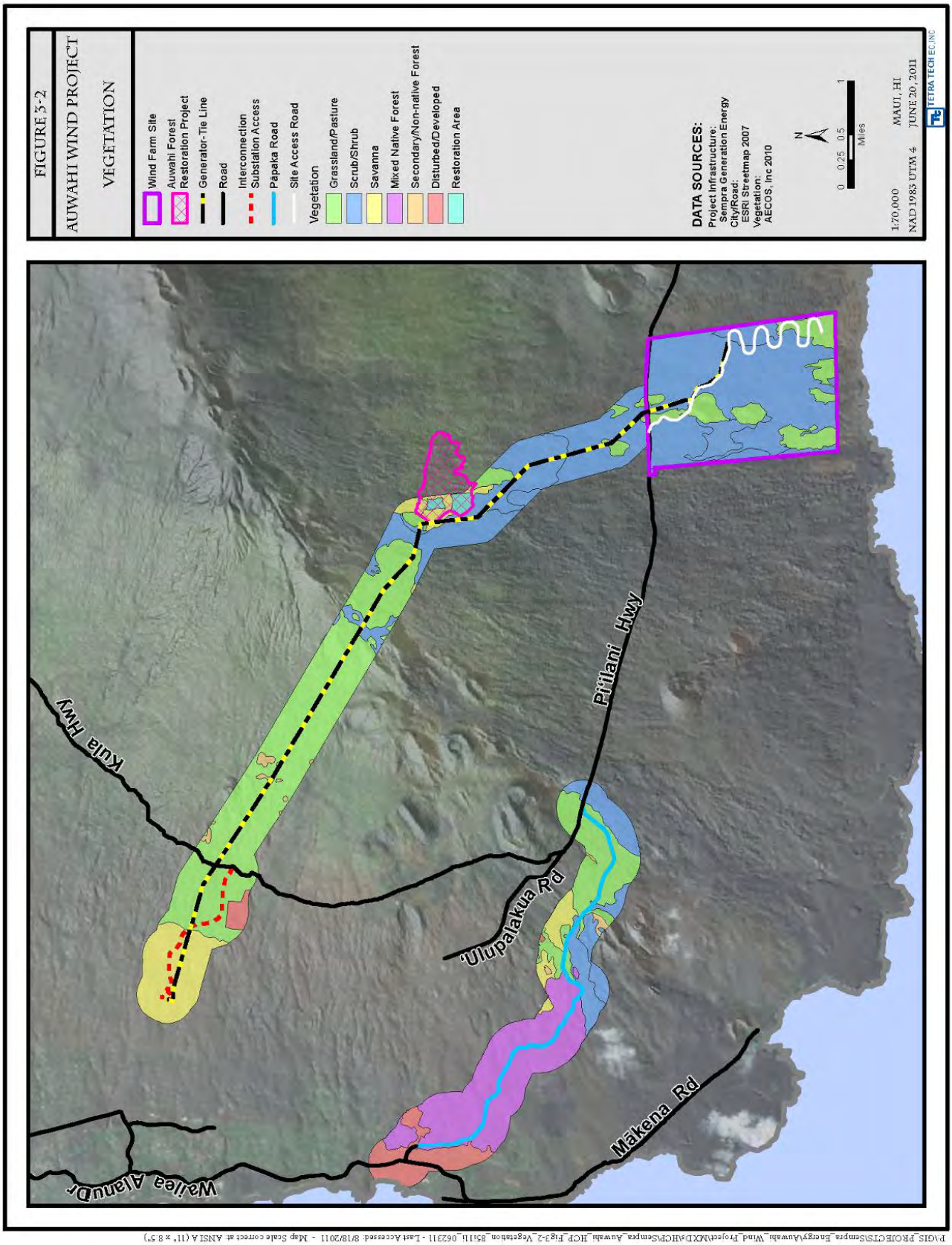


FIGURE 5-2
AUWAHI WIND PROJECT
VEGETATION
Wind Farm Site
Auwahi Forest Restoration Project
Generator-Tie Line
Road
Interconnection Substation Access
Papaka Road
Site Access Road
Vegetation
Grassland/Pasture
Scrub/Shrub
Savanna
Mixed Native Forest
Secondary/Non-native Forest
Disturbed/Developed
Restoration Area
DATA SOURCES:
Project Infrastructure: Sempra Generation Energy
City/Road: ESRI Streetmap 2007
Vegetation: AECOS, Inc 2010
N
0 0.25 0.5 1
Miles
1:70,000
NAD 1983 UTM 4
MAUI, HI
JUNE 20, 2011
TETRA TECH EC, INC
Kula Hwy
Pi'ilani Hwy
'Ulupalakua Rd
Makena Rd
Waiea Alanui Dr
P:\GIS_PROJECTS\Sempra_Energy\Auwahi_Wind_Project\MXD\AHCP\Sempra_Auwahi_HCP_Fig5-2_Vegetation_8511ii_06231l - Last Accessed: 8/18/2011 - Map Scale correct at ANSI A (11" x 8.5")

WTG 5, one of which occurs in an area of temporary disturbance. These plants would be fenced and avoided during construction. Therefore, no impacts to special status species would occur as a result of construction within the wind farm site. There are scattered remnants of wiliwili forest (isolated trees and some well-developed groves) within this area. Although wiliwili is not a listed species, it is endemic to Hawaii and is considered a keystone species of the native dry forest ecosystem, one of the most endangered ecosystems in the Hawaiian Islands (USGS 2006). However, the understory of the wiliwili tree groves in the Project is no longer intact and is often dominated by non-native grasses.

One federal and state-listed endangered species, 'iliahi (*Santalum freycinetianum*), and one candidate for federal listing, ʻaiea (*Nothocestrum latifolium*), were documented within the generator-tie line corridor. A single individual of ʻiliahi occurs in an area of permanent disturbance and a single individual of ʻaiea occurs in an area of temporary disturbance. Because there is some flexibility in the installation of generator-tie line pole locations, these occurrences will be flagged and fenced to ensure direct impacts during construction are avoided. Consequently, no direct impacts would occur to listed or candidate species in association with the proposed project during construction. Another candidate for federal listing, hole'i (*Ochrosia haleakalae*), was documented approximately 490 ft (150 m) east of the generator-tie line centerline, and outside of any area of potential disturbance.

One federal species of concern, maiapilo (*Capparis sandwichiana*), was documented in the vicinity of the construction access route (David and Guinther 2011). Three individual maiapilo occur within an area of temporary disturbance along Pāpaka Road; other plants of this species occur adjacent to the construction access road but outside of the areas of disturbance. Auwahi Wind would, to the extent possible, avoid these plants during construction. A single occurrence of island nesoluma, based on Natural Heritage data, is located several miles from the road and outside of the disturbance footprint.

Adverse impacts to special status or rare native plant species associated with the Auwahi Wind Project are unlikely because disturbance of vegetation would be limited. Fencing around listed plant species would remain during the operations period to enable continued avoidance of these species. Implementation of standard Best Management Practices for reducing the spread of invasive plant species during construction and operation and implementation of additional fire prevention measures during operations near the Kanaio NAR and the Auwahi Forest Restoration Project would minimize the chance of indirect effects on special status or rare native plants (see Sections 4.2.4 and 4.2.5 for a detailed description of avoidance and minimization measures related to invasive species and fire, respectively).

ʻIliahi and red ʻilima were the only listed endangered plant species documented during botanical surveys. Avoidance and minimization measures specific to these listed plants are identified in Chapter 4.

The wind farm site is characterized by a combination of dry, rocky pastureland and scrubland vegetation on rugged lava flows. This area is heavily exposed to grazing by cattle and feral ungulates, and is generally dominated by non-native shrubs and other low-growing woody plants (Appendix A), though pockets of grassland or barren, rocky ground are also present. Dominant species include natal redtop (*Melinus repens*), glycine (*Neonotonia wightii*), and koa haole (*Leucaena leucocephala*). There are several well-developed groves of wiliwili, a few scattered native trees such as hao (*Rauvolfia sandwicensis*), and some large specimens of naio (*Myoporum sandwicense).*

The generator-tie line traverses several plant communities along its route, which travels inland from the wind farm site, toward the Southwest Rift ridgeline, crosses the ridgeline, and then descends to

the Wailea substation. Vegetation communities include: dry shrubland/scrub vegetation (from the wind farm site upslope to approximately 4,000 ft (1,220 m) asl dominated by koa haole, glycine, lantana (*Lantana camara*), buffel grass (*Cenchrus ciliaris*), narrow-leaved plantain (*Plantago lanceolata*)); grasslands and pastures (from approximately 4,000 ft to 1,000 ft [1,220 m to 305 m] asl on the windward slope) dominated by kikuyu grass (*Pennisetum clandestinum*) and Guinea grass (*Urochloa maxima*); and savanna (below 1,200 ft [365 m] asl on the windward slope) consisting of grassland with scattered trees and dominated by kikuyu grass, sweet vernal grass (*Anthoxanthum odoratum*), and kiawe trees (Appendix A). Areas crossed by the generator-tie line are also grazed by cattle and feral ungulates and are dominated by non-native species interspersed with patches of native vegetation. The savannah transitions to dryland forest based on increased canopy cover below 800 ft (240 m) asl but this vegetation community occurs outside the generator-tie line corridor. The most significant remaining dryland forest in the vicinity is located within the adjacent Kanaio NAR, located west and outside of the generator-tie line corridor (Figure 3-2; David and Guinther 2011).

The eastern half of Pāpaka Road, between Upcountry Piʻilani Highway and approximately 780 ft (238 m) asl, is characterized by a combination of dry rocky pastureland and scrub vegetation (Appendix A). Common to abundant species include koa haole, indigo (*Indigofera suffruticosa*), ʻākia (*Wikstroemia oahuensis*), ʻaʻaliʻi, glycine, air plant (*Kalanchoë pinnata*), and ʻuhaloa (*Waltheria indica*). A relatively recent lava flow located along the west side of the Puʻu Naio cinder cone supports native species including natal redtop, ʻaʻaliʻi, common sword fern (*Nephrolepis multiflora*), and lantana. Downslope, the vegetation changes gradually to a kiawe/buffel grass association mixed with groves of wiliwili.

3.7 NON-LISTED WILDLIFE

The grassland, dryland forest and remnant native vegetation in the Project area provide habitat for native invertebrates; migratory, native and non-native birds; and a variety of introduced mammals. Federal- and state-listed wildlife species that occur in the Project area are discussed in Section 3.8 below.

The invertebrate survey results, which covered a much larger area than the currently proposed Project, indicated that the proposed Project site and surrounding area support a variety of native terrestrial mollusks and native and adventive arthropod species, including the federal- and state-listed Blackburn's sphinx moth. This species is addressed in detail in Section 3.8 below. Also observed was a species of Hawaiian yellow-faced bee (*Hylaeus* spp.). Seven yellow-faced bee species are currently the subject of a federal 12-month status review, four of which are also federal species of concern and state special status species. In total, 36 of the 49 total invertebrate species documented are endemic or indigenous to the Hawaiian Islands (Table 3-3; Montgomery 2008). Twenty-one species were documented in the wind farm site, 34 species were documented along the proposed generator-tie line corridor, and 16 species were documented along the construction access route.

During the environmental surveys, 11 mammalian species and 28 avian species were observed either during surveys or as incidentals (Table 3-4; David and Guinther 2011). All but 3 documented species are common and not native to the Hawaiian Islands. The native avian species observed include the pueo or Hawaiian short-eared owl and amakihi, which are endemic species, and the Pacific golden plover, which is indigenous to Hawaiʻi and a migrant that winters in coastal and upland areas of the main Hawaiian Islands. The Hawaiian short-eared owl is considered a Species of

Table 3-3. Species Detected During the Invertebrate Surveys at the Project

Order	Number of Species
Pulmonata (Snails and Slugs)	2
Araneae (Spiders)	1
Coleoptera (Beetles)	1
Diptera (Flies)	10
Lepidoptera (Moths and Butterflies)	25
Heteroptera (True Bugs)	2
Homoptera (Cicadas, Hoppers, Aphids)	1
Hymenoptera (Wasps, Bees, Ants)	6
Odonata (Dragonflies and Damselflies)	1

Concern by the USFWS but is not listed as threatened or endangered on Maui under either the ESA or HRS Chapter 195D (Mitchell et al. 2005). Ten avian species protected by the MBTA (50 CFR Chapter 10.13) were documented during surveys (Table 3-4).

Table 3-4. Species Detected During the Avian and Terrestrial Mammal Surveys at the Project

Birds	
African silverbill (*Lonchura cantans*)	Java sparrow (*Padda oryzivora*)
Hawai'i 'amakihi (*Hemignathus virens wilsoni*)1/	mourning dove (*Zenaida macroura*)2/
barn owl (*Tyto alba*)1/2/	northern cardinal (*Cardinalis cardinalis*)2/
black francolin (*Francolinus francolinus*)	northern mockingbird (*Mimus polyglottos*)2/
California quail (*Callipepla californica*)	nutmeg mannikin (*Lonchura punctulata*)
cattle egret (*Bubulcus ibis*) 2/	Pacific golden-plover *(Pluvialis fulva)*2/ 3/
chukar (*Alectoris chukar*)	red junglefowl (*Gallus gallus*)
common myna (*Acridotheres tristis*)	red-crested cardinal (*Paroaria coronata*)
common peafowl (*Pavo cristatus*)	ring-necked pheasant (*Phasianus colchicus*)
gray francolin (*Francolinus pondicerianus*)	short-eared owl (*Asio flammeus sandwichensis*)1/2/3
house finch (*Carpodacus mexicanus*)2/	sky lark (*Alauda arvensis*) 2/
Japanese bush-warbler (*Cettia diphone*)	sooty tern (*Onychoprion fuscatus*) 2/3/
Japanese quail (*Coturnix japonica*)	spotted dove (*Streptopelia chinensis*)
Japanese white-eye (*Zosterops japonicus*)	zebra dove (*Geopelia striata*)
Mammals	
axis deer (*axis axis*)	domestic horse (*Equus c. caballus*)
domestic cat (*Felis catus*)	European house mouse (*Mus musculus*)
domestic cattle (*Bos taurus*)	feral pig, wild boar (*Sus scrofa*)
domestic dog (*Canis. familiaris*)	roof rat (*Rattus rattus*)
elk (*Cervus elaphus*)	small Indian mongoose (*Herpestes auropunctatus*)
feral goat (*Capra a. hircus*)	

1/ Documented during invertebrate surveys (Montgomery 2008).
2/ Protected by the Migratory Bird Treaty Act.
3/ Documented during the fall radar surveys (Hamer 2010a).

3.8 LISTED WILDLIFE

There are five federal- and state-listed wildlife species known to occur or with the potential to occur in the Project area (Table 3-5). These species are the Hawaiian hoary bat, Hawaiian petrel, Newell's shearwater (*Puffinus auricularis newelli*), nēnē, and Blackburn's sphinx moth.

The Newell's shearwater is unlikely to occur in the Project area. Although Newell's shearwaters have been observed on Maui, there are no confirmed breeding colony locations (although they are suspected to nest on the island). In West Maui, recent radar and audio-visual surveys suggest that Newell's shearwaters may be potentially nesting in the upper portions of the Kahakuloa Valley but this has not been confirmed (KWP 2010). Newell's shearwaters were not confirmed during radar surveys conducted at the Project and are not expected to fly over the Project area (Duvall pers. comm. 2010). Hence, incidental take of this species is not expected to occur during the life of the Project. As a result, the Newell's shearwater is not included as a Covered Species under the HCP, following recommendations of the USFWS and DOFAW.

Table 3-5. Listed Species Potentially Occurring or Known to Occur in the Project Area

Common Name	Status[1]	Year Listed	Critical Habitat Present
Hawaiian hoary bat	SE, FE	1970	None
Hawaiian petrel	SE, FE	1967	None
nēnē	SE, FE	1967	None
Blackburn's sphinx moth	SE, FE	2000	None; critical habitat located to east and west of Project

1/ SE = State endangered; FE = Federal endangered

3.8.1 Hawaiian Hoary Bat

3.8.1.1 Distribution, Population Estimates, and Ecology

The Hawaiian hoary bat is the only fully terrestrial native mammal in the Hawaiian Islands. Reports of the Hawaiian hoary bat are known from all the main islands except Niʻihau (HBMP 2007), although this species is most often seen on Hawaiʻi, Maui, and Kauaʻi (Kepler and Scott 1990). Today, the largest populations and only known breeding populations are thought to occur on Kauaʻi and Hawaiʻi. Duvall and Glassmann-Duvall (1991) suggested that at least one resident, potentially breeding, population of the Hawaiian hoary bat exists on Maui.

Relatively little research has been conducted on the Hawaiian hoary bat and data regarding its habitat and population status are very limited. Population estimates for this species range from hundreds to a few thousand; however, these estimates are based on limited and incomplete data due to the difficulty in estimating populations of patchily distributed bats (USFWS 2007).

Breeding activity takes place between April and August with pregnancy and birth of two young (twins) occurring from April to June. Lactating females have been documented from June to August and post-lactating females have been documented from September to December (Menard 2001). Until weaning, young of the year are completely dependent on the female for survival.

The Hawaiian hoary bat has been observed in a variety of habitats that include open pastures and more heavily forested areas in both native and non-native habitats (DLNR 2005a). Typically, this species feeds over streams, bays, along the coast, over lava flows or at forest edges. The Hawaiian hoary bat is an insectivore and prey items include a variety of native and non-native night-flying insects, including moths, beetles, crickets, mosquitoes, and termites (Whitaker and Tomich 1983). Hawaiian hoary bats are known to roost solitarily in tree foliage and have only rarely been seen

exiting lava tubes, leaving cracks in rock walls, or hanging from human-made structures. Foliage roosting has been documented in hala (*Pandanus tectorus*), coconut palms (*Cocos nucifera*), kukui (*Aleurites moluccana*), pukiawe (*Styphelia tameiameiae*), Java plum (*Syzygium cumini*), kiawe, avocado (*Persea americana*), shower trees (*Cassie javanica*), ʻohiʻa trees (*Meterosideros polymorpha*), and fern clumps; they are suspected to roost in eucalyptus (*Eucalyptus* spp.) and Sugi pine (*Cyrptomeria japonica*) stands (USFWS 1998; DLNR 2005a).

Hawaiian hoary bats are found in both wet and dry areas from sea level to 13,000 ft (2,962 m) asl, with most observations occurring below 7,500 ft (2,286 m) asl. While the Hawaiian hoary bat may migrate between islands and within topographical gradients on the islands, long distance migration like that of the North American hoary bat is unknown (USFWS 1998). Seasonal and altitudinal differences in bat activity have been suggested (Menard 2001), but the timing and extent of this variation is unknown.

3.8.1.2 Threats

The main threats to the Hawaiian hoary bat may be reduction in tree cover, increases in pesticide use, reduction in prey availability due to the introduction of non-native insects, and predation. It is unknown what effect these threats have on local population dynamics. Observation and specimen records do suggest that this species is now absent from historically occupied ranges; however, the magnitude of any population decline is unknown. The hoary bat is one of the bat species most frequently killed by wind turbines in the continental US, primarily during fall migration (Kunz et al. 2007). It is not known if Hawaiian hoary bat seasonal movements expose them to the same turbine collision risks encountered by hoary bats during migration. Two Hawaiian hoary bats have been killed to date at the Kaheawa Wind Power I facility (KWP I) since beginning operation in 2006 (KWP 2010).

3.8.1.3 Occurrence on Maui and in the Project Area

Historically, Hawaiian hoary bats have been observed in the Project area (David and Guinther 2011). However, Hawaiian hoary bats were not observed or acoustically detected during radar surveys at the Project site during July and October 2006 surveys (Hamer 2010a) or at any time during diurnal surveys on site (Montgomery 2008, David and Guinther 2011). Biologists recorded a single Hawaiian hoary bat audio detection and observed bat-like targets on the radar screen during the Spring 2010 surveys (Hamer 2010a). Two Anabat detectors were erected on the temporary met tower located within the turbine string in July 2010 and monitoring is ongoing. To-date, very low levels of bat activity has been recorded. Results of acoustic monitoring surveys within the wind farm site indicate that over a one year period of monitoring (July 2010 through August 2011), a total of 78 bat passes were recorded resulting in 0.12 bat passes per detector night, with a maximum of 5 calls recorded in one night. These results are consistent with the lack of forest within the Project to provide suitable habitat for roosting and breeding, suggesting that the occurrence of this species in the Project area is likely infrequent and associated with foraging. This level of bat activity is low in comparison to similar studies on both the mainland and Hawaiʻi (Bonaccorso pers. comm. 2008; Kepler and Scott 1990; Menard 2001), as expected due to lack of suitable foraging and roosting habitat within the Project area.

3.8.2 Hawaiian Petrel

3.8.2.1 Distribution, Population Estimates, and Ecology

The endemic Hawaiian petrel is one of the larger species in the *Pterodroma* genus. This species formerly nested in large numbers on all of the main islands in the Hawaiian chain except Ni'ihau. Currently, Hawaiian petrels nest at high elevations on Maui, primarily in Haleakalā National Park, and in smaller colonies on Kaua'i, Hawai'i, and Molokai. Population estimates for the species are mainly based on at-sea numbers with the total population of Hawaiian petrels estimated to be 20,000, with an estimated 4,500 to 5,000 nesting pairs on Kauai and Maui (Mitchell et al. 2005). A recently rediscovered colony on Lāna'i is thought to number over 1,000 birds (Tetra Tech 2008).

During the non-breeding season, Hawaiian petrels are found far offshore, primarily in equatorial waters of the eastern tropical Pacific. Adult Hawaiian petrels are long lived (up to 30 years) and return to their colonies each year between March and April. Nesting colonies are typically on steep slopes at high elevation, xeric habitats or wet, dense forests (8,200 to 9,840 ft [2,500 to 3,000 m] asl on Maui). Nests may be in burrows, crevices, or cracks in lava tubes in both sparsely vegetated areas and areas with dense vegetation (e.g., uluhe fern [*Dicranopteris linearis*]). In the nesting colony in the south rim of the Haleakalā Crater, nests occur in more densely vegetated areas of shrub cover (Simons and Hodges 1998).

One egg is laid by the female, which is incubated alternately by both parents for approximately 55 days. The egg is not replaced if it is lost to predation. When eggs hatch in July or August, both adults make nocturnal flights out to sea to bring food back to the nestlings. Hawaiian petrels feed their young mostly at night and most movements take place during crepuscular periods (Cooper and Day 2003). On Kauai, Hawaiian petrels traveled primarily inland in the evening, seaward in the morning, and in both directions during the night (Day and Cooper 1995). In October and November, the fledged young depart for the open ocean. Petrels exhibit strong philopatry, returning to their natal colony to breed and returning to the same nesting site over many years (Cruz and Cruz 1990; Podolsky and Kress 1992). Adults do not breed until age 6 and may not breed every year, although they all return to the colony to socialize (USFWS 1983; Mitchell et al. 2005). During their pre-breeding period, they may "wander" or "prospect," visiting a number of potential breeding sites (established colonies, former breeding sites and uncolonized sites); factors such as availability of mates, food abundance, the presence of predators and conspecifics could all be important for deciding where to breed (Podolsky and Kress 1992).

3.8.2.2 Threats

A variety of threats have been documented for the Hawaiian petrel but the greatest limiting factors include habitat degradation at breeding colonies and disturbance or predation by introduced animals during the breeding season (USFWS 1983; Carlile et al. 2003; Mitchell et al. 2005). Introduced ungulates, including feral goats, pigs, axis deer, and cattle, browse on native vegetation and groundcover within petrel colonies and trample and collapse burrows causing nest abandonment. The soil disturbance caused by ungulates also facilitates the introduction and spread of invasive plants, which further reduces habitat suitability for petrels (Reeser and Harry 2005). Ungulates also create trails in the colony that increase access for predators to active burrows. Annual monitoring of nests at Haleakalā National Park has shown that predation by cats and mongooses causes more than 60 percent of all egg and chick mortality in some years (Simons 1998 as cited in Carlile et al. 2003). Rats also prey upon Hawaiian petrels, but to a lesser extent. Even an individual predator, such as a small Indian mongoose, can be extremely destructive to and decimate a population of colony-nesting seabirds (Hodges and Nagata 2001). Development of new fisheries may directly or indirectly

harm seabird populations by eliminating predatory fish needed to drive petrel prey species closer to the surface. Also, live bait needed for these fisheries could potentially decrease the availability of prey items. Development of a squid fishery, a primary food source, could also impact Hawaiian petrels (USFWS 1983).

In addition, petrels sometimes collide with power lines, fences, and other structures (Hodges 1994) or become disoriented by lights (Telfer et al. 1987). Adults apparently are not attracted to lights to the same degree as fledglings, but they do collide with power lines. Three Hawaiian petrel fatalities, presumed to have resulted from a WTG collision, has been reported at KWP I since the beginning of operations in January 2006 (Greenlee per. Comm. 2011).

3.8.2.3 Occurrence on Maui and in the Project Area

Haleakalā in east Maui supports Hawaii's largest known nesting colony of Hawaiian petrels (Hodges and Nagata 2001; USFWS 2005a) with approximately 1,000 known burrows. The nests are within the crater of the dormant shield volcano, with the highest concentration on the western rim between 7,870 ft and 10,020 ft [2,400 m and 3,055 m] asl. A small subcolony has been located along the south rim of the crater (Simons and Hodges 1998).

Radar surveys conducted at the Project in October 2006 and May 2010 documented mean passage rates of 12.01 (fall) and 7.31 (spring) petrel targets per hour (Hamer 2010a). The spring passage rates are expected to be higher than the fall rates because the non-breeders are still on-island during the spring. The relatively higher fall 2006 data may include an unknown number of sooty terns (Hamer pers. comm. 2010) as they were detected by outside observers but could not be distinguished from targets on the radar screen. Additionally, radar surveys had been conducted by other entities in the vicinity of where the Auwahi generator-tie line crosses a ridge that is adjacent to the communication towers owned by Island Airwaves. The towers are located on the ʻUlupalakua Ranch within a 3-acre (1.2-ha) parcel at roughly 4,450 ft [1,356 m] asl. Radar surveys were conducted over 5 nights in 2007. Petrel passage rates over this area averaged 2.3 petrel targets per hour (Gall and Day 2007 as cited in USFWS 2008).

Field studies and research conducted in support of the KWP I HCP confirmed the presence of a small nesting colony in West Maui in the lower portion of Kahakuloa Valley (Makamakaole Colony), later corroborated by DLNR/DOFAW biologists, and documented evidence of a potential nesting colony in the West Maui Mountains in the upper portions of Kahakuloa and Honokōhau (KWP 2010).

3.8.3 Nēnē

3.8.3.1 Distribution, Population Estimates, and Ecology

The nēnē is the only extant endemic goose in the Hawaiian Archipelago and was reintroduced on Maui as part of its recovery plan. Fossil evidence suggests that the nēnē occurred on all of the main Hawaiian Islands. However, the current population occurs from just above sea level to approximately 8,850 ft [2,700 m] asl on the islands of Kauaʻi, Maui, Hawaiʻi, and Moloka'i, a distribution influenced largely by the locations of release sites of captive-bred birds (Banko et al. 1999). The statewide population is over 1,300 birds with approximately 450 on Maui (250-300 in Haleakalā National Park). Populations are increasing on Kauaʻi and Moloka'i while the Hawaiʻi Island and Maui populations are static (HNP 2009).

Nēnē nest on sparsely vegetated lava flows or on the vegetated edges of kipukas (islands of vegetation around which lava once flowed that are now characterized by older vegetation than the surrounding areas). Nēnē do not appear to require standing water as a habitat component.

Historically, nēnē bred in lowland habitats; however, these areas have been destroyed by development or have become inundated with predators and now nesting occurs at higher elevations (Banko et al. 1999). Nēnē nest between October and March, during the wet winter season. Clutch size is typically three to five eggs, and the young are able to fly at approximately 10 to 12 weeks. Typically, nēnē do not renest in the same season if the first attempt fails. During the nonbreeding season, nēnē forage in pastures and grassland habitats. Nēnē are year-round residents, making only island-wide movements of up to 6 miles (10 km).

3.8.3.2 Threats

The 2004 draft recovery plan for nēnē (USFWS 2004) lists predation by non-native mammals as the greatest factor limiting nēnē populations. In Haleakalā National Park, rats and mongooses were observed to be the main predators (Baker and Baker 1995). Other threats to the species include lack of access to seasonally important lowland habitats, insufficient nutritional resources for breeding females and for goslings, human-caused disturbance and mortality (e.g., road mortality, disturbance by hikers), behavioral problems related to captive propagation, and inbreeding depression.

3.8.3.3 Occurrence on Maui and in the Project Area

On Maui, the nēnē is found primarily within the boundaries of Haleakalā National Park at elevations between 6,300 ft and 7,700 ft (1,920 m and 2,347 m) asl (Banko et al. 1999). They also occur in the West Maui Mountains, and around the towns of Lahaina and Wailuku (USFWS 2004). During radar surveys on May 26, 2010, 7 overlapping nēnē vocalizations were heard adjacent to the Project area. Nēnē have not been observed or heard vocalizing during any other surveys conducted to date on the Project or incidentally. Because the nēnē detection appears to have been a rare, single event and because suitable habitat does not exist in the Project area, Auwahi Wind anticipates there is only a small chance that nēnē could fly through the wind farm or across the generator-tie line.

3.8.4 Blackburn's Sphinx Moth

3.8.4.1 Distribution, Population Estimates, and Ecology

The Blackburn's sphinx moth is one of Hawai'i's largest native insects and a federal-listed insect in Hawai'i. This species once occurred on all seven of the Hawaiian Islands and now is found only on Hawai'i, Maui, and Kaho'olawe. This species was believed extinct until 1984, when a single population was rediscovered on east Maui (USFWS 2003b). Additional populations on the two other islands were subsequently rediscovered. The Blackburn's sphinx moth population numbers are known to be small based upon past sampling results; however, no reasonably accurate estimates of population sizes have been made at this point due to the adult's wide-ranging behavior and its overall rarity (Black 2005). Populations likely vary from year to year and from season to season in association with climatic and environmental conditions that affect the quality and quantity of available habitat and food.

Adults can be found year-round, but are most active from January through April and from September through November. Larvae take 65 days to develop to adulthood, but pupae may remain in torpor in the soil for up to a year. Larvae sightings have only been documented between the months of October and May (USFWS 2005c). The lifespan for this species is unknown, but is presumed to be short.

The Blackburn's sphinx moth is most commonly found in dry to mesic forests throughout its current range between sea level and 5,000 ft (1,525 m), and is known to inhabit this habitat on Maui. Larvae of the Blackburn's sphinx moth feed on plants in the nightshade family (Solanaceae). The

native host plants are trees within the genus *Nothocestrum* (ʻaiea; *N. latifolium* and *N. breviflorum*; Riotte 1986), on which the larvae consume leaves, stems, flowers, and buds. However, many of the host plants recorded for this species are not native to the Hawaiian Islands, including *Nicotiana tabacum* (commercial tobacco), *Nicotiana glauca* (tree tobacco), *Solanum melongena* (eggplant), *Lycopersicon sculentum* (tomato), and possibly *Datura stramonium* (Jimson weed; Riotte 1986). Although Blackburn's sphinx moth larvae feed on the non-native tree tobacco, USFWS does not consider this plant to be a necessary biological requirement for this species due to the ephemeral nature of this plant species and its intolerance to drought. Three plant species—maiapilo, ʻilieʻe (*Plumbago zeylanica*, and koali ʻawa (*Ipomea indica*; native morning glory)—are thought to be food plants of adults.

3.8.4.2 Threats

The primary threats to the species are predation by ants and parasitic wasps that prey on the eggs and larvae, and the continued decline of its native larval host plants (USFWS 2005c). The continued decline of the species' native larval host plants is partly a result of grazing by feral ungulates, wildfire, introduced plants, human development and ranching. Blackburn's sphinx moths are also susceptible to over-collection for personal collections or for trade. No known populations occur entirely within protected areas, and the species is endangered throughout its range.

3.8.4.3 Occurrence on Maui and in the Project Area

Of the seven islands, the Blackburn's sphinx moth historically was most common on Maui where the largest and most persistent population of this species currently occurs. The largest remaining stand of ʻaiea trees in Hawaiʻi is located on Maui in the Kanaio Natural Area Reserve, adjacent to the Project (Mitchell et al. 2005). The USFWS designated critical habitat for this species in the vicinity of the Project, in critical habitat unit 9. Unit 9 contains what is likely the largest, extant moth population or meta-population in its range. This unit contains native ʻaiea and introduced larval host plants as well as numerous nectar-supplying plants for adults. Areas within this unit may serve as a source area for local populations and habitat for dispersing adult moths. Although the Auwahi parcel of ʻUlupalakua Ranch was originally considered for inclusion in the critical habitat unit, ultimately the ʻUlupalakua Ranch land (and the Haleakalā Ranch) was removed from the critical habitat unit because "the landowners' ongoing conservation activities on these ranches provided more benefits for the species than would be provided by critical habitat designation" (USFWS 2005c, p. 38).

The species' non-native host plant, tree tobacco, has been observed on the Project during the invertebrate and botanical resources surveys conducted in 2007, 2010, and 2011. In 2010 and 2011, ʻaiea plants were documented within the wind farm site and along the generator-tie line corridor. In 2008, three adult male Blackburn's sphinx moths and one larva (located on examined tobacco plants) were observed in the Project area during invertebrate surveys (Montgomery 2008). No larvae were observed on the eight ʻaiea plants examined outside the generator-tie line corridor. In March and April, 2011, an additional survey for Blackburn's sphinx moth was conducted to capture wet season conditions. Seven larvae and 2 eggs were observed on tree tobacco plants adjacent to the construction access route; three additional tree tobacco showed possible evidence of larvae feeding.

3.9 OTHER RESOURCES

Details of other resources such as visual, air quality, cultural and archaeology, and other resources are provided in the Final Environmental Impact Statement accepted by Maui County Planning Commission on August 9, 2011(Tetra Tech 2011).

4.0 GOALS AND CONSERVATION MEASURES

This section describes the biological goals and objectives of the HCP, as well as measures that would be implemented to avoid and minimize impacts to the Covered Species. This section is prepared in accordance with Sections 10(a)(2)(A) and 10(a)(2)(B) of the ESA, Section 195D-21(b)(2)(D) of the HRS, and federal regulations (50 CFR §§ 17.21 and 17.22). These regulations require, among other items, that an HCP include measurable goals and objectives and specify the steps that will be taken to minimize and mitigate the effects of any taking allowed by the HCP.

4.1 BIOLOGICAL GOALS AND OBJECTIVES

Auwahi Wind has worked collaboratively with the USFWS and DOFAW to assess the potential for the proposed Project to cause adverse effects to the Covered Species. The purpose of identifying these goals and objectives is to establish a framework for developing the conservation measures for the HCP as outlined in the USFWS Five-point Policy guidance for the HCP process (USFWS and NMFS 2000).

The biological goals and objectives for the Hawaiian petrel, nēnē, and Hawaiian hoary bat are species-based because the proposed Project is anticipated to directly or indirectly affect individuals through collisions with Project facilities, but would have only no (petrel) or negligible (bat and nēnē) impacts on the amount or quality of their terrestrial habitats. The biological goals and objectives for the Blackburn's sphinx moth are both habitat- and individual-based. The proposed Project has the potential to indirectly affect this species through impacts to its host plants that are present in the Project area and could cause direct harm to larvae during construction. Through minimization and mitigation measures (Sections 4.2 and 6.0, respectively), the Project HCP is designed to provide a net benefit to the Covered Species.

4.1.1 Goals

Biological goals are intended to be broad, guiding principles that clarify the purpose and direction of the HCP (USFWS and NMFS 2000). The specific goals of this HCP are to:

- Avoid, minimize, and mitigate the potential effects on the Covered Species associated with construction and operation of the Project;
- Increase the knowledge and understanding of the occurrence and behavior of the Covered Species in the Project vicinity;
- Adhere to the goals of the recovery plans for each of the Covered Species; and
- Provide a net conservation benefit to each of the Covered Species.

4.1.2 Objectives

The biological objectives for achieving the HCP goals are to:

- Offset the potential direct and indirect effects of the Project on the Hawaiian hoary bat by implementing a mitigation plan that includes providing funding for management, habitat restoration and preservation, and/or research funding;
- Offset the potential direct and indirect effects of the Project on the Hawaiian petrel by implementing a mitigation plan that includes providing funding for petrel habitat and colony management such as predator control and burrow monitoring;

- Offset the potential direct and indirect effects of the Project on the nēnē by providing funding toward management, research, education, or rehabilitation; and
- Offset the potential direct and indirect effects of the Project on Blackburn's sphinx moth during construction through pre-construction avoidance measures and by providing funding toward habitat restoration.

4.2 AVOIDANCE AND MINIMIZATION OF IMPACTS

Sections 10(a)(2)(A)(ii) and 10(a)(2)(B)(ii) of the ESA require that an HCP describe the steps that will be taken to avoid, minimize and mitigate the effects of the taking provided for in the plan, and that, for an HCP to be approved, such taking be minimized and mitigated to the maximum extent practicable where complete avoidance is not possible. Auwahi Wind will take appropriate steps to avoid adverse effects to the Covered Species. Auwahi Wind has incorporated measures, identified below, to avoid and minimize take of the Covered Species; these measures include construction timing considerations, pre-construction surveys, selection of Project components, and micrositing considerations.

4.2.1 General Project Development Measures

- A daytime speed limit of 25 mph (40 kph) and a nighttime speed limit of 10 mph (16 kph) will be observed on Project area roads to minimize the potential for vehicle collisions with Covered Species.
- Truck and heavy-equipment traffic will be limited to existing disturbed areas as much as possible.
- The spread of invasive, non-native plant species caused by Project construction will be minimized through cleaning and inspecting equipment coming to the site and by replanting disturbed areas with native species or pasture grasses to be compatible with continued grazing (see Appendix B for potential species list). Trash, especially food stuffs, will be removed from the construction area on a weekly basis to avoid attraction of ants and other animals such as mongooses, cats, and rats that may negatively affect the Covered Species.
- A Project biologist will be on-staff during Project operations to conduct post-construction monitoring surveys, to assist with mitigation measures, and to address any potential wildlife issues that may arise.

4.2.2 Pre-construction Surveys and Timing Considerations

- Prior to any construction activities, threatened or endangered plant species within or adjacent to the project footprint will be protected with enclosures to avoid direct impacts to individual listed plants.
- To minimize impacts to Blackburn's sphinx moth habitat, the native host plant ʻaiea within the project footprint will be permanently fenced and avoided during construction; maiapilo and moon flower, moth food plants, that can be avoided within the areas of disturbance will also be flagged and temporarily fenced during construction.
- A survey and relocation plan for the Blackburn's sphinx moth, based on USFWS and DOFAW protocol, will be implemented by a qualified entomologist. Pre-construction clearance surveys will be conducted 90 days prior to the start of construction for Blackburn's

sphinx moth adults and larvae. These surveys will identify and map plants in the Solanaceae family (i.e., tree tobacco, the plant species Blackburn's sphinx moths are most commonly associated with) and those plants with Blackburn's sphinx moth or larvae within the Project area. Unoccupied solanaceous plants will be removed to prevent future use by the Blackburn's sphinx moth. Should any larvae or moths be found just prior to construction, the larvae and moths will be removed and relocated by the authorized entomologist to an approved nearby location outside the area of disturbance that contains suitable moth habitat to avoid direct take. These occupied areas will be flagged and avoided during construction until the moth or larvae can be relocated. The pre-construction surveys and associated plant removal/moth relocation will help to reduce the likelihood of the Blackburn's sphinx moth occurring in the Project area during construction and ultimately the potential direct take from ground disturbance during construction.

- Auwahi Wind will maximize the amount of construction activity that can occur in daylight during the seabird breeding season to minimize the use of nighttime lighting that could be an attraction to seabirds. Construction at night would be necessary for small time periods (i.e., a few hours) in the event that high winds above 25 mph (40 kph) during daytime hours prohibit safe turbine erection. The need for erecting the turbine towers at night will be determined by Auwahi Wind and is anticipated to be infrequent and restricted to the period of September to December 2012. Additional limited Project activities, such as the transportation of some Project equipment and the pouring of concrete pads, may occur at night as well to minimize daytime construction traffic, but will be kept to a minimum. Each turbine foundation will require 1 day to pour the concrete; a total of 8 days spaced throughout May to August 2012. In instances where nighttime construction is unavoidable, lighting will be limited to one tower at a time, providing that doing so does not compromise worker safety. An environmental monitor will be onsite during those periods of night construction. If the monitor observes that any Covered Species are being attracted to the construction lighting, such lighting will be turned off as soon as it is safe to do so. In the unlikely event that construction lighting results in the grounding of Covered Species, the monitor will retrieve and assist such individuals in accordance with the Downed Wildlife Protocols.

- Hawaiian hoary bats roost in non-native and native woody vegetation that is at least 15 ft (4.5 m) or taller. To minimize potential impacts to the Hawaiian hoary bat, woody plants greater than 15 ft (4.5 m) tall will not be removed or trimmed between June 1 and September 15 during the installation and ongoing maintenance of the Project structures. Disturbance of trees or shrubs suitable for bat roosting will be minimized during the April through mid-May early period of the bat breeding season. The primary area of concern for the Project is the portion of the generator-tie line in the area between the NARS and Auwahi Forest Restoration Project.

4.2.3 Project Components and Siting Considerations

- At the time of installation, the permanent met tower guy wires or lattice of the temporary met towers will be fitted with bird flight diverters and/or white, 1-inch [2.5-cm] poly tape, to increase visibility and subsequently increase the likelihood of avoidance by the seabirds and bats. This tape has proven effective in minimizing petrel collisions on other projects within the Hawaiian Islands when wrapped on the guy wires (Hodges and Nagata 2001; Tetra Tech 2008). Flagging will be used to minimize perching should a lattice tower model be installed.

- The wind farm is sited in an area with limited forested areas to avoid potential impacts to bat roosting habitat.
- The proposed WTG model has significantly slower rotational speeds (6 to 16 rotations per minute [rpm]) compared to older designs (28.5 to 34 rpm). This increases the visibility of turbine blades during operation and decreases collision risk (Thelander et al. 2003). Additionally, the selection of the 3.0-MW Siemens model results in the least ground disturbance because only 8 turbines will be installed compared to the other turbine models considered that would require 15 or 10 turbines (1.5-MW GE and 2.3-MW Siemens; see Chapter 8 for additional discussion).
- A Federal Aviation Administration (FAA) endorsement of a minimal lighting plan has been requested to reduce the likelihood of attracting or disorienting seabirds, bats, and insects.
- To minimize potential impacts to wildlife, onsite lighting at the O&M building and substation will consist only of fixtures that will be shielded and/or directed downward and triggered by a motion detector. These lights will be utilized only when workers are at the site at night.
- The proposed substation and interconnect to MECO's transmission lines will be designed and installed using industry-standard measures to reduce the possibility of wildlife collisions by fitting bird flight diverters on the generator-tie line in high risk areas. Based on site-specific design work conducted to date, the maximum height of the generator-tie lines is expected to be 65.5 ft [20m] above ground level, which should reduce the potential for collision by seabirds.
- The measures described in this Chapter for Covered Species will also avoid and minimize impacts to MBTA-protected species to the extent possible. The Applicant has committed to implementing a post-construction monitoring program to assess project-related impacts to avian species and would use the results of this monitoring to ensure that impacts to MBTA-protected species are avoided and minimized to the extent possible. Additionally, the mitigation measures for the Hawaiian hoary bat, Hawaiian petrel, and Blackburn's sphinx moth (Chapter 6) that would protect and/or restore native habitats would also benefit migratory bird species. Thus, the HCP's conservation strategy will be a significant benefit to all migratory bird species potentially impacted by the Auwahi Wind Project. Therefore, the Auwahi Wind Project is consistent with the requirements of the MBTA.
- 'Iliahi and red 'ilima are the only listed endangered plant species documented during botanical surveys. Prior to construction, additional botanical surveys will be conducted to identify any occurrences of these or any other listed plant species in areas proposed for development based on the final project design. These plants will be fenced and avoided during construction.
- The listed plant species that occur within the Auwahi Wind project vicinity are known to occur in dryland forests on Maui including within the nearby Auwahi Forest Restoration Project and the lower elevations of the Kahikinui Forest Project. Mitigation measures described in Chapter 6 at the Waihou Mitigation Area (Hawaiian hoary bat) and Auwahi Forest Restoration Project (Blackburn's sphinx moth) will also benefit special status and rare plants that occur in the vicinity of the Auwahi Wind project by protecting and/or restoring native vegetation communities.

- The project has been designed to avoid impacts to listed and candidate plant species. The fence enclosures to be installed around each ʻaiea, ʻiliahi, and red ʻilima adjacent to Project disturbance areas will increase the long-term viability of each plant and provide protection from ungulates that would not otherwise occur. Therefore, there are no direct impacts to these plants and mitigation for direct impacts is not needed. The USFWS is concerned that the project will, however, affect existing lands which hold the potential for supporting listed species in the future. The current and planned management of these areas in the absence of the project is expected to continue as pastureland, a condition that does not provide suitable habitat for the listed plants. However, because USFWS determined that a small potential exists that these lands could otherwise support listed plants at some point in the future, USFWS is requiring that the Applicant implement conservation measures. Based on these minimal potential future impacts within the degraded lands, USFWS requested that a total of 10 additional plants for each species (ʻaiea, ʻiliahi, and red ʻilima) be planted.

  The Auwahi Forest Restoration Project includes the plantings of ʻaiea and ʻiliahi and therefore will benefit these species directly. As part of the Blackburn's sphinx moth mitigation (Section 6.5.1), 250 outplantings of ʻaiea per restored acre will be installed at the Auwahi Forest Restoration Project (6 acres). Because this number of plants far exceeds the number requested by USFWS, there is no need for additional outplantings of this species. The Auwahi Forest Restoration Project may also outplant ʻiliahi in that same acreage and will, as a result of this project, include 10 plants. As part of its ongoing conservation efforts, the Ulupalakua Ranch is working on a propagation effort for red ʻilima; 10 ʻilima from this project will be outplanted on the ranch to offset potential project impacts.

4.2.4 Invasive Plant Species Management

Auwahi Wind will work actively to minimize and reduce the ingress of certain undesirable invasive plant species such as fireweed (*Senecio madagascariensis*), a pasture weed that is highly toxic to grazing livestock and quick to recolonize disturbed areas. Auwahi Wind intends to implement measures to minimize and avoid the introduction of invasive species to ʻUlupalakua Ranch including:

- All equipment, materials, and vehicles brought onto the site during construction will be cleaned and inspected to prevent the introduction of invasive or harmful non-native species. An inspection station will be located at the staging area close to Piʻilani Highway.
- To minimize the introduction and spread of invasive plant species, potential off-site sources of materials (e.g., gravel, fill) will be inspected, and the import of materials from sites that are known or likely to contain seeds or propagules of invasive species will be prohibited.
- Vehicle operators transporting materials to the proposed Project site from off site will be required to follow protocols for removing soils and plant material from vehicles and equipment prior to entry onto the site.
- The Hawaiʻi Department of Agriculture and Maui Invasive Species Commission will be consulted to establish protocols and training orientation methods for screening invasive species introductions during construction.
- As part of the fire management plan, Auwahi Wind will conduct surveys for invasive species of fire-prone grasses, with an emphasis on barbed wire grass and fountaingrass (*P. setaceum*). The survey extent will include, at a minimum, areas within 33 ft (10 m) of disturbance resulting from construction within the wind farm site, the connection substation site, and

within roadways constructed or utilized more than once monthly for wind farm construction or maintenance. Individuals or colonies observed will be exterminated by Auwahi Wind Energy via a means that includes killing the root system.

4.2.5 Fire Prevention During Construction and Operation

- Fire risk associated with generator-tie line construction and operation is extremely low. The agencies' area of concern is along the pinch point corridor between the State NAR land and the Auwahi Forest Restoration Project, due to the presence of native vegetation. However, the probability of a fire associated with the generator-tie line is approximately 0.05 percent over the lifetime of the Project (see the Fire Management Plan in Appendix C). Downed generator tie-lines represent an ignition threat which usually stems from a weather event that causes degraded wood poles to blow over in high winds, or from a hazard tree coming into contact with the line itself. In addition to downed lines, poorly maintained lines can produce sparks and arcing that may cause a fire ignition in rare cases. Thus, design and maintenance are keys to the integrity of the line.

  As noted above in Section 1.3.1.2 the generator-tie line would consist of a vertically arranged three-phase 34.5-kV line (i.e., 6 conductors), designed and constructed according to industry standards. As configured the line is capable of carrying the entire wind farm output. During normal operations, assuming full output from the wind farm, only half of the plant output will be carried on each individual circuit. Under these conditions the current flow on each circuit will be approximately 211 Amperes and the associated conductor temperature will be 132 degrees Fahrenheit (F), far below the design temperature criteria of 212 degrees F for calculating line clearances. Therefore, the generator-tie line will easily maintain the minimum required 18.5-foot (5.6-meter) ground clearance under maximum line sag conditions at 212 degrees F. Consequently, there should be no issue with line conductors sagging down towards the ground and starting a fire based on the National Electric Safety Code (NESC) design for this line. In the unlikely event that the full plant output of 24 MW is carried on a single circuit, current flow would be 423 Amperes and conductor temperature would be 171 degrees F, also well below the design criteria of 212 degrees F. With full wind farm plant output on only one of the two circuits, the single circuit would load within 80 percent of the maximum design rating, which is a typical engineering design standard. It is important to note that design calculations are based on wind speed of 2 ft per second (0.6 m per second) or 1.62 mph (2.61 kph) and 104 degrees F ambient temperature assumptions. In reality, the line will be fully loaded only when wind speeds are above 29 mph (47 kph), so there will be a significant natural cooling effect to reduce conductor temperature even further below the calculated value of 171 degrees F at 1.36 mph (2.19 kph). This effect is one of the benefits of loading a generator-tie line for a wind project.

  Auwahi Wind will incorporate measures to address extreme wind design conditions. Although the line voltage is 34.5 kV, Auwahi Wind would use one class higher insulators (69 kV) for added strength and shorten the span lengths between poles to withstand severe weather conditions and strong wind uplift forces due to undulating topography near the line. The benefit of higher rated insulators will be greater arcing and leakage distance to counteract salt contamination, soiling (i.e., build up on exterior of the insulator due to dust or pollution), and provide greater horizontal conductor separation to reduce the source of ignition (electrical faults). Basically, the design of the generator-tie line will reduce the risk of fire because the line will be normally operated with each circuit carrying only half of the full

wind farm output and be structurally designed to meet or exceed NESC requirements and withstand extreme weather conditions.

To further reduce the very low risk of fire during construction and operations, Auwahi Wind will implement the measures outlined in the Fire Management Plan (Appendix C) and conduct regular maintenance of the generator-tie line and the turbines.

- A scheduled maintenance system will be established by Auwahi Wind during Project operations as a repository of key information about fire prevention activities associated with the generator-tie line. This system will be used and updated by Project O&M personnel who are trained in fire management practices. The system will also maintain records of best practices in fire prevention. One way to improve fire prevention performance over the long term is to adopt practices that have proven to be valuable and effective elsewhere in the industry and can be applied at the Project.
- The generator-tie line poles will be inspected regularly to determine if there is any degradation or structural problem preventing them from withstanding high winds. As part of the fire management plan, trained personnel will maintain the generator-tie line conductors and remove any overhanging limbs or trees, as necessary, to prevent branches from falling onto the power line. However, most of the generator-tie line traverses pasture.
- Generator-tie line insulators will be maintained as needed. Furthermore, vegetation will be maintained at least 16 ft (5 m) radius around the conductors in all directions. Most of the generator-tie line traverses pasture. Brushing or brush removal around the base of the poles is a precautionary measure to prevent fires from starting or keep them from spreading and affecting the integrity of wood pole structures along the generator-tie line. Furthermore, regular grazing by cattle is an integral part of the fuel management approach.

- Auwahi Wind is part of a $1 billion wildfire liability insurance program through its parent corporation, Sempra Energy. The insurance coverage not only pays for bodily injury and repair/replacement of the dwellings and personal property of third parties but also pays for replanting and refurbishing of vegetation that is damaged by wildfires caused by the legal liability of Auwahi Wind in the operations of the wind farm.
- Fire risk associated with WTG operation is very low and will be prevented by the design features of the turbine model selected. The direct drive design of the Siemens 3.0-MW turbine eliminates the gearbox and therefore the need for gearbox lubricating oil inside the nacelle. Therefore, this WTG design has no risk of gearbox-related fires.

4.2.6 Measures to Minimize Environmental Impacts

In addition to the measures detailed in this HCP document to avoid and minimize impacts to the Covered Species, Auwahi Wind will also implement certain measures to avoid and minimize impacts to visual, air quality, cultural and other resources. The details of these other avoidance and minimization measures are described in the Final Environmental Impact Statement accepted by the Maui County Planning Commission on August 9, 2011(Tetra Tech 2011) and published by the Hawaii Office of Environmental Quality Control in the *Environmental Notice* on August 23, 2011. In addition, the avoidance, minimization, and mitigation measures associated with cultural resources are described in Appendix D of this document.

5.0 ASSESSMENT OF POTENTIAL IMPACTS AND TAKE LIMITS

The issuance of an ITP/ITL requires establishing the number of individuals of or habitat for each Covered Species authorized for incidental take during a defined period. The following subsections describe potential direct and indirect impacts from the proposed Project to the Hawaiian hoary bat, Hawaiian petrel, nēnē, and Blackburn's sphinx moth. Implementation of the measures described in Section 4.2 is expected to minimize the potential for take of species resulting from the proposed covered activities. Temporary impacts associated with construction of the Project are identified as well as permanent impacts resulting from Project operations. For each species, the approach taken for estimating take levels over a 25-year term is described. Anticipated levels of take for the Covered Species are based on modeling, post-construction monitoring results at other Hawaiian wind projects, and field surveys conducted on the Project site.

For the Hawaiian hoary bat and Hawaiian petrel, a three-tiered approach to take and mitigation has been developed based on the best available scientific information. Each tier represents a level of take and associated compensatory mitigation measures. Reaching Tier 1 levels of take for a species triggers initiation of Tier 2 associated mitigation, with a similar trigger to move from Tier 2 to Tier 3.

For the nēnē and Blackburn's sphinx moth, the likelihood of Project-related effects is low due to the absence of the species from the Project area (nēnē) or due to measures that would avoid or minimize take (moth). Thus, in consultation with the USFWS and DOFAW, a maximum take limit has been established for the nēnē over the 25-year period. Direct impacts to Blackburn's sphinx moths are anticipated to be largely avoided, so no direct mortality due to construction is anticipated; however, it is recognized that some potential impacts could occur to habitat that will be mitigated. For all species, mitigation is described in detail in Section 6.0.

5.1 HAWAIIAN HOARY BAT

Across the United States, hoary bats account for the majority of wind farm fatalities, primarily during the fall migration period (Arnett et al. 2008). It is unknown if the Hawaiian hoary bat exhibits the same propensity to collide with WTGs as its North American relative, given that the subspecies is not known to migrate long distances. However, there is the potential for Hawaiian hoary bats to collide with WTGs or succumb to barotrauma while foraging. This species forages for insects in open areas such as grasslands and shrublands, habitats which exist in the Project area. However, roosting habitat does not occur within the Project. It is not known how far Hawaiian hoary bats forage from roost sites in forested areas.

Bat activity is anticipated to be low at the Project due to the absence of roosting habitat and the low level of activity detected during radar and acoustic surveys (Hamer 2010a, Tetra Tech 2011). Biologists recorded a single Hawaiian hoary bat audio detection and observed bat-like targets on the radar screen during the Spring 2010 radar survey and only a few Hawaiian hoary bats have been documented in the Project area either by acoustic monitoring or visual incidental observations by ranch staff over the years. Furthermore, after close to 5 years of operation, only two Hawaiian hoary bat fatalities have been reported at KWP I (USFWS 2010). Acoustic monitoring surveys conducted at KWP1 have indicated low bat activity as well. Although the topography of the KWP1 and Project sites is similar, KWP1 contains more forest habitat in the vicinity suitable for roosting, and therefore bat use would be expected to be greater there than at the Project.

Results of acoustic monitoring surveys within the wind farm site indicate that over a one year period of monitoring (July 2010 through August 2011), a total of 78 bat passes were recorded resulting in 0.12 bat passes per detector night, with a maximum of 5 calls recorded in one night. This level of bat activity is low in comparison to similar studies on both the mainland and Hawai'i (Bonaccorso pers. comm. 2008; Kepler and Scott 1990; Menard 2001), as expected due to lack of suitable foraging and roosting habitat within the Project area. Acoustic monitoring in the Project is ongoing.

5.1.1 Direct Take

There are four potential sources of direct bat mortality associated with the Project. The first is vehicle collisions. This source of mortality is considered negligible given the limited nighttime traffic expected in the Project area and low speed limits posted and strictly enforced on Project roads. The second is associated with construction- and maintenance-related clearing or trimming of woody vegetation taller than 15 ft (4.5 m) during the bat breeding season. However, this source of potential mortality is negligible, as such vegetation only occurs along a short portion of the new generator-tie line, and Auwahi Wind will not remove or trim such vegetation during the April to August breeding season. The third is collisions with stationary (e.g., met tower, generation tie-lines) and near-stationary (e.g., crane booms) objects. These sources of mortality are also considered negligible given the general ability of bats to avoid colliding with stationary objects. The fourth, and relatively most likely, potential source of direct bat mortality, used as the basis for quantifying direct take here, is a collision or other negative interaction with an operational WTG.

Given the similarities in landscape features (e.g., slope, aspect) and the number of WTGs between KWP I and the Project, it is reasonable to use the KWP I data to estimate potential direct take resulting from WTG interactions at the Project. Acoustic monitoring surveys have indicated that bat activity is also low at KWP I; however, KWP I contains more forest habitat in the vicinity suitable for roosting. Therefore, bat use would be expected to be greater there than at the Project. Two bat fatalities have been observed at the KWP I site during approximately 5 years of monitoring, which translates to an estimated bat mortality of 0.04 bat per WTG per year after accounting for scavenger activity and searcher efficiency (USFWS 2010). Transferring the KWP I per WTG estimate to the Project for the 8-WTG Siemens array results in an estimated direct bat mortality of 0.320 bats per year.

5.1.2 Indirect Take

The take of a bat during the breeding season may result in the indirect loss or take of a dependent offspring. Several variables are needed to assess both the potential for and magnitude of this indirect take: the proportion of take assumed to be adult, the proportion of the take that is assumed to be female as only female bats care for young, the proportion of the year that is the breeding period, the likelihood that the loss of a reproductively active female results in the loss of its offspring, and average reproductive success. The rationale and values used to estimate indirect take are outlined in Table 5-1 and result in an indirect take estimate of 0.123 young per year.

5.1.3 Authorized Take Request for the ITP

Based on the assumptions and analysis above, the maximum estimated annual take resulting from Project construction and operation is 0.320 adult bat per year and 0.123 young per year, or 0.443 bats per year combined (Table 5-1).

Table 5-1. Annual Indirect Take Estimate for Hawaiian Hoary Bat

Component	Description/Rationale	Estimate
A. Annual Direct Take (bats/year)	Estimate annual direct take	0.320
B. Proportion of take that is adult	As a conservative estimate, it was assumed that all take would be of adult bats, despite the potential for newly volant young (i.e., young of the year) to pass through the Project area during the fall.	1.00
C. Proportion of take that is female	Hawaiian hoary bats are assumed to have an adult sex ratio of 1:1 and no sex-based differential susceptibility to WTG interactions. Therefore, female bats should comprise 50 percent of total take.	0.50
D. Proportion of "year" that is breeding period (5 of 12 months)	Adult hoary bats potentially occur at the Project throughout the year. However, as the breeding season only spans April through August (Menard 2001, cited in Cooper and Day 2009), it is only the loss of adult bats during this 5-month period that may result in the indirect loss of dependent young.	0.42
E. Proportion of taken breeding adults with dependent young	Until weaning, young of the year are completely dependent on the female for survival. Therefore, all female mortality during the breeding season results in the loss of her young.	1.00
F. Average offspring/pair	Data are limited, average reproductive success in terms of young/year based on Bogan (1972) and Koehler and Barclay (2000).	1.83
G. Annual Indirect Take (young/year)	Multiplying Lines A through F results in an indirect take estimate.	0.123

A tiered approach was taken for determining the requested authorized take levels for the Hawaiian hoary bat. Given the limited bat habitat present within the Project area, the expected low levels of activity, and the fact that WTGs will be regularly curtailed during the night (see below), the calculated level of take is not expected to occur. There are no obvious biological breaking points to establish a tiered approach; therefore, the three tiers were created relative to the maximum estimated take. Tier 1 take level is defined as 25 percent of estimated maximum take values, Tier 2 is defined as 50 percent of estimated maximum take, and Tier 3 defined as is the estimated maximum take.

The take limits for each tier were derived by extrapolating the annual estimated take (0.080 adult per year for Tier 1, 0.160 adult per year for Tier 2, and 0.320 adult per year for Tier 3) over the 25-year Project life span and rounding up to the nearest whole number. Indirect take was calculated based on the adjusted number of adult fatalities. The expected risk and magnitude of bat collisions will be reduced below these estimates because the WTGs are expected to be curtailed (turned-off) on a regular basis between 23:00 hrs and 06:00 hrs due to the low demand for power from MECO during this time period, and the WTGs blades will not be spinning during these periods of night-time curtailment. This curtailment was not included in the estimate of take.

Predicted Take

- Tier 1: 2 adults and 1 young over the 25-year permit period
- Tier 2: 4 adults and 2 young over the 25-year permit period
- Tier 3: 8 adults and 4 young over the 25-year permit period

Requested ITP and ITL Authorization

In recognition of the uncertainty surrounding the prediction of take and the estimation of actual mortality (i.e., searcher and scavenger bias may be more extreme at the Project relative to KWP I), Auwahi Wind is requesting authorization of a higher than predicted take and will mitigate accordingly. These requested take authorizations are based on a maximum annual take of 0.74 bats/year, a value that is 2.3 times higher than the predicted maximum annual take.

- Tier 1: 5 adults and 2 young over the 25-year permit period
- Tier 2: 10 adults and 4 young over the 25-year permit period
- Tier 3: 19 adults and 8 young over the 25-year permit period

Each tier represents the total take requested (i.e., take is not additive among tiers). Actual take will be adjusted based on the post-construction fatality monitoring plan (Appendix E) according to observed searcher efficiency and carcass removal rates. Should the post-construction monitoring results indicate that take levels will exceed a given tier the mitigation for the next tier will be initiated (Section 6.0).

Recent population estimates for Hawaiian hoary bat have ranged from several hundred to several thousand (Bonaccorso pers. comm. 2010; Menard 2001). Although the greatest overall numbers of this species are thought to occur on the islands of Hawai'i and Kaua'i (Menard 2001), systematic monitoring has not been conducted on Maui to estimate the size of its local population. Therefore, it is difficult to assess the effect that take of Hawaiian hoary bat resulting from the proposed Project may have on the local population of this species. However, the levels of bat activity are expected to be low onsite; accordingly, the identified tiered levels of take are relatively low and are unlikely to result in a significant impact on the overall population of the Hawaiian hoary bat.

5.2 HAWAIIAN PETREL

Seabird and waterfowl species have been documented detecting and avoiding WTGs and other human-made structures (e.g., transmission lines) in low-light conditions (Winkelman 1995; Dirksen et al. 1998; Desholm and Kahlert 2005; Desholm et al. 2006; Tetra Tech 2008). Petrels are adept at flying through forests to and from their nests during low-light conditions and variable weather conditions and may exhibit strong avoidance behaviors when approaching WTGs or other structures. Petrels have been observed exhibiting avoidance behaviors at communication towers on Lanai (Tetra Tech 2008) by adjusting flight directions away from the tower or by approaching the tower and turning away from the structure to avoid it. Only three petrel fatalities have been reported at KWP I wind farm during 5 years of operation and monitoring which further supports that petrels exhibit avoidance behavior with WTGs (Dawn Greenly, USFWS, pers. comm.). It is reasonable to assume that petrels have the behavioral and physical capabilities to avoid towers and Project components, and that a high proportion of petrels would detect and avoid large structures.

The Haleakalā Hawaiian petrel colony is located approximately 5 mi (8 km) northeast of the Project, and petrels fly to sea to forage for food for their young during the breeding season. Therefore, potential direct impacts could occur to petrels due to collision with WTGs or other Project facilities when flying to and from the colony. As Haleakalā is an active petrel breeding colony, the potential for indirect take of petrels exists if an adult is killed while incubating an egg or rearing a chick. However, not all losses of an adult during the nesting season will result in the loss of that year's young because not all adults are breeders. During the spring season, a large number of non-

breeding individuals (both adults and juveniles) may also be present on the island; these individuals typically exit the colony by late August (Warham 1990; Ainley et al. 1997; Simons and Hodges 1998).

Radar and visual surveys were conducted at the Project site in 2006 and 2010. Mean movement rates during the fall 2006 period were 12.01 targets per hour per 3 km at an average flight altitude of 757 ±56 ft (231 ± 17 m) above ground level (agl). Of the petrel targets for which flight height was collected during fall, 24 percent were recorded within the rotor swept area (Hamer 2010a). Mean movement rates during the spring 2010 period were 7.31 targets per hour per 3 km at an average flight altitude of 620 ± 72 ft (189 ± 22 m) agl. Of the targets for which flight height data were recorded, 46 percent were flying below the maximum Siemens 3.0-MW WTG height of 427 ft (130 m) agl (Hamer 2010a). All targets were flying within the height of the rotor swept area between 97 ft (29 m) to 427 (130 m) agl. However, typical fall passage rates would be expected to be approximately 20 to 30 percent lower than spring passage rates. In spring, non-breeders are still present on Maui, but typically exit the colony by late August. Thus, as noted in Section 3.8.2.3, the fall 2006 survey appears to include an undetermined number of non-petrel/shearwater targets such as sooty terns that seem to be inflating the fall passage rate. Hamer Environmental observed a number of sooty terns during the fall 2006 survey on Maui and shortly thereafter during similar surveys on Hawai'i (Hamer pers. comm. 2010).

5.2.1 Direct Take

Potential sources of direct mortality of petrels at the Project include collisions with WTGs, met towers, construction cranes, and generator-tie lines. Passage rates of petrels through the Project area, as determined by the fall 2006 and spring 2010 radar surveys, were used as the basis for estimating direct take due to collisions with WTGs which are the most likely source of collision. Evidence suggests that petrels are capable of high levels of avoidance of vertical structures (Cooper and Day 1998; Tetra Tech 2008; KWP 2009, 2010). In the context of wind energy facilities, avoidance rate is defined as the probability that an individual bird that nears the airspace of a WTG is able to avoid colliding with it. A high level of WTG avoidance is supported by mortality data collected during KWP I post-construction monitoring (KWP 2010), which suggest that the avoidance rate is at least 97 percent. Hamer (2010b; Appendix F) estimated annual direct take of Hawaiian petrels resulting from collision with the Siemens 3.0-MW WTGs at the Project to range from 0.662 to 2.487 petrels per year, at avoidance rates of 99 and 95 percent, respectively (Table 5-2).

In addition to collisions with operational WTGs, petrels may also collide with met towers. For KWP II, the avoidance rate for collisions with a met tower was estimated at 95 percent, resulting in an annual take estimate of 0.04 petrels/year/tower, which we have applied to the Project single guyed-met tower (Cooper and Day 2009; Table 5-2). The Project met tower will also be marked with flagging and bird diverters to increase visibility as was done at KWP I. This potential take

Table 5-2. Direct Take Estimates for Hawaiian Petrel

Source of Potential Direct Take	Avoidance Rate of 95%	Avoidance Rate of 99%
Annual Direct Take from Siemens WTGs[1/]	2.487	0.662
Annual Direct Take from Met Tower	0.040	0.040
Annual Direct Take from Generator-tie	0.100	0.100
Annual Direct Take	2.627	0.802

1/ From Hamer 2010b.

estimate may be an overestimate; after 2 years of monitoring six met towers on Lanai, no take of petrels has been documented (Standley pers. comm. 2010). Given the limited time period during which cranes will be on site (during only a portion of which they will be vertical or in operation), the potential for petrel-crane collisions is assumed to be negligible and is not considered further.

The construction of the Project will necessitate the construction of 9 mi (15 km) of overhead generator-tie lines. Although there is some potential for petrels to collide with the generator-tie line along its corridor, based on discussions with USFWS, DOFAW and the ESRC, the only area identified as being of concern was the approximately 1.6 miles (2.6 km) of the generator-tie line that runs perpendicular to the ridge running south west of the Haleakalā crater. This area stands in starkest relief to the surrounding landscape and, as a result, should present the highest collision risk. The highest component of this line (i.e., top of pole) will be no higher than 65.5 ft (20 m) above ground level in this segment, with the actual height dependent on terrain features. To minimize collision risk in this area, lines will be marked with bird diverters. Observations of petrels on Kauai (Day et al. in review, cited in Cooper and Day 2009) suggest that petrels are highly capable of avoiding transmission lines. As a result, take resulting from collision with the 9-mi (15-km) generator-tie line is assumed to be very small (0.1 petrels/year, following Cooper and Day 2009; Table 5-2).

Collisions between construction and maintenance vehicles and healthy, free-flying petrels are highly unlikely due to the temporal disconnect between bird activity and construction activity periods; their probability will be further minimized by the implementation of low speed limits (25 mph [40 kph]) on Project roads, which would be strictly enforced. Project vehicles do have the potential to collide with petrels that have been injured by collisions with WTGs, met towers or collection systems. As these collisions involve birds already accounted for in the preceding calculations, no additional take estimates are warranted. In addition, an environmental monitor will be onsite during any periods of night construction to assist with any downed birds that may be attracted to the lights, thereby minimizing the potential for collisions with downed birds. Petrels could also be inadvertently trapped during predator control trapping; however, the likelihood of this occurring is very low and any captured birds would be rehabilitated and released.

5.2.2 Indirect Take

The incidental take of a petrel during the breeding season may result in the indirect loss or take of a dependent chick. Several variables are needed to assess both the potential for and magnitude of this indirect take: the proportion of take assumed to be adult, the proportion of the activity period (i.e., period during which adults are visiting the colony) during which adults may be expected to have eggs or chicks, the likelihood that a given adult is reproductively active, the likelihood that the loss of a reproductively active adult results in the loss of its chick, and average reproductive success (Table 5-3). Indirect take of petrels associated with the Project is estimated to be 0.283 or 0.928 petrel per year, for the 99 percent and 95 percent avoidance rates, respectively.

Table 5-3. Indirect Take Estimate for Hawaiian Petrel

Component	Rationale/Description	Avoidance Rate	
		95%	99%
A. Annual Direct Take (adults/year)	Annual direct take from Table 5-2	2.627	0.802
B. Proportion of take that is adult	Assumed that 100 percent of direct take was of adult birds because juveniles (i.e., non-breeders under the age of six) rarely visit the breeding colony during the breeding season (Simons and Hodges 1998).	1.00	1.00

Table 5-3. Indirect Take Estimate for Hawaiian Petrel (continued)

Component	Rationale/Description	Avoidance Rate 95%	Avoidance Rate 99%
C. Proportion of "year" that is breeding period (6 of 8 months)	Although adult birds may be present at the colony over an 8-month period (March-October), only six of these months represent the breeding period (Simons and Hodges 1998).	0.75	0.75
D. Proportion of adults that breed	The proportion of adults attending the breeding colony that attempt to breed in a given year (Simons and Hodges 1998).	0.89	0.89
E. Proportion of taken breeding adults with dependent young	The impact of the loss of a single parent on a dependent chick varies within the breeding season: During May to September, both parents are deemed critical to chick survival. During May-August, only 89 percent of adults are breeding (89 percent breeding * 1 chick/pair * 100% parental contribution). By September, only reproductively active adults are present on the colony (100 percent breeding * 1 chick/pair * 100 percent parental contribution). In October, the chick is no longer dependent on both parents (100 percent breeding * 1 chick/pair * 50 percent parental contribution). The proportion of taken breeding adults with dependent young was calculated as: ((0.89*1*1*4 months) + (1.00*1*1*1 month) + (0.5*1*1*1 month))/6 months = 0.84.	0.84	0.84
F. Average chicks/pair	Average reproductive success for petrels on Maui (Simons and Hodges 1998).	0.63	0.63
G. Annual Indirect Take (chicks/year)	Multiplying Lines A through F.	0.928	0.283

5.2.3 Total Take Estimate (25 years)

Combining the direct and indirect take estimates for each level of avoidance, provides a range of Project total take of adults and juveniles (Table 5-4).

Table 5-4. Total Take Estimate for Hawaiian Petrels (25 years)

	Adults	Juveniles
99% avoidance		
Annual average	0.802	0.283
Over 25 years	20.050	7.075
95% avoidance		
Annual average	2.627	0.928
Over 25 years	65.675	23.200

The population size of the Haleakalā petrel colony is estimated at 475 to 650 breeding pairs (950-1300 individuals; Simons and Hodges 1998) and is assumed currently to be stable (Greenlee pers. comm.). The maximum projected take from the Project (Tier 3) is 64 adult petrels (Section 5.2.4) over 25 years or 2.6 adults per year. In order to assess the potential population-level effects of additive mortality, it is important to compare additive mortality and current population size on the

same temporal scale; in this instance, because petrels reproduce annually, the correct comparison is between projected annual additive mortality of adults (i.e., predicted take) and annual estimates of adult population size (i.e., the assumption of a stable population implies an annual population of 950-1300 adults at Haleakalā). The maximum projected annual take of adults represents an additive mortality equivalent to 0.27 percent of the low end of the population estimate. Therefore, even in the absence of mitigation, the maximum projected take should not have a population-level effect on the Haleakalā petrel colony because stable populations can absorb low levels (i.e., < 1 percent of current population) of additive mortality. The mitigation measures that Auwahi Wind has committed to (Section 6.3) will further ensure that no population-level effects will result from Project construction and operations.

5.2.4 Authorized Take Request for ITP

A tiered approach was taken for determining the requested authorized take levels for the Hawaiian petrel. The tiered approach provides assurance that if actual take levels (as determined by post-construction fatality monitoring) are higher than anticipated, additional specific mitigation measures will be automatically triggered. The requested Tier 1 and Tier 3 levels were based on anticipated annual adjusted take levels assuming 99 percent and 95 percent avoidance, respectively, over the life of the Project (Table 5-4). Tier 2 was based on 50 percent of the Tier 3 (or maximum) take level. That is, the take limit for each tier is the modeled estimated annual take for adults and juveniles extrapolated over a 25-year time frame and then rounded up to the nearest whole number. Estimated annual take assuming an avoidance rate of 99 percent was deemed appropriate for Tier 1 based on observations of petrels consistently avoiding vertical structures (Tetra Tech 2008) and the mortality data collected at KWP I (i.e., three fatalities observed in 5 years of monitoring; KWP 2010). Furthermore, the WTGs are expected to be curtailed (turned-off) on a regular basis between 23:00 hrs and 06:00 hrs due to the low demand for power from MECO during this time period. Since the WTG blades will not be spinning during these periods of night time curtailment, the expected risk of petrel collisions will be reduced further given that this period of curtailment partially coincides with the dawn peak period of petrel activity.

Requested ITP and ITL Authorization

- Tier 1: 19 adults and 7 chicks over the 25-year permit period.
- Tier 2: 32 adults and 12 chicks over the 25-year permit period.
- Tier 3: 64 adults and 23 chicks over the 25-year permit period.

Each tier represents the total take requested and is not additive for each level. Should the post-construction fatality monitoring (Appendix E) results indicate that take levels will exceed Tier 1 levels, Tier 2 mitigation will be initiated; if Tier 2 levels are exceeded, Tier 3 mitigation will be initiated (Section 6.0).

5.3 NĒNĒ

During the spring 2010 radar study, biologists documented nēnē vocalizations during one night of radar surveys in the Project vicinity (Hamer 2010a); however, nēnē have not been historically known to frequent ʻUlupalakua Ranch below 2000 feet due to lack of habitat (David pers. comm. 2010; Erdman pers. comm. 2009). Nēnē have not been observed in the wind farm site, and less than 5 nēnē sitings have been noted on the entire Ranch over the past 20 years. Nēnē are known to occur on Maui but, as previously discussed, considered highly unlikely to fly over or visit the Project

vicinity. Therefore, the likelihood of collision with WTGs or other Project facilities such as the generator-tie line is considered extremely low. However, take was considered to be likely because introductions of the species may occur on Maui in the future. In the slight chance that a nēnē would fly across the Project and collide with one of the WTGs, the generator-tie line or a crane (as described above for the Hawaiian petrel), the nēnē has been included as a Covered Species in the HCP, and only one level of take is requested. The take limit request for the 25-year permit period of the HCP is 5 nēnē. Should the post-construction fatality monitoring (Appendix E) results indicate that take will exceed 5 nēnē, Auwahi Wind will reopen consultation with USFWS and DLNR. Any mortality resulting from Project construction and operation is unlikely to have population-level impacts on the Maui population over the 25-year permit period.

5.4 BLACKBURN'S SPHINX MOTH

Blackburn's sphinx moth larvae were detected during field surveys in 2008 and 2011; the host plants verified to occur within the Project footprint are the invasive tree tobacco (*Nicotiana glauca*) and two ʻaiea (*Nothocestrum* sp.; native host plant located in the generator tie-line and the wind farm site) (Montgomery 2008; David and Guinther 2011; Guinther 2011). Native adult food plants, maiapilo and moonflower (*Ipomea tuboides*), were documented near Pāpaka Road and within the wind farm site. The ʻaiea will be fenced and avoided during construction. Maiapilo and moon flower that can be avoided within the areas of disturbance will be flagged and temporarily fenced during construction. The Project is situated in a region where adjacent and nearby parcels of land support stands of the native *Nothocestrum* species and where the moth is known to occur. Host plants in the remaining undeveloped portions of the Project area would be unaffected by Project construction and operations and would continue to provide habitat for the moth.

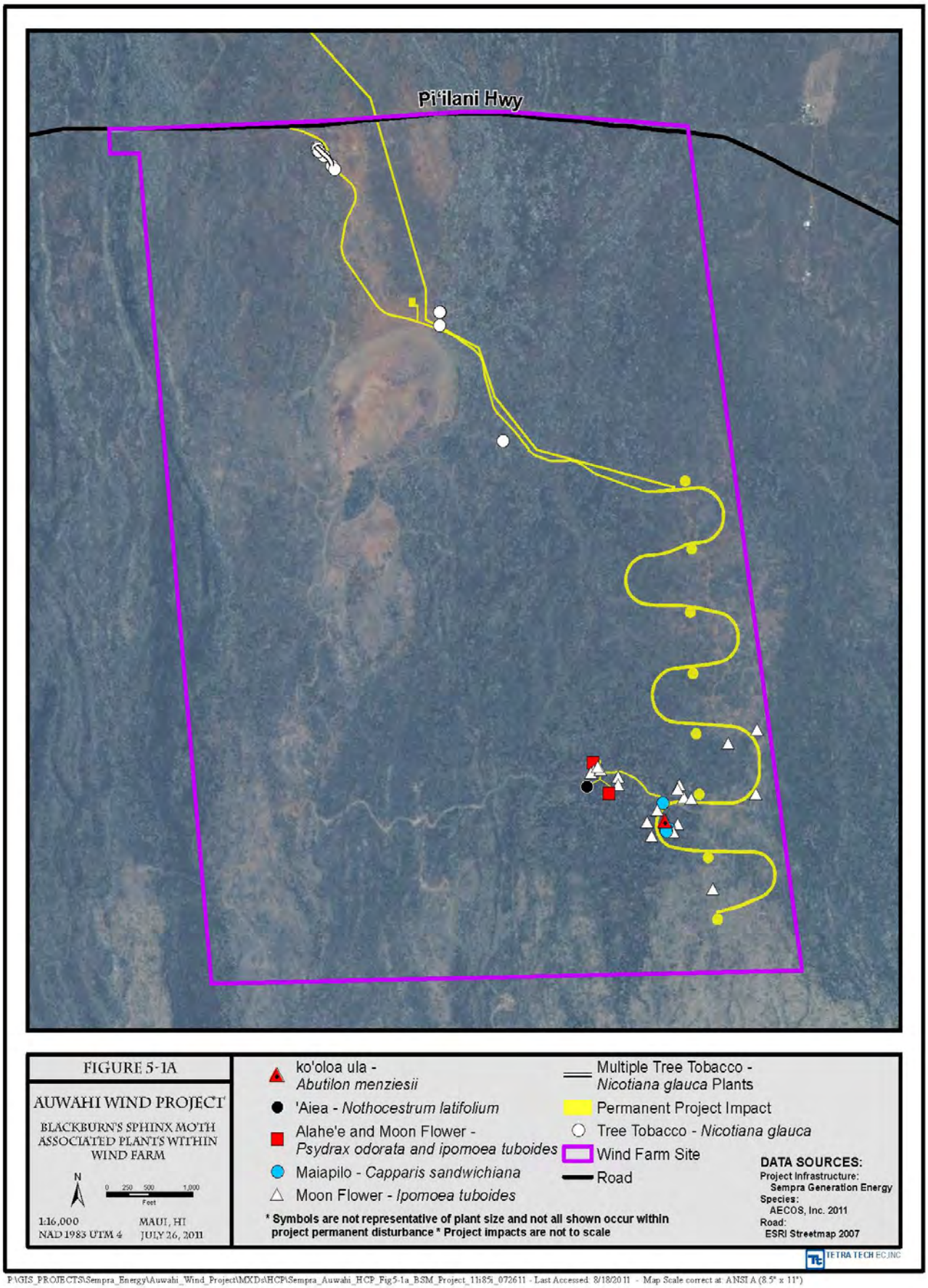
Auwahi Wind anticipates that direct impacts to Blackburn's sphinx moths and larvae can be avoided by having a qualified entomologist conduct pre-construction surveys for moths and larvae according to the DOFAW- and USFWS-approved protocol. The surveys involve assessing tree tobacco plants for the presence of Blackburn's sphinx moth eggs, larvae, or signs indicating the possibility of pupating larvae (e.g., chewed stems or other browsing). If none of these signs are present, entire young plants and the above-ground portion of the mature plants are removed. On more mature plants, signs of pupating larvae may be less visible and root disturbance may dislodge larvae which can remain in the ground around the host plant, typically within 33 ft (10 m). Thus, around these cut stems the protocol requires that a 33-ft (10-m) disturbance-free buffer around the woody host plant be established to prevent disturbance to any pupating larvae. The plant roots can be removed 90 days following the initial survey.

A wet season survey was conducted in March-April 2011 (i.e., approximately one year prior to the initiation of construction). Tree tobacco was inspected and those tree tobacco plants without evidence of eggs or larvae were removed. Those few plants with larvae were left in place. This effort removed the invasive host plants within the disturbance area reducing potential impacts. Another survey will be conducted within the disturbance area 90 days prior to construction to , remove tree tobacco with no signs of moths, and relocate moths. By clearing the non-native host plants and relocating any remaining moths or larvae prior to construction, direct impacts to the Blackburn's sphinx moth will be avoided because construction activities will not remove plants containing eggs or larvae, or expose eggs or larvae in the immediate vicinity of construction activities to dust. Only four maiapilo plants were observed within the wind farm site and three individual plants along Papaka Road within or adjacent to a temporary area of disturbance. Mitigation for habitat loss is addressed in Section 6.0 of this HCP.

In general, all life stages of Blackburn's sphinx moth generally remain on or in proximity to their host plants. The adults would most likely not fly high enough to occur within the rotor swept area of the turbines as they tend to stay close to the host plants (Montgomery pers. comm. 2011). The proposed generator-tie line is located adjacent to the Kanaio Reserve, one of two regional populations of the moth that are regarded as possible source areas for dispersing or colonizing moth adults. Therefore, there is the possibility that individual adult moths could wander into work areas as they disperse, and thus would be at risk of collision with construction equipment or vehicles; however, site speed limits of 25 mph or less will minimize this likelihood. Given that construction would be temporary and spatially localized, as equipment and vehicles would move along the corridor, the Project should result in negligible effects to the species.

There are no estimates of the numbers of Blackburn's sphinx moths that reside in or near the Project site; therefore, it is not possible to quantify the exact number of individuals that could be taken by the removal of its nonnative host plant during Project construction or harmed as a result of collision with construction equipment or vehicles. The pre-construction surveys within the Project will identify the number of moths or larvae located near host plants, if any. These individuals will be removed and relocated to the same species of host plant, where possible, in the vicinity of where the moth or larvae were found but well outside of the Project disturbance area. Therefore, it is anticipated that direct impacts will be avoided from clearing and construction activities with the exception of an unknown number of eggs or larvae not observed or removed from the soil surrounding larval host plants during the pre-construction surveys.

USFWS and DOFAW are requiring that impacts to the Blackburn's sphinx moth be quantified by calculating the acreage of permanently disturbed vegetation, including areas where Blackburn's sphinx moth larval host or adult food plants have not been documented within the wind farm site and Pāpaka Road. Figures 5-1A, B, and C show the few moth-associated plants located in relation to the area of permanent disturbance. Although the native host plant would be avoided (see Section 4.2 for additional discussion) and very few food plants would be affected by construction of the project, the area of permanent disturbance in the wind farm site and Pāpaka Road would be approximately 28 acres primarily due to turbine access roads and Pāpaka Road. Therefore, take authorization is requested for any minor incidental take of Blackburn's sphinx moth individuals or habitat during Project construction and operations. Mitigation for these Project effects is described in Section 6.0.


Pi'ilani Hwy
FIGURE 5-1A
AUWAHI WIND PROJECT
BLACKBURN'S SPHINX MOTH ASSOCIATED PLANTS WITHIN WIND FARM
N
0 250 500 1,000
Feet
1:16,000
NAD 1983 UTM 4
MAUI, HI
JULY 26, 2011
ko'oloa ula - Abutilon menziesii
'Aiea - Nothocestrum latifolium
Alahe'e and Moon Flower - Psydrax odorata and ipomoea tuboides
Maiapilo - Capparis sandwichiana
Moon Flower - Ipomoea tuboides
Multiple Tree Tobacco - Nicotiana glauca Plants
Permanent Project Impact
Tree Tobacco - Nicotiana glauca
Wind Farm Site
Road
* Symbols are not representative of plant size and not all shown occur within project permanent disturbance * Project impacts are not to scale
DATA SOURCES:
Project Infrastructure:
Sempra Generation Energy
Species:
AECOS, Inc. 2011
Road:
ESRI Streetmap 2007
TETRA TECH EC INC
P:\GIS_PROJECTS\Sempra_Energy\Auwahi_Wind_Project\MXDs\HCP\Sempra_Auwahi_HCP_Fig5-1a_BSM_Project_11x85_072611 - Last Accessed: 8/18/2011 - Map Scale correct at: ANSI A (8.5" x 11")

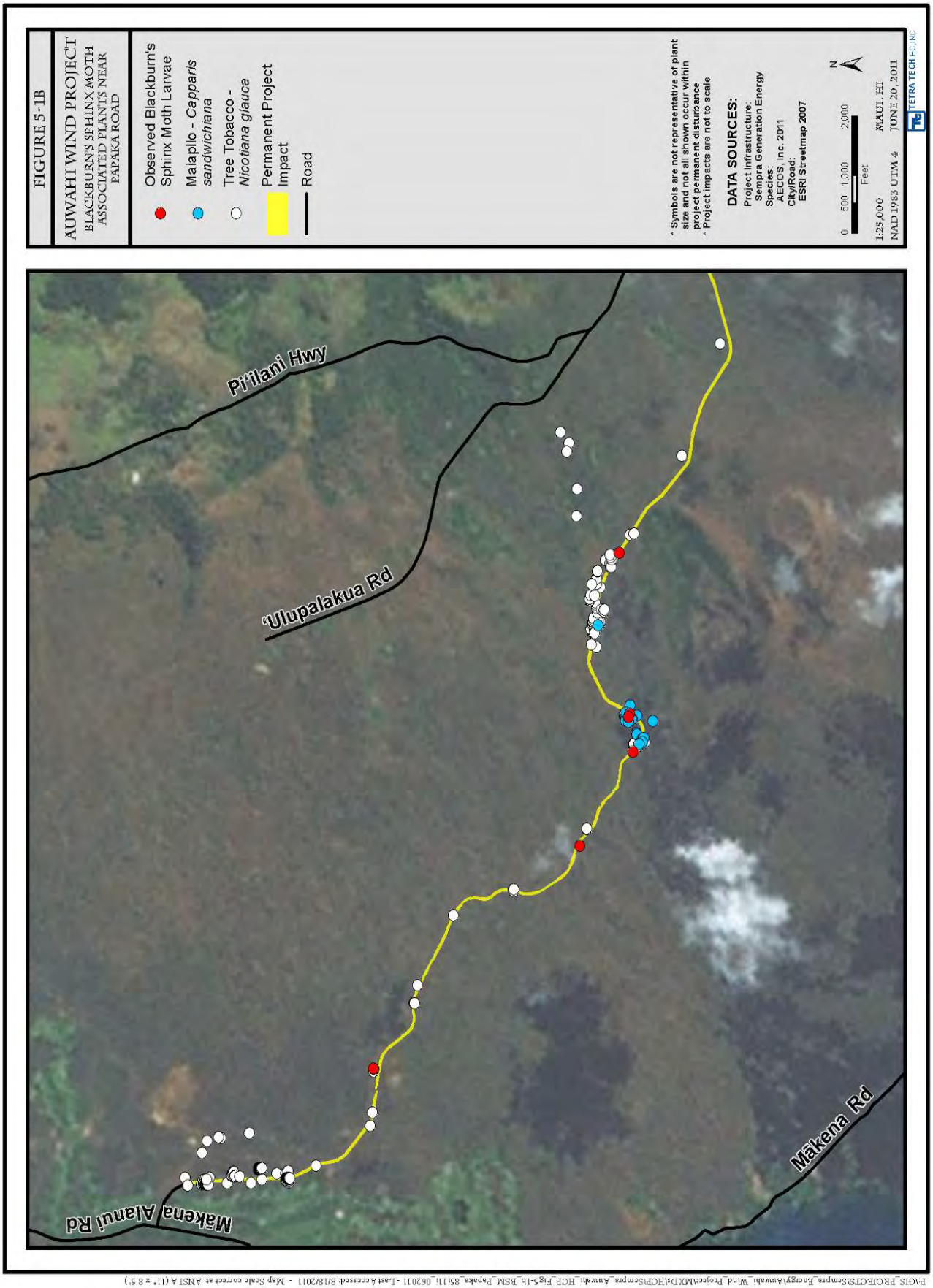
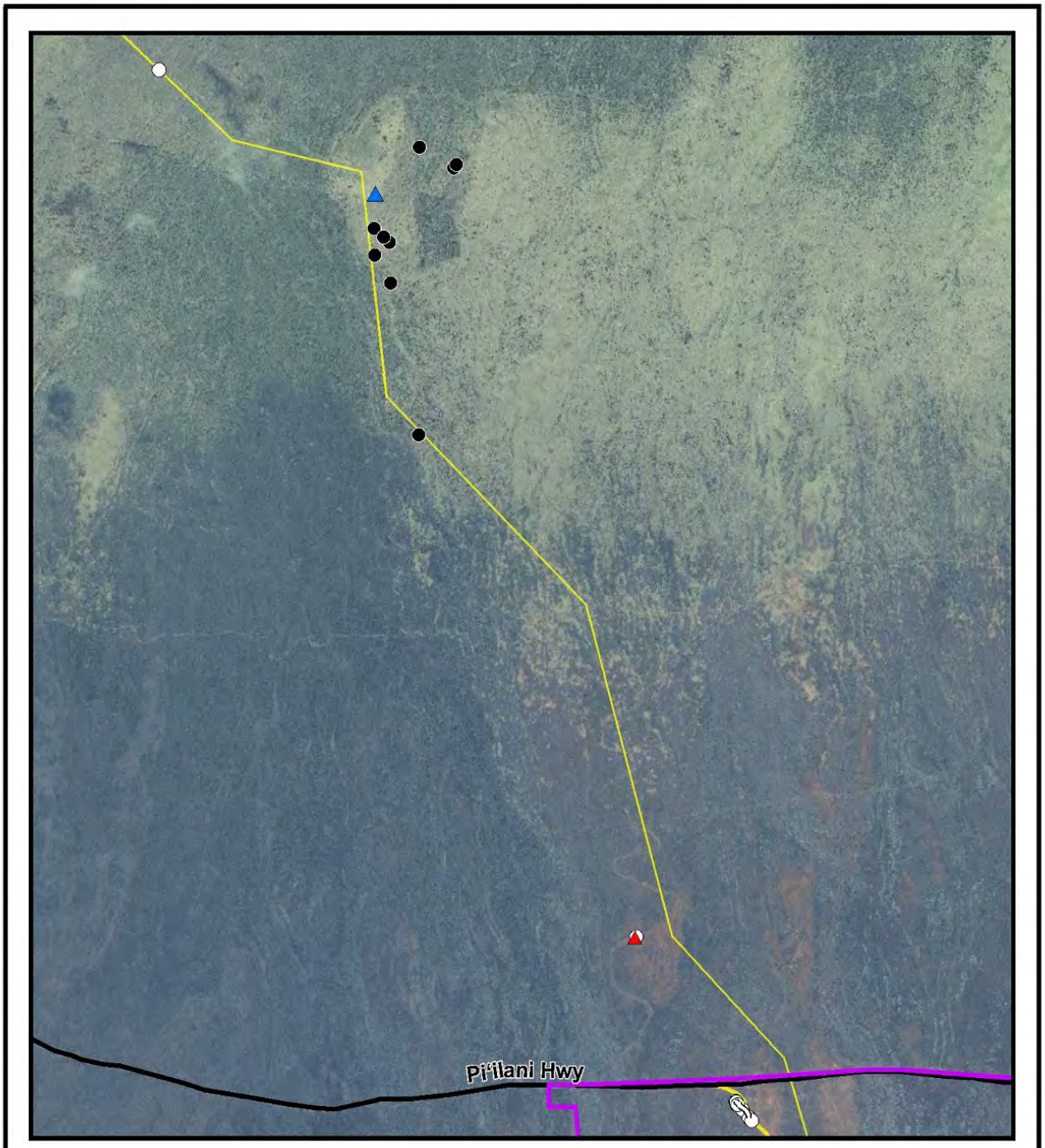


FIGURE 5-1B
AUWAHI WIND PROJECT
BLACKBURN'S SPHINX MOTH ASSOCIATED PLANTS NEAR PAPAKA ROAD
Observed Blackburn's Sphinx Moth Larvae
Maiapilo - Capparis sandwichiana
Tree Tobacco - Nicotiana glauca
Permanent Project Impact
Road
* Symbols are not representative of plant size and not all shown occur within project permanent disturbance
* Project impacts are not to scale
DATA SOURCES:
Project Infrastructure: Sempra Generation Energy
Species: AECOS, Inc. 2011
City/Road: ESRI Streetmap 2007
0 500 1,000 2,000
Feet
N
1:25,000
NAD 1983 UTM 4
MAUI, HI
JUNE 20, 2011
TETRA TECH EC, INC
Pi'ilani Hwy
'Ulupalakua Rd
Makena Alanui Rd
Makena Rd
P:\GIS_PROJECTS\Sempra_Energy\Auwahi_Wind_Project\MXD's\HCP\Sempra_Auwahi_HCP_Fig5-1b_BSM_Papaka_8511b_062011 - Last Accessed: 8/18/2011 - Map Scale correct at ANSI A (11" x 8.5")


Pi'ilani Hwy
FIGURE 5-1C
AUWAHI WIND PROJECT
BLACKBURN'S SPHINX MOTH ASSOCIATED PLANTS ALONG GENERATOR-TIE LINE
N
0 250 500 1,000
Feet
1:20,000
NAD 1983 UTM 4
MAUI, HI
JUNE 20, 2011
'Aiea - Nothocestrum latifolium
'Aiea and Olopua - Nothocestrum latifolium and Nestegis sandwicensis
Manduca
Multiple Tree Tobacco - Nicotiana glauca Plants
Tree Tobacco - Nicotiana glauca
Wind Farm Site
Zone of Potential Impact (Pole Spacing Appx. 200 Feet)
Road
* Symbols are not representative of plant size and not all shown occur within project permanent disturbance
* Project impacts are not to scale
DATA SOURCES:
Project Infrastructure: Sempra Generation Energy
Species: AECOS, Inc. 2011
Road: ESRI Streetmap 2007
TETRA TECH EC, INC
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6.0 COMPENSATORY MITIGATION FOR POTENTIAL IMPACTS

In addition to the need for avoidance and minimization measures, Section 10(a)(2)(A) of the ESA and HRS Chapter 195D require that an HCP describe the steps that will be taken to mitigate the effects of the taking authorized by the proposed ITP/ITL. Unlike incidental take avoidance and minimization measures (Section 4.2), which are designed to reduce the amount of take, mitigation measures are designed to offset or compensate for the actual effects of unavoidable incidental take that occurs under the Project HCP.

Auwahi Wind has worked with USFWS, DOFAW, and the ESRC to identify and select appropriate mitigation measures to compensate for the take of the Covered Species. Several criteria were considered in developing the proposed mitigation plan for this Project, including:

- The mitigation program should be based on sound biological principles, be practical, and commensurate with currently anticipated levels of take;
- Mitigation measures should have measurable goals and objectives that allow success to be assessed, and should have flexibility to adjust to higher or lower levels of anticipated take;
- Mitigation measures should be species-specific and should contribute to recovery (i.e., be consistent with recovery plan objectives) and have a net benefit to the species;
- Mitigation may include habitat enhancement or restoration of degraded or former habitats; and
- Mitigation alternatives may include studies/strategies that provide new information.

The mitigation proposed to compensate for unavoidable impacts consists of a three-tiered approach for the Hawaiian hoary bat and Hawaiian petrel, based on recommendations provided by USFWS and DOFAW, as described in Section 5.0. For these species, initial mitigation efforts are designed to compensate for take at the Tier 1 authorized take level. Only one mitigation level is presented for the nēnē and Blackburn's sphinx moth due to the low anticipated level of take.

The mitigation measures (Figure 6-1; Table 6-1) would meet the mitigation criteria required of Auwahi Wind by DOFAW and USFWS, and would be complementary to other management activities that may be taking place for the benefit of the Covered Species. Over the term of the ITL/ITP, mitigation measures may be subject to modification in cooperation with the USFWS and DOFAW (and in accordance with the Amendment procedures described in Section 9 of this HCP) depending on the measured levels of take and the mitigation measures implemented. Should the net benefit provided by the mitigation implemented for a tier level exceed what was needed for that level of take (e.g., petrel mitigation at Tier 1 produces more than 19 adults and 7 chicks), the additional net benefit from the mitigation will be incorporated into the mitigation planning for the next higher tier if reached; all take will be mitigated.

All costs provided in Section 6.0 are estimates. The Applicant is committed to providing the funds necessary to complete the required mitigation and will provide funding assurance in the form of a letter of credit.

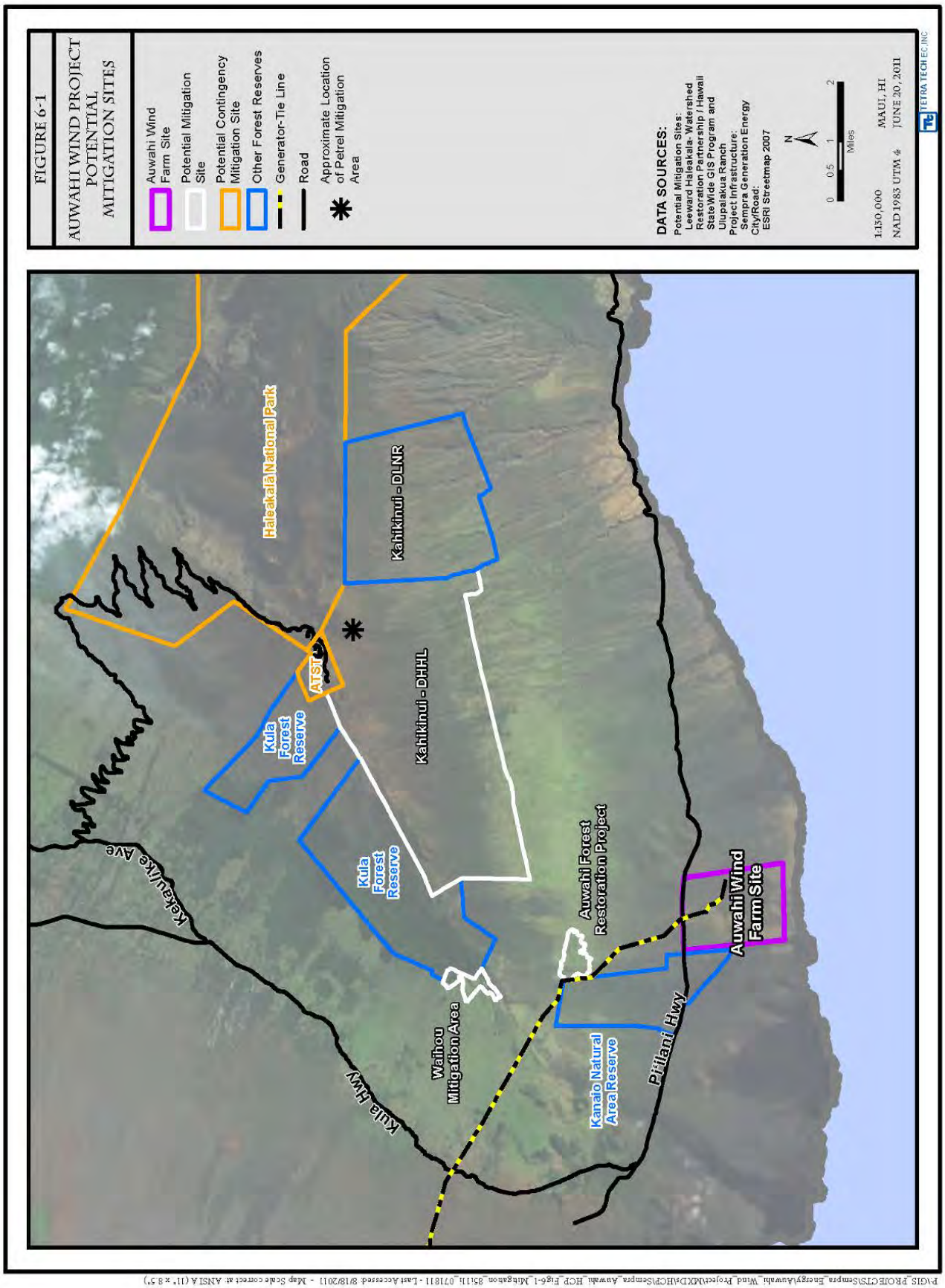
FIGURE 6-1
AUWAHI WIND PROJECT
POTENTIAL
MITIGATION SITES
Auwahi Wind Farm Site
Potential Mitigation Site
Potential Contingency Mitigation Site
Other Forest Reserves
Generator-Tie Line
Road
Approximate Location of Petrel Mitigation Area
DATA SOURCES:
Potential Mitigation Sites:
Leeward Haleakala- Watershed Restoration Partnership / Hawaii StateWide GIS Program and Ulupalakua Ranch
Project Infrastructure:
Sempra Generation Energy
City/Road:
ESRI Streetmap 2007
0 0.5 1 2
Miles
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NAD 1983 UTM 4
MAUI, HI
JUNE 20, 2011
TETRA TECH EC, INC
Haleakala National Park
Kahikinui - DLNR
Kahikinui - DHHL
ATST
Kula Forest Reserve
Kula Forest Reserve
Auwahi Forest Restoration Project
Auwahi Wind Farm Site
Waihou Mitigation Area
Kanaio Natural Area Reserve
Piilani Hwy
Kula Hwy
Kekaulike Ave
P:\GIS_PROJECTS\Sempra_Energy\Auwahi_Wind_Project\MXD\HCP\Sempra_Auwahi_HCP_Fig6-1_Mitigation_85x11_071811 - Last Accessed: 8/18/2011 - Map Scale correct at ANSI A (11" x 8.5")

Table 6-1. Proposed Mitigation for Covered Species

Covered Species	Tiered or One-Time	Tier 1 or One-Time	Tier 2	Tier 3
Hawaiian hoary bat	Tiered	Implement at Waihou Mitigation Area. Bat habitat restoration measures include fencing, ungulate removal, and outplanting.	Research such as a radio telemetry study.	Use research to evaluate appropriate mitigation – additional area for bat habitat restoration available at Waihou Mitigation Area or conduct additional research.
Hawaiian petrel	Tiered	Implement petrel management measures including conducting predator control and monitoring at the Kahikinui Forest Project.	Implement additional petrel management measures at the Kahikinui Forest Project or other appropriate management program.	Implement additional petrel management measures at the Kahikinui Forest Project or other appropriate management program.
Nēnē	One-time	Funding to conduct predator control at Haleakalā Ranch or support egg and gosling rescue at Haleakalā National Park.	NA	NA
Blackburn's sphinx moth	One-time	Funding to the LHWRP to restore dryland forest in the Auwahi Forest Restoration Project including outplantings of larval and adult host plants.	NA	NA

LHWRP – Leeward Haleakalā Watershed Restoration Partnership

6.1 MITIGATION LOCATIONS

The three primary locations targeted to provide mitigation for the Covered Species are the Waihou Mitigation Area, the Auwahi Forest Restoration Project and the Kahikinui Forest Project. These projects focus on the preservation, management, and restoration of remnant native or degraded habitats and forest with the goal of creating or enhancing habitat for rare or listed plant and wildlife species including the Covered Species. Native habitats on Maui have been degraded by feral ungulates, introduced predators, invasive plant species, and other land management activities. Microsites within the dryland and mesic forests on Maui that historically fostered unassisted, natural establishment of seedlings and saplings (shaded understory sites) have been so extensively damaged that some native species have not reproduced naturally in the last 50 to several hundred years (USGS 2006).

6.1.1 Waihou Mitigation Area

The Waihou Mitigation Area, located on ʻUlupalakua Ranch, creates a travel corridor that connects suitable bat habitat to other conservation areas where bats are also known to occur (Erdman pers. comm. 2011) such as the Polipoli area within the Kula Forest Reserve (SWCA 2010, Figures 6-1 and 6-2). The approximately 350–acre (142-ha) area includes four parcels, all owned by the ranch: Pu'u Makua (195 acres [79 ha]), Duck Ponds (53 acres [21 ha]), Cornwell Spring (41acres [17 ha]), and Kaumaea Loko (61 acres [25 ha]). The Waihou Mitigation Area is a mosaic of vegetative communities dominated by pastureland (Figure 6-3). All parcels have had some level of plantings, although on a small scale, and are enclosed with cattle fencing. The Cornwell Spring area is partially forested with koa and Pacific ash with the remainder pastureland. The Kaumaea Loko area is currently dominated by kikuyu and matching funding is currently available to add an ungulate-proof fence and to reforest portions of the area by outplanting. The Duck Ponds are partially forested with Monterey pines and the remainder is pastureland, while Pu'u Makua is dominated by pastureland. None of these parcels are currently protected by a conservation easement or have guaranteed funding for long-term management measures such as forest restoration, ungulate removal, and invasive species control management. The restoration and management activities outlined in Section 6.2 demonstrate how the restoration of these parcels will provide additional bat breeding, foraging, and traveling habitat and will provide a forested corridor with other state reserves (Kula Forest Reserve, Auwahi Forest Restoration Project, and the Kanaio Forest Reserve) protecting bat habitat.

6.1.2 Auwahi Forest Restoration Project

The Auwahi Forest Restoration Project was initiated in 1997 by a coalition of private and public agencies spearheaded by the USGS and ʻUlupalakua Ranch. The Auwahi Forest Restoration Project is located on ʻUlupalakua Ranch and is protected by an agricultural conservation easement. The goal of this project is to protect the remnants of the native dryland forest and reestablish natural forest processes (e.g., seed dispersal and germination) that will support a self-sustaining forest ecosystem. To this end, the Auwahi Forest Restoration Project consists of a three-pronged approach including 1) fencing tracts of high quality forest to exclude ungulates; 2) eliminating kikuyu grass and other invasive species using both herbicides and hand pulling; and 3) outplanting of native tree, shrub, vine, and grass species that were elements of the original forest community (USGS 2006). Success of this approach has been demonstrated by the increase in native tree and shrub growth, including several endangered plant species, where these efforts have been implemented within the Auwahi

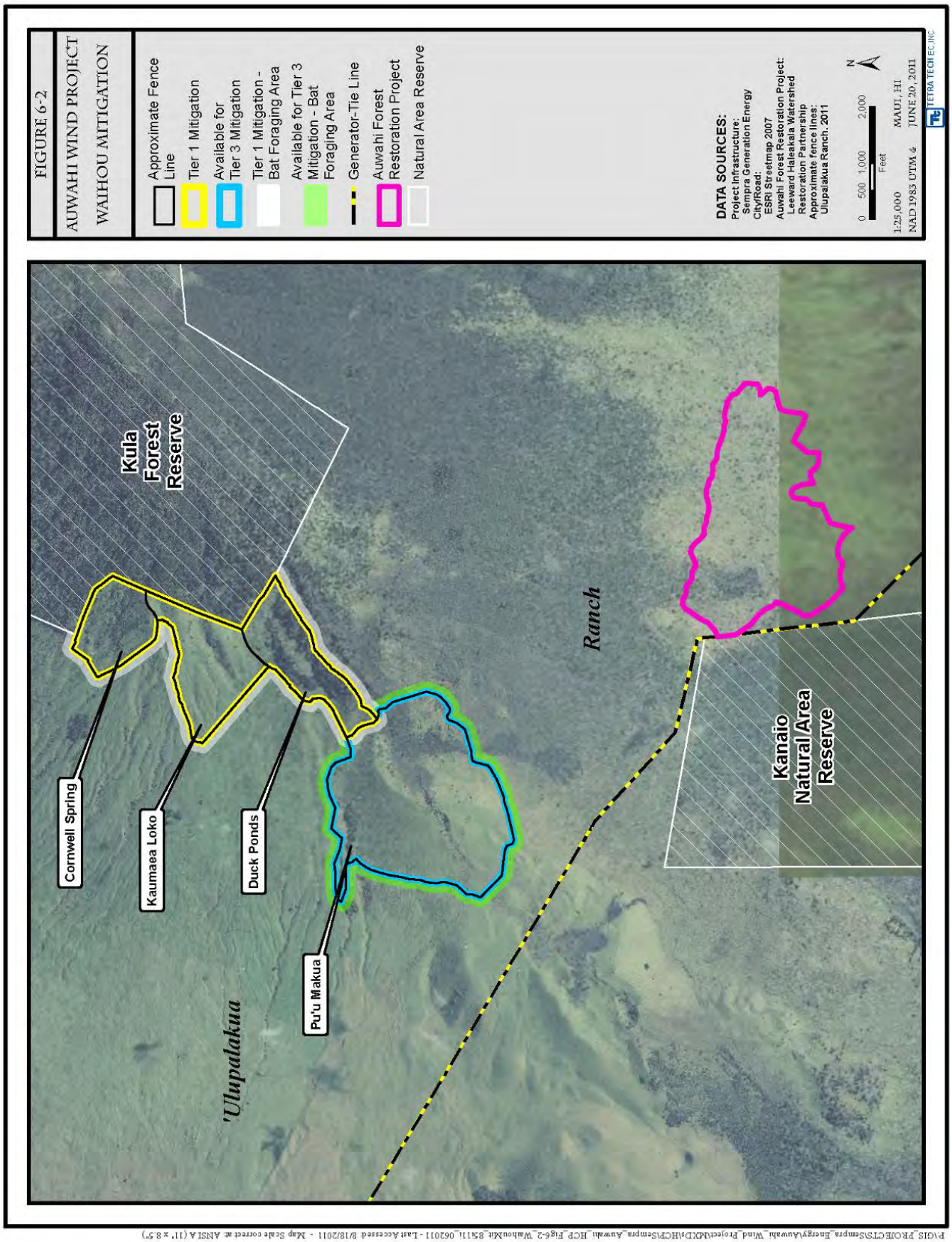
FIGURE 6-2
AUWAHI WIND PROJECT
WAIHOU MITIGATION
Approximate Fence Line
Tier 1 Mitigation
Available for Tier 3 Mitigation
Tier 1 Mitigation - Bat Foraging Area
Available for Tier 3 Mitigation - Bat Foraging Area
Generator-Tie Line
Auwahi Forest Restoration Project
Natural Area Reserve
DATA SOURCES:
Project Infrastructure: Sempra Generation Energy
City/Road: ESRI Streetmap 2007
Auwahi Forest Restoration Project: Leeward Haleakala Watershed Restoration Partnership
Approximate fence lines: Ulupalakua Ranch, 2011
0 500 1,000 2,000
Feet
1:25,000
NAD 1983 UTM 4
MAUI, HI
JUNE 20, 2011
TETRA TECH EC, INC
Kula Forest Reserve
Cornwell Spring
Kaumaea Loko
Duck Ponds
Pu'u Makua
'Ulupalakua
Ranch
Kanaio Natural Area Reserve
P:\GIS_PROJECTS\Sempra_Energy\Auwahi_Wind_Project\MXD's\HCP\Sempra_Auwahi_HCP_Fig6-2_WaihouMit_85x11_062011 - Last Accessed: 8/18/2011 - Map Scale correct at: ANSI A (11" x 8.5")

Figure 6-3. Photos of the Waihou Mitigation Area

Forest Restoration Project (USGS 2006). The entire restoration project consists of approximately 188 acres (76 ha; Figure 6-1). Fencing was installed in 1997 and outplanting was completed at the initial 10-acre (4-ha) portion of the Auwahi Forest Restoration Project. This site served as the pilot project for subsequent restoration efforts (USGS 2006). Outplanting is nearly complete for an additional 23 acres (9 ha) of the Auwahi Forest Restoration Project. Native shrubs and trees have recovered and now dominate both of these areas, providing a contrast to the surrounding pasturelands. The Auwahi site includes ʻohiʻa, a species of tree documented as a roost tree for Hawaiian hoary bats (USGS 2006; Gorressen et al. 2008). Fencing of the remaining 155 acres (63 ha) of the Auwahi Forest Restoration Project has been completed and outplanting is ongoing.

6.1.3 Kahikinui Forest Project

The objective of the Kahikinui Forest Project is to protect and restore remnant native habitats and forest along the southern slope of Haleakalā. The Leeward Haleakalā Watershed Restoration Partnership (LHWRP) and DLNR propose to manage the Kahikinui Forest Project and restore the native forest by installing adequate fencing to protect the area from non-native ungulates, followed by the removal of ungulates and predators (cats and mongooses) from within the fence line, and finally elimination of invasive weeds and reforestation with native plant species. The LHWRP is a coalition that was formed in June 2003 by 11 private and public landowners and supporting agencies. The LHWRP is partnering with the DHHL and DLNR to implement this overall program on all their lands which encompass approximately 8,000 acres (3,237 ha), with initial focus placed on 5,200 acres (2,104 ha) of DHHL lands (Medeiros pers. comm. 2010). Prior to the 1800s, the leeward flanks of Haleakalā were covered in extensive koa forests. These koa forests, among the most robust and diverse in the archipelago, supported abundant native Hawaiian flora and fauna, some of it found nowhere else in the world. Through fog interception, these forests, which were over 100 feet (30 m) tall, contributed to a greater volume of water than other areas in this region of limited rainfall. In the past 200 years, systematic deforestation due to overgrazing by feral ungulates has reduced forest cover to less than 5-10 percent of former extents, none of it intact. In response to this decline, the LHWRP and DLNR's goal is to restore native watershed forests on Haleakalā from Makawao through ʻUlupalakua to Kaupō (Medeiros pers. comm. 2010).

Restoration of the watershed and forests will benefit a number of native Hawaiian species including the Hawaiian hoary bat, Hawaiian petrel, and other native bird species. Furthermore, active petrel burrows

sufficient to manage for this Project have been identified in the upper portion of Kahikinui Forest Project where the landscape is mostly unvegetated (Figure 6-4).

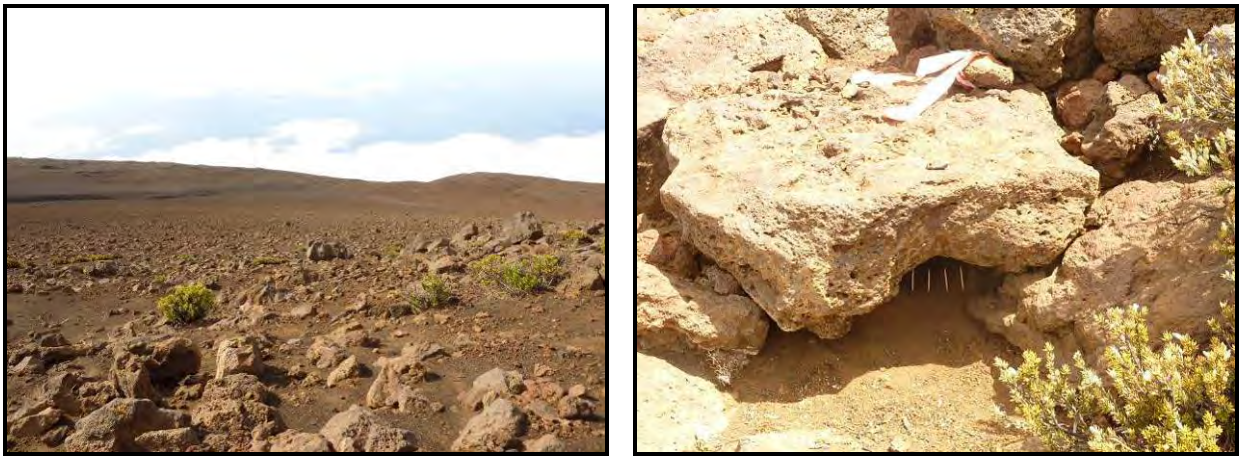

Figure 6-4. Photos of the Kahikinui Forest Project Petrel Mitigation Area

The LHWRP will construct a 7-ft (21-m) high ungulate-proof fence with no gaps at the ground, the standard for exclusion of feral ungulates (Reeser and Harry 2005; Medeiros 2011). The fence is designed to encompass the perimeter of the Kahikinui Forest Project so that it will connect the DHHL and DLNR properties resulting in the protection of the entire 8,000-acre (3,237-ha) project.

The current proposal includes 7.8 miles (13.1 km) of new fence and 1.7 miles (2.8 km) of upgrades to the existing fence. Once the fence is in place, introduced ungulates, including feral goats, pigs, axis deer, and cattle, will be removed from the Kahikinui Forest Project. These introduced ungulates browse on native vegetation and groundcover and may affect the Covered Species by trampling and collapsing petrel burrows causing nest abandonment within colonies. The soil disturbance caused by ungulates also facilitates the introduction and spread of invasive plants, which further reduces habitat suitability for the Covered Species (Reeser and Harry 2005). Ungulates also create trails in the colony that increase access for predators to active burrows. Once ungulates have been removed from within the fenced area, additional mitigation measures such as predator control and vegetation restoration can be undertaken.

Mitigation under the HCP would occur at the upper elevations of the Kahikinui Forest Project. As shown in Figure 6-1, the proposed petrel mitigation area is located southwest of Haleakalā National Park and east of the Advanced Technology Solar Telescope (ATST) observatory site.

6.2 HAWAIIAN HOARY BAT

The recovery plan for the Hawaiian hoary bat (USFWS 1998) states that bat populations can be threatened by habitat loss, pesticides, predation, and roost disturbance. The recovery criteria identified in the Hawaiian hoary bat recovery plan (USFWS 1998) list protecting and managing key roosting and foraging areas and research essential to the conservation of the subspecies as the first two actions needed for the species recovery. Based on recommendations from USFWS and DOFAW, bat mitigation will be implemented in 3 tiers: Tier 1—habitat conservation and enhancement; Tier 2—research study; and Tier 3—adaptive management to incorporate either additional habitat preservation or bat management reflecting the results of the research. Mitigation for Tiers 1 and 2 will be initiated within 30 days of the issuance of the ITP. Tier 3 mitigation will be initiated if the Tier 3 take level is triggered. Associated costs are summarized in Table 6-2.

Table 6-2. Funding Matrix for the Auwahi Wind Project[1]

	Tier, Ongoing, or One-time	Event	One-time Cost	Cost per year	Years Effort	Total	Time of Payment/Execution
General Measures	Ongoing	Wildlife Education and Incidental Reporting Program	$5,000	$1,500	24	$41,000	Prior to and throughout operations
	Ongoing	Downed Wildlife Post-Construction Monitoring and Reporting and Mitigation Monitoring	$40,000	$21,500 Year 1, $120,250 per year Years 2-3 $70,000-$95,000 per year Years 4-25	24	$1,810,000	Initiate at time of commissioning; conduct first 2 years of intense effort and then less intense effort with approval from DOFAW and USFWS over life of ITP/ITL
	Ongoing	DOFAW Compliance Monitoring	---	$10,000 per year	20	$200,000	DOFAW compliance monitoring conducted only if needed
	Subtotal General Measures					***$2,051,000***	
Hawaiian Hoary Bat	Tier 1	Retrofit fencing and restoration measures at the Waihou Mitigation Project	$522,000	---	---	$522,000	Initiate mitigation within 30 days of obtaining ITP/ITL
		Acoustic monitoring onsite	$40,000	---	---	$40,000	Years 1 and 2 of operation, may be extended additional years
	Tier 2	Monitoring/ Research	$150,000-$300,000	---		$150,000 - $300,000	Initiate by Year 2 of operation.
		Subtotal Tier 1, 2				***$712,000 - $862,000***	

Table 6-2. Funding Matrix for the Auwahi Wind Project (continued)

	Tier, Ongoing, or One-time	Event	One-time Cost	Cost per year	Years Effort	Total	Time of Payment/Execution
Hawaiian Hoary Bat (continued)	Tier 3	Additional restoration activities or research	$200,00 - 450,000	---	---	$200,000 - 450,000	Timing and amount to be determined in consultation with and approval by DOFAW and USFWS
		Subtotal Bats				***$912,000 – 1,312,000***	
	Bat Contingency Fund		$100,000	---	---	$100,000	Provide assurance of funding in the form of a letter of credit. Funds are to be used only if proposed mitigation requires additional funds to complete work identified in these tiers or if alternative mitigation strategies are deemed necessary to achieve mitigation targets.
Hawaiian Petrel	Tier 1	Burrow monitoring	$50,000	---	---	$50,000	To be completed 2012
		Predator control and burrow monitoring	$500,000	---	---	$500,000	Initiate mitigation within 30 days of obtaining ITP/ITL
		Subtotal Tier 1				***$550,000***	
	Tier 2	Predator control and burrow monitoring	---	---	---	$135,300	Years 1 and 2 after reaching net benefit for Tier 1 take.

Table 6-2. Funding Matrix for the Auwahi Wind Project (continued)

	Tier, Ongoing, or One-time	Event	One-time Cost	Cost per year	Years Effort	Total	Time of Payment/Execution
Hawaiian Petrel (continued)	Tier 3	Predator control and burrow monitoring	---	---	---	$350,000	Years 1 and 2 after reaching net benefit for Tier 2 take.
		Subtotal Petrels				***$985,300***	
	Petrel Contingency Fund		$250,000	---	---	$250,000	Provide assurance of funding in the form of a letter of credit. Funds are to be used only if proposed mitigation requires additional funds to complete work identified in these tiers or if alternative mitigation strategies are deemed necessary to achieve mitigation targets.
Nēnē	One-Time	Research or Management Funding	$25,000	---	---	$25,000	Within 60 days of obtaining ITP/ITL
Blackburn's Sphinx Moth	Two payments	Restoration of 6 acres of Dryland Forest	$144,000	---	---	$144,000	First payment within 60 days of obtaining ITP/ITL
Totals							
General						$2,051,000	
Tier 1 (including one-time and upfront mitigation covering multiple tiers)						$1,281,000	
Tier 2						$435,300	
Tier 3						$800,000	
Subtotal Tiers 1 - 3						***$2,516,300***	
Subtotal Mitigation and Monitoring						***$4,567,300***	

Table 6-2. Funding Matrix for the Auwahi Wind Project (continued)

	Tier, Ongoing, or One-time	Event	One-time Cost	Cost per year	Years Effort	Total	Time of Payment/Execution
Contingency Funds						$350,000	

Auwahi Wind is committed to funding the specific tasks used to calculate the estimated cost figures contained in this Chapter 6 and in this table, even if the actual costs of the specific tasks turns out to be different.

6.2.1 Tier 1 Mitigation

The Auwahi mitigation for bats is based on the recommendations received from USFWS and DOFAW in May 2011. USFWS and DOFAW received the results of Home Range Tools for ArcGIS®, Version 1.1 (compiled September 19, 2007) calculations based on Hawaiian hoary bat tracking data collected by USGS-BRD Wildlife Ecologist, Dr. Frank Bonaccorso. This dataset from a two-week tracking study indicated that the mean core area of rainforest habitat on the island of Hawai'i used by 14 male bats was 84.3 acres (34.1 ha) and the average size of the core area utilized by the 11 females in the dataset was 41.2 acres (16.7 ha). Foraging habitat may be a limiting factor to the recovery of the Hawaiian hoary bat (USFWS 1998). The USFWS and DOFAW recommended that upland forest habitat restoration be completed as mitigation for bat take at the rate of 84.3 ac per pair of bats (one male and one female). Current research indicates male bat core areas do not appear to overlap but female core areas may overlap with male core areas (Bonaccorso, F. 2011. pers. comm., USGS. May 3, 2011). A core area was defined as the area that incorporates 50 percent of tracked movements; therefore, the USFWS and DOFAW feel that the core area is a minimum habitat requirement for bats. Hence, in an 84.3-ac forest, USFWS has reasoned that one pair of bats may be found. Furthermore, as Hawaiian hoary bats are conservatively estimated to live 10 years, for a 20-year project like Auwahi Wind Project, up to two pairs of bats may use the 84.3-acre area. Hence, Auwahi Wind will compensate for the take of a pair of bats by restoring 40 ac. (80 ac. for a pair of bats/ 2 lifespans = 40 ac.). Because the bat habitat restoration area will be conserved, in perpetuity, by a permanent conservation easement, the USFWS supports that the project will contribute to the recovery of the species by permanently increasing Maui's Hawaiian hoary bat carrying capacity.

The Tier 1 requested take level for bats is 5 adults and 2 juveniles. To mitigate for the loss of these bats, it is necessary to determine the total number of adult bats represented by the 2 juveniles. An estimated 30 percent of juveniles survive to adulthood (based on little brown bat survival; Humphrey 1982), the 2 juveniles represent 0.6 adult bat. Thus the Tier 1 requested take level equates to 6 adult bats. Assuming a 50:50 adult sex ratio, the potential take of 6 adults would result in the take of 3 adult male and 3 adult female bats. The USFWS and DOFAW recommended restoration of 252.9 acres (102.3 ha) as mitigation for the take of these 3 adult male and 3 adult female bats. Assuming that one core area supports one bat at a given time, and assuming that the lifespan of a Hawaiian hoary bat is approximately 6 years (similar to mainland subspecies), then it could be conservatively assumed that one core area could be used by, or benefit, up to 4 male bats over the 25-year permit term. Additionally, benefits of restoration would presumably extend beyond the 25-year term of the ITP/ITL. However, Auwahi Wind recognizes that the benefits of the restoration activities may take some time, so has conservatively assumed that 2 male bats will benefit from the enhancement or preservation of each core area of habitat over the life of the Project. Based on this assumption, 126.5 acres will be restored to Hawaiian hoary bat habitat to offset Tier 1 take.

The initial joint USFWS and DOFAW bat mitigation guidance recommend mitigation occur on 'Ulupalakua Ranch or other private lands rather than state lands. However, DOFAW later revised their guidance to include mitigation on state lands. The mitigation area identified to compensate for potential take of bats by the Project occurs on the northern section of the 'Ulupalakua Ranch referred to as the Waihou Mitigation Area (Figures 6-2 and 6-3). The Waihou Mitigation Area contains degraded and remnant patches of rare, native forest ecosystems that are the focus of restoration and management, and provide suitable foraging, breeding, and roosting habitat for Hawaiian hoary bats (Erdman pers. comm. 2011; Medeiros pers. comm. 2011). This mitigation area

will provide additional benefits for Hawaiian hoary bat mitigation because it is adjacent to the Kula Forest Reserve, which currently has extensive native vegetation and bat habitat; creates a larger forested travel corridor between Kula Forest Reserve, Auwahi Forest Restoration Project, and the Kanaio Forest Reserve which can offset habitat fragmentation/genetic concerns; and has existing water sources in the form of ponds and springs that provide food for breeding and non-breeding bats. Mitigation will be conducted under an approved management plan at the Waihou Mitigation Area (see below) and will entail ungulate fencing (either by installing ungulate fencing or upgrading existing cattle fence), removing ungulates, removing or managing invasive vegetation, conducting forest restoration activities (either outplantings or natural regeneration, where appropriate. These activities will be captured in a management plan (see below). These activities would facilitate the recovery of native vegetation and reestablishment of the forest canopy while allowing for open areas for foraging within the mitigation area, ultimately contributing to the restoration of Maui's native forest ecosystem. Ulupalakua Ranch is a partner and has consented to creating and implementing the management activities in this bat mitigation area with Auwahi Wind. Auwahi Wind will ensure that the management activities described in this section are fully implemented.

In addition this mitigation area will be preserved in perpetuity by recording a conservation easement running with the land within 210 days of issuance of the ITL/ITP. Such conservation easement will preclude future development of the mitigation land and preclude any land use activities inconsistent with bat conservation (e.g., timber harvesting, forest clearing, road construction). The easement will incorporate the management plan described above, require that it be implemented, and specify the funding that will be available for such implementation. The easement grantee and the terms of the easement must be approved by the USFWS prior to recording. Ulupalakua Ranch has agreed to grant this conservation easement, and Auwahi Wind will ensure that Ulupalakua Ranch grants such conservation easement to a state or local government agency or a private non-profit organization qualified to hold conservation easements, and records such easement. Since Ulupalakua Ranch is not a party to this HCP, its failure to grant such an easement in accordance with these provisions, or the failure to record the easement within the specified time period, will be deemed to be the responsibility of Auwahi Wind, and may result in additional mitigation requirement notwithstanding Section 9.3 of this HCP, or suspension or termination of the incidental take permit.

Should a DOFAW pooled-partnership restoration funding opportunity for bat mitigation at the Kahikinui Forest Project become available during the term of this HCP, Auwahi Wind may consider contributing an agreed-upon amount to the partnership in lieu of individual bat mitigation at the Waihou Mitigation Area. If the Kahikinui-DOFAW pooled partnership mitigation option becomes a viable bat mitigation option for the Project, a conservation easement would not be required over the Waihou Areas. In addition, the timeframe may be shifted if this option was implemented while the funding mechanisms are instituted.

The following provides a summary of the management activities to occur within the mitigation area. These management activities will be incorporated in more detail into a management plan for the mitigation area which will be developed prior to construction of the vertical portions of the WTGs. The plan will describe the goals of the management plan, the current conditions, the management activities and schedule to be executed, adaptive management options, and measures of success criteria. Success criteria will be refined based on information about bat biology and vegetation restoration and may be provided in the context of species composition or reestablishment of the forest. Auwahi Wind may need to revise elements of the management plan for the mitigation area over time based on the best available information. Changes to the management activities presented

below, independent of who initiates the changes, will be made only with approval of the USFWS and DOFAW.

Tier 1 mitigation will occur within the 155-acre (62-ha) area comprised of the Cornwell Spring, Kaumaea Loko, and Duck Pond parcels of the Waihou Mitigation Area and the foraging area immediately surrounding the parcels (Table 6-3). The Cornwell Spring area is 41 acres (17 ha), the Kaumaea Loko area is 61 acres (25 ha), and the Duck Pond area is 53 acres (21 ha). Because ʻUlupalakua Ranch will be receiving some matching federal funds toward the fencing and planting of the Kaumaea Loko area, USFWS mandated that Auwahi Wind count only 50 percent of the acreage of Kaumaea Loko towards its bat mitigation. Therefore, the total acreage counted for bat mitigation is 125 acres (41 + 31 [i.e., 50 percent of 61] + 53 acres), although 155 acres (62 ha) will be put into conservation easement. Auwahi Wind will get full credit for the Kaumaea Loko parcel if ʻUlupalakua Ranch does not accept federal funding and only 125 acres will be managed at Waihou.

Additionally, Auwahi Wind assumes that the area 148 feet (45 m) outside of the conservation easements, adjacent to the mitigation parcels, will also be used as foraging areas by the hoary bats if they are maintained in pasture, as hoary bats often forage in open areas (Greenlee pers. comm. 2011). Maintenance of grazed pasture will reduce fire threat to the forest restoration area for the life of the Project. Thus, this additional foraging area will add 44 acres to the 125 acres of bat habitat required for Tier 1 mitigation.

To protect these parcels from ungulates, the existing cattle fence will be retrofitted to be ungulate-proof fencing. Retrofitting will begin within the first year of permit issuance and be completed within 2 years of permit issuance. Retrofitting the fence was selected because it is cost effective and minimizes disturbance to other resources. The Kaumaea Loko parcel will have new ungulate fencing and will not need to be retrofitted. Combined over all the parcels, this fence will result in the complete enclosure of the approximately 155-acre (62-ha) area. The fence will be inspected annually to identify any issues and to ensure its integrity throughout the life of the permit.

After the ungulate-proof fence retrofitting is completed, ungulates will be removed from within the fenced area within 2 years of fence completion. Following ungulate removal, restoration efforts will begin. A site visit was conducted in October 2011 to evaluate the existing conditions and restoration potential of each of the Waihou mitigation parcels. Based on observations made during this site visit, it is anticipated that restoration will include a combination of invasive species control, planting of native trees and shrubs, maintenance of existing forest stands, and maintenance of open foraging areas surrounding ponds. Auwahi Wind will work with ʻUlupalakua Ranch to manage the parcels to include both forested areas (through outplanting and natural regeneration) and open areas at levels and locations which will be mapped and described in detail in the management plan.

There are three general types of mitigation that would occur on Waihou; pasture, areas with some native forest, and areas with some Monterey pine. Open/pasture areas, which are dominant within Waihou, will be planted with a combination of trees and shrubs. Species chosen for plantings will depend on the location within the parcel but will likely include predominately koa, 'ohia lehua, 'a'ali'i, and kōlea lau nui, along with additional native trees and understory plantings (Appendix B includes a list of potential plants to be used). Koa is fast growing, and therefore will reach heights suitable for bat roosting in a few years, while the slower growing species such as 'ohia lehua mature. To increase stand diversity, tree plantings (spaced approximately 8 to 10 feet on center) will be interspersed with understory shrub plantings. Invasive species removal and control will also be conducted in these areas. Over time, it is anticipated that a mature forest canopy dominated by koa and 'ohia will develop in reforested areas providing suitable roosting and breeding habitat for bats. Some native

Table 6-3. Comparison of Existing Conditions and Proposed Conditions After Bat Mitigation Is Implemented

				Existing Conditions			Proposed Conditions		
Plot	**Acres – to be forested**	**Acres – potential foraging**	**Acres – total bat benefit**	**Easement**	**Fence**	**Forest Restoration Completed**	**Easement**	**Fence**	**Forest Restoration Completed**
Tier 1 Mitigation									
Cornwell Spring Area	41	9.3	50.3	Agriculture	Cattle	50% forested in koa forest, and ~20% in non-native forest (Pacific ash dominant)	Conservation (perpetuity) + assured funding for maintenance	Ungulate	Plant with native understory plants and koa and other native trees, replace Pacific ash with native trees;
Kaumaea Loko area	61	14.5	75.5	Agriculture	Cattle	~5% with native trees	Conservation (perpetuity) + assured funding for maintenance	Ungulate	Plant with native understory plants and koa and other native trees
Duck ponds	53	20	73	Agriculture	Cattle	~60% forested, dominated by Monterey pines	Conservation (perpetuity) + assured funding for maintenance	Ungulate	Plant with native understory plants and koa and other native trees
Total Tier 1	**155**	**43.8**	**198.8**						
Pu'u Makua	195	41	236	Agriculture	Cattle	~10 % forested	Conservation (perpetuity) + assured funding for maintenance	Ungulate	Plant with native understory plants and koa and other native trees
Tier 3 Total Potential Acres Available	**195**	**41**	**236**						

forest and non-native Monterey pine forest provides suitable roosting and breeding habitat for bats; therefore, the management focus in the stands will be to maintain mature trees and conduct invasive species removal where necessary. Native forest stands, particularly those with a more open overstory include patchy growth of invasive species such as ash, black wattle, and blackberry which will be removed and controlled. The Monterey pine stands typically have dense overstories which shade the understory, limiting invasive understory plant growth. However, pines continue to encroach into the adjacent open pastures; therefore, management will focus on removal of pine saplings on the peripheries of these stands to prevent further encroachment. Restoration efforts will have the added benefit of creating and enhancing habitat for native forest birds including the amakihi, Maui creeper, elepaio, and pueo which are known to occur there. The Duck Ponds parcel also includes several small ponds and will be managed. Costs for these restoration efforts were based on estimates of labor, equipment, and materials provided by the 'Ulupalakaua Ranch, LHWRP, and other research (Table 6-2). The Applicant will be responsible for ensuring the successful implementation of approved mitigation strategies. Auwahi Wind will be responsible for ensuring that the Waihou mitigation area is managed for the permit term of the project (via partnership or otherwise).

6.2.2 Tier 2 Mitigation

The Tier 2 requested take level for bats is 10 adults and 4 juveniles. To mitigate for the Tier 2 requested take level, it is necessary to determine the total number of adult bats represented by the 4 juveniles. Assuming that 30 percent of juveniles survive to adulthood (based on little brown bat survival; Humphrey 1982), the 4 juveniles represent 1 adult bat. Thus the Tier 2 requested take level equates to a total of 11 adult bats and will require mitigation for an additional 5 adult bats over the Tier 1 mitigation. Based on the USFWS and DOFAW recommendation, Auwahi Wind will fund and ensure the implementation and completion of research projects that contribute to the overall knowledge of the Hawaiian hoary bat on Maui, as described below. Auwahi Wind will initiate this research within 2 years of the issuance of the ITP regardless of take levels. This research project will be used to monitor the success of the Tier 1 mitigation.

Auwahi Wind will provide $150,000 to $300,000 for a Hawaiian hoary bat research project to provide additional data that contribute to the knowledge of the Hawaiian hoary bat on Maui. Auwahi Wind will work with a qualified bat biologist, approved by DOFAW and USFWS, to either design a radio telemetry study or other appropriate studies within the mitigation area to help evaluate bat population trends on Maui, as recommended in the Hawaiian hoary bat recovery plan. If the radio-telemetry option is chosen, it will be designed to 1) estimate male and female core areas and home ranges, 2) identify habitat associated with foraging and roosting, and 3) collect data for genetic evaluation of effective population size. Data will be collected over an approximately 4- to 8-week period after the young of the year have become independent. Data will be collected in 3 separate years. The initial year of data collection will be within 2 years of commercial operation of the wind farm and during the initial restoration efforts of the mitigation parcel. The second and third years of data collection will be at years 8 and 16 of commercial operation of the Project. This will ensure that data have been collected when the mitigation site is in different stages of vegetative development.

A formal research plan and study design will be provided to USFWS and DOFAW for review within 1 year of the issuance of the ITP. The research plan will be finalized before the initiation of the study, which will occur within 2 years after the issuance of the ITP. Research reports will be completed after each year's data collection and for the later years will include a comparison to the previous year's results. Reports will be provided to USFWS and DOFAW as part of Auwahi Wind's annual reports. If logistical or other constraints prevent the execution of the study described above,

Auwahi Wind will provide a total of $150,000 to $300,000 towards a different applied research study, as agreed upon by USFWS and DOFAW.

6.2.3 Tier 3 Mitigation

Given the lack of bat roosting habitat on the project site, the monitoring data from another Maui wind project, and Auwahi Wind's anticipated night-time curtailment, it is expected that Tier 3 is very unlikely to be triggered. However, due to Auwahi Wind's cautious approach and the uncertainty associated with estimating bat fatalities, Auwahi Wind has included this third tier of take and mitigation out of an abundance of caution.

As discussed in Section 6.2.5 below, mitigation levels were established based upon a 24-hour operation of the wind farm for the life of the Project, though such operation will not take place. Instead, the WTGs are expected to be curtailed (turned off) during times when bats are expected to be active. As a result, the likelihood of triggering Tier 3 is low. Thus, Auwahi Wind has taken a conservative approach.

The Tier 3 requested take level is 19 adults and 8 young. To mitigate for the loss of these bats, it is necessary to determine the total number of adult bats represented by the 8 juveniles. Assuming that 30 percent of juveniles survive to adulthood (based on little brown bat survival; Humphrey 1982) the 8 juveniles represent 2 adult bats. Thus, the Tier 3 requested take level equates to a total of 21 adult bats, requiring mitigation for an additional 10 adult bats over the Tier 2 level. Should the Tier 3 mitigation be required, Auwahi Wind will use the results of the research conducted to date in Tier 2 and data from other applicable studies to identify appropriate mitigation measures to be implemented potentially including the restoration of forest habitat using native species.

In the unlikely event that Tier 3 take is reached and Tier 3 mitigation triggered, Auwahi Wind will focus mitigation efforts on one or more alternate mitigation sites and/or additional research in consultation with and subject to the approval of the USFWS and DOFAW. Selection of site and mitigation focus will depend on agency recommendation and timing, such that mitigation activities will integrate with and enhance ongoing management actions at the selected site. The Waihou Mitigation Area, the Kahikinui Forest Project, and the Auwahi Forest Restoration Project will serve as potential Tier 3 mitigation sites for bat mitigation. Within the Waihou Mitigation Area (first priority), Auwahi Wind has the option to expand the fenced portion to include all or part of the 195–acre (79-ha) Pu'u Makua area to be placed in a permanent conservation easement. This parcel would include up to 41 acres (16.6 ha) of adjacent bat foraging area. Furthermore, should DOFAW establish a pooled-partnership for bat mitigation at the Kahikinui Forest Project or another appropriate bat mitigation site during the term of this HCP, Auwahi Wind will consider this as a possible mitigation option in lieu of some or all of the mitigation described above, subject to approval by DOFAW and USFWS.

Auwahi Wind would ensure adequate funding is available when Tier 3 mitigation is triggered to implement appropriate Tier 3 bat management measures such as habitat enhancement, restoration, monitoring, or additional research as determined to be appropriate in consultation with USFWS and DOFAW. The mitigation program identified to be appropriate for Tier 3 as agreed upon by Auwahi Wind, USFWS, and DOFAW will be initiated within 30 days of that agreement.

6.2.4 Contingency Funds

Auwahi Wind will establish a $100,000 cost overrun contingency fund for the Hawaiian hoary bat for the mitigation described for Tiers 1–3. This fund will ensure the described mitigation will be implemented should actual costs be higher than estimated. The funding of this contingency fund will be assured through the letter of credit described in Section 9.4.

6.2.5 Net Benefit

The Waihou Mitigation Area is a long-term effort that, among other goals, provides immediate protection for bat foraging and roosting habitat. Additionally, the mitigation project would reestablish naturally regenerating native forests on Maui. Auwahi Wind's contributions to and efforts in support of the Waihou Mitigation Area would create, protect, and enhance suitable habitat for Hawaiian hoary bats over the life of the Project. A net benefit to the species will be realized by these mitigation efforts in two ways: one, the projected benefit to 21 adult bats does not account for young produced by the bats using the restored and protected habitat; and, two, the protected habitat would continue to be used by adult bats and their offspring beyond the term of the ITP/ITL.

The net benefits provided by the Waihou Mitigation Area include the following:

- Immediate protection for bat foraging/roosting habitat,
- Creation of a forest/grazing (i.e., forest/open area) interface for preferred bat foraging areas both within and adjacent to the mitigation area,
- Creation of additional roost trees, maternity trees, foraging areas,
- Increased site stability, particularly in drought years, due to diversity of native plants adapted to drought conditions,
- Increased insect diversity due to increased plant diversity, more abundant and stable food resources, and
- Protection of springs and other water sources for water and food requirements.

Furthermore, the assessment of potential impacts (Section 5.1) assumes that all WTGs will operate continuously (24 hours a day, 7 days a week), and the proposed mitigation measures are based on those potential impacts. However, the WTGs are expected to be curtailed (turned off) on a regular basis between approximately 23:00 hrs and 06:00 hrs (29 percent of a 24-hour day) due to the low demand for power from MECO during that time period. This time period overlaps the portion of the day during which bats are likely to be the most active. As a result, the actual amount of take caused by the WTGs will likely be significantly less than estimated in this HCP. Since Auwahi Wind has not reduced its estimates of bat mortality or the associated mitigation based on this curtailment, Auwahi Wind will, in effect, be over-estimating take and thus associated mitigation for bats. This further ensures that the mitigation provided in this HCP will result in a net benefit to the Hawaiian hoary bat.

6.2.6 Measures of Success

Bat mitigation efforts will be considered successful if:

- After 6 years, mitigation fencing is completed and ungulates have been removed from within the fenced area, and over the 25-year permit term the fence is maintained and the area is kept free of ungulates.
- After 25 years, the cover of invasive species (excluding kikuyu grass) in the managed areas is less than 50 percent.
- After 25 years, reforested areas within the Waihou mitigation area have greater than 50 percent cover dominated by native woody species (particularly koa and ohia). According to Wagner et al. (1999), mature koa/'ohia montane mesic forests "consist of open-to-closed uneven canopy of 35 m tall koa emergent above 25 m tall ohia."

- The bat research plan is finalized and the study is initiated within 2 years of the issuance of the ITP/ITL.
- Radio-transmitter monitoring (or other measures as appropriate) is conducted in three separate years to detect changes in bat use and home range core area size as the site is restored.

6.3 HAWAIIAN PETREL

The primary limiting factors for the Hawaiian petrel population on Maui include predation by introduced animals and habitat degradation and disturbance at breeding colonies (Carlile et al. 2003). Therefore, in keeping with the USFWS' Recovery Plan and to mitigate its unavoidable impacts, Auwahi Wind will conduct habitat management and predator control at a confirmed Hawaiian petrel breeding colony, in order to improve reproductive success. As discussed below, Auwahi Wind has determined the number of active petrel burrows it must manage to achieve the required mitigation and net benefit requirements. Having already confirmed through an initial survey in April 2011 that Hawaiian petrels are breeding within the Kahikinui Forest Project, and through more detailed surveys in June/July 2011 that this parcel contains the required number of burrows to mitigate for Project-related take (see population modeling discussion in Section 6.3.3), the next step will be to conduct a baseline surveys during the spring/summer of 2012 to delineate the boundaries of the breeding colony area to be managed. This will be followed by implementing management activities to remove predators and improve breeding success.

The activities proposed here would benefit the petrels in multiple ways. First, the surveys will provide information about the number and location of petrel burrows within the previously unsurveyed Kahikinui Forest Project, thereby providing important information about the distribution of petrels on Maui. Second, predator management will increase survival and reproduction of petrels, thus changing the population growth rate and the probability that the species will move toward recovery. Third, anecdotal evidence from Haleakalā National Park indicates that when predator and ungulate control is implemented, the population appears to increase. The following sections describe the surveys that have been conducted to date, modeling of predator control benefits, and next steps.

6.3.1 Survey Activities

6.3.1.1 Spring 2011 Reconnaissance Surveys

Auwahi Wind conducted an initial 2-day reconnaissance survey of the Kahikinui Forest Project in April 2011. The purposes of this survey, which was knowingly conducted prior to the start of petrel nesting activity, were to determine 1) whether petrel nesting is occurring in the Kahikinui Forest Project (something that has been suspected but never previously verified); 2) identify general areas within the Kahikinui Forest Project where petrel burrows are located; and 3) identify specific burrows with active or old signs of petrel use. The reconnaissance survey confirmed that petrels are nesting in the Kahikinui Forest Project; surveyors identified 20 burrows with active or old sign of petrel use (e.g., droppings, egg shell fragments, feathers, or tracks) and an additional 10 burrows without obvious petrel sign (Figure 6-5).

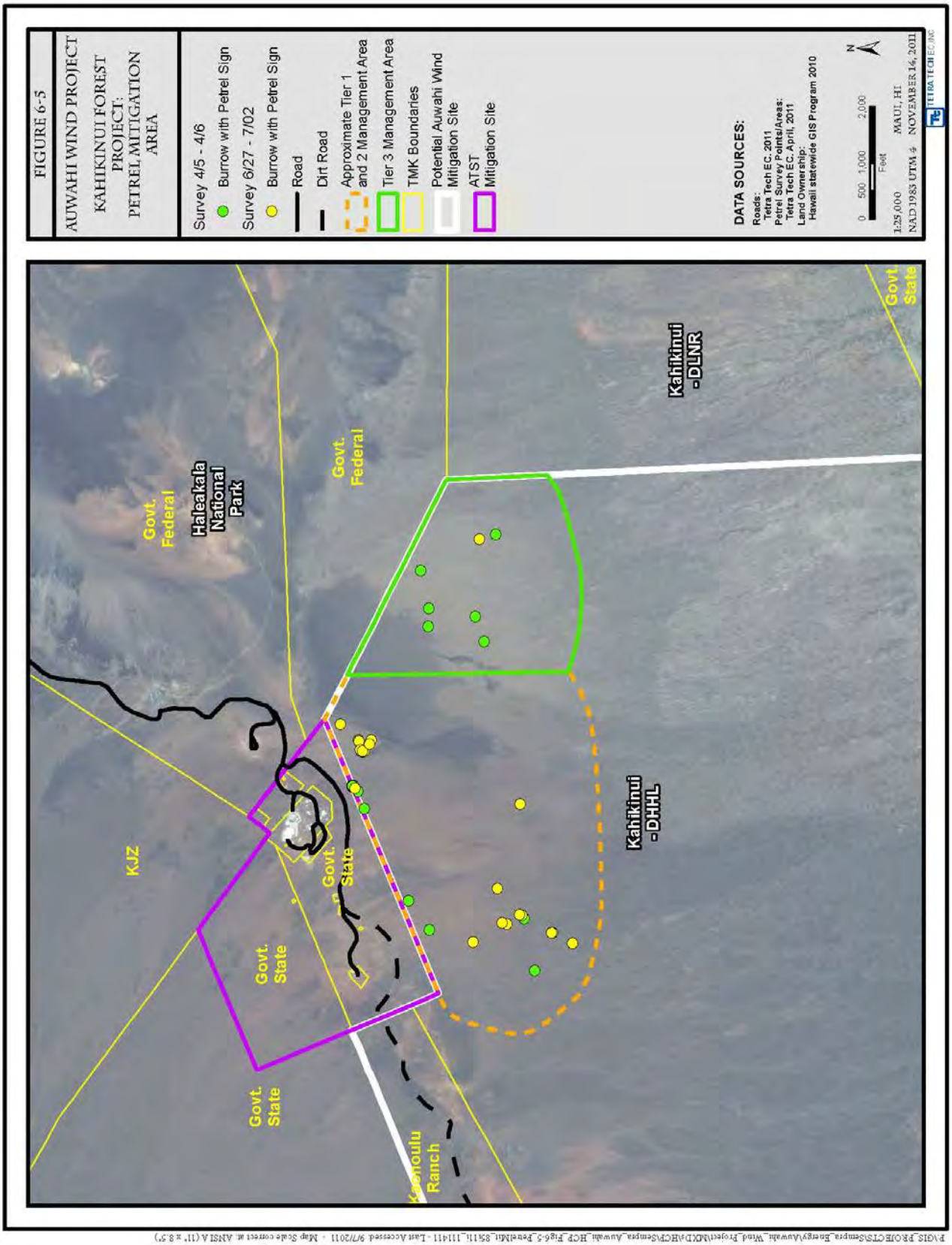
FIGURE 6-5
AUWAHI WIND PROJECT
KAHIKINUI FOREST PROJECT: PETREL MITIGATION AREA
Survey 4/5 - 4/6
Burrow with Petrel Sign
Survey 6/27 - 7/02
Burrow with Petrel Sign
Road
Dirt Road
Approximate Tier 1 and 2 Management Area
Tier 3 Management Area
TMK Boundaries
Potential Auwahi Wind Mitigation Site
ATST Mitigation Site
DATA SOURCES:
Roads:
Tetra Tech EC. 2011
Petrel Survey Points/Areas:
Tetra Tech EC. April, 2011
Land Ownership:
Hawaii statewide GIS Program 2010
0 500 1,000 2,000
Feet
1:25,000
NAD 1983 UTM 4
MAUI, HI
NOVEMBER 16, 2011
TETRA TECH EC INC
Govt. Federal
Haleakala National Park
Govt. Federal
Kahikinui -DLNR
Govt. State
KJZ
Govt. State
Govt. State
Govt. State
Kahikinui -DHHL
Kaonoulu Ranch

6.3.1.2 Summer 2011 Focused Surveys

Auwahi Wind conducted focused petrel surveys in the Kahikinui Forest Project during the summer period when petrels had returned to the breeding colony, enabling Auwahi Wind to verify the location of currently active petrel burrows. Surveys were conducted from June 27 to July 2, 2011, by systematically surveying potential petrel breeding areas by spacing surveyors 5-15 m apart, depending on the terrain. All the petrel burrows found in April were relocated and checked for breeding status during these surveys. A total of 44 burrows with petrel sign were located during the surveys, 20 burrows during the April surveys and 24 additional burrows were found during the June/July surveys (Figure 6-5). Thirty-three of the burrows had petrel sign from 2011 (Figure 6-5). Sign of predators and depredation seen during the surveys including two dead adult petrels outside of a burrow, feral cat scat containing eggshells, and rat remains and feces. This assists Auwahi Wind in identifying an area within the Kahikinui Forest Project that contains a sufficient number of currently active burrows that can effectively be managed to improve breeding success.

6.3.2 Predicting the Effects of Predator Control

A deterministic matrix model was used to model how the changes in vital rates due to predator control impact the population growth rate. This simple model is commonly used in population ecology to calculate the population growth rate (i.e., lambda) using stage-specific information on survival and reproduction. A lambda value of 1 indicates a stable population, less than 1 a declining population, and greater than 1 an increasing population.

Auwahi Wind created a 7-stage matrix model where stage 1 represents the young that survive their first year, stages 2 through 6 represent non-breeding juveniles, and stage 7 represents breeding adults (Figure 6-6).

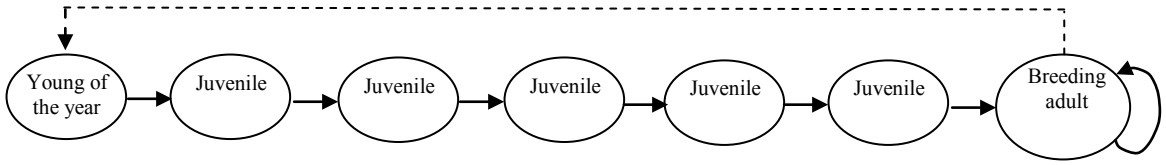

Figure 6-6. Visualization of a Hawaiian Petrel Matrix Model

Note: Solid arrows represent survival between and within stages and the dashed arrow represents reproduction.

Auwahi Wind used demographic values provided by the USFWS (Greenlee pers. comm. 2011; based on Simons 1984) to represent vital rates under baseline conditions and when petrels are protected by varying levels of predator control (Table 6-4). The primary assumption underlying these demographic scenarios is that predator trapping alone does not result in a self-sustaining population; however, data from the NPS (Haleakalā National Park, unpublished data) suggests that a predator control campaign consisting of predator trapping (without predator exclusion fencing) can contribute to a self-sustaining Hawaiian petrel population.

Table 6-4. Vital Rates used in the Population Model for Current Condition and Anticipated Conditions Under Predator Control and the Associated Population Growth Rate (Lambda)

	Survival – Breeding Adults	Survival – Juvenile	Fledglings per Female	Female Fledgling per female	Lambda
Moderate predation (No predator control)	0.850	0.8034	0.55	0.245	0.933
Mild predation (Predator trapping)	0.900	0.8034	0.60	0.300	0.978
Minimal predation (Predator exclusion fencing + trapping)	0.930	0.8034	0.72	0.360	1.009

6.3.3 Estimation of Predator Control Benefits

Auwahi Wind evaluated population and net benefit projections under scenarios with and without predator control as followings:

1. **Estimate the starting size of the breeding population (i.e., population at time T):** Auwahi Wind first estimated the number of active burrows that might be found on the mitigation sites and then adjusted this number to reflect the number of breeding pairs. The number of breeding pairs is equal to the number of breeding females, which is the starting size of the breeding population.
2. **Estimate population size of the breeding population over the Project's operation period of 20 years (i.e., population size at time T+1):** For the first year, Auwahi Wind took the starting size of the breeding population and multiplied it by lambda to generate the breeding population size in the following year (T+1). For each subsequent year, Auwahi Wind took the breeding population size in each subsequent year and multiplied it by lambda.
3. **Calculate size of adult population (breeders + nonbreeders) at a colony:** After the population management period, the population of active breeders is adjusted upwards to account for the observation that, in any given year, 25% of the adult population at a colony does not breed (Simons 1984).
4. **Evaluate success of predator control program:** At the end of the 20-year projections (i.e., the duration of the Kahikinui mitigation program proposed in this HCP), the relative benefit of a given predator control program is assessed by taking the difference in the number of adults in the unmanaged population versus to two predator control scenarios.

Based on the preliminary assessments of burrow availability and activity at Kahikinui (Sections 6.3.1.1 and 6.3.1.2), Tetra Tech performed an iterative series of analyses for a population of 25 breeding pairs (33 active burrows) and 33 breeding pairs (44 active burrows) (Table 6-5a). If the proposed predator control strategy (Section 6.3.5) achieves the Mild Predation scenario, the realized benefit after 20 years is projected to range between 26 and 34 adult petrels (Table 6-5a) thereby mitigating take at both the Tier 1 and Tier 2 levels. If the proposed predator control strategy (Section 6.3.5) achieves the Minimal Predation scenario, the realized benefit after 20 years is projected to range between 61 and 81 adult petrels (Table 6-5a), thereby mitigating take at all three predicted levels. Although adult petrels serve as the benchmark for mitigation benefits, juvenile birds will also benefit.

Table 6-5a. Population and Net Benefit Projections for Three Predator Control Scenarios at Kahikinui

	33 Active Burrows			44 Active Burrows		
	Moderate Predation	**Mild Predation**	**Minimal Predation**	**Moderate Predation**	**Mild Predation**	**Minimal Predation**
Number of active burrows	33	33	33	44	44	44
% of active burrow with breeding pairs	75	75	75	75	75	75
# of breeding females	24.8	24.8	24.8	33	33	33
Year 1	24.8	24.8	24.8	33	33	33
Year 2	23.1	24.2	25.0	30.8	32.3	33.3
Year 3	21.5	23.7	25.2	28.7	31.6	33.6
Year 4	20.1	23.2	25.4	26.8	30.9	33.9
Year 5	18.8	22.6	25.7	25.0	30.2	34.2
Year 6	17.5	22.1	25.9	23.3	29.5	34.5
Year 7	16.3	21.7	26.1	21.8	28.9	34.8
Year 8	15.2	21.2	26.4	20.3	28.2	35.1
Year 9	14.2	20.7	26.6	18.9	27.6	35.5
Year 10	13.3	20.3	26.8	17.7	27.0	35.8
Year 11	12.4	19.8	27.1	16.5	26.4	36.1
Year 12	11.5	19.4	27.3	15.4	25.8	36.4
Year 13	10.8	19.0	27.6	14.4	25.3	36.7
Year 14	10.0	18.5	27.8	13.4	24.7	37.1
Year 15	9.4	18.1	28.1	12.5	24.2	37.4
Year 16	8.7	17.7	28.3	11.7	23.6	37.7
Year 17	8.2	17.3	28.6	10.9	23.1	38.1
Year 18	7.6	17.0	28.8	10.2	22.6	38.4
Year 19	7.1	16.6	29.1	9.5	22.1	38.8
Year 20	6.6	16.2	29.3	8.8	21.6	39.1
Number of Breeding Adults after 20 years	13.3	32.4	58.7	17.7	43.2	78.2
Total number of adults after 20 years	17.7	43.2	78.2	23.6	57.7	104.3
Benefit from Moderate to Mild	25.6			34.1		
Benefit from Moderate to Minimal	60.6			80.8		

If the predator control of additional burrows is needed to achieve the necessary mitigation (i.e., the proposed predator control methods at Kahikinui only achieve a Mild Predation scenario or if additional mitigation is required to meet Tier 3 obligations), Auwahi Wind will assume management of additional burrows at Kahikinui and/or the ATST mitigation parcel after their mitigation responsibilities have been met (ATST 2010). The ATST site (Figure 6-1) is located on the leeward slope of Haleakalā adjacent to the Kahikinui Forest Project parcel and currently supports 74 active burrows (Greenlee pers. comm. 2011) as described below. Based on the assumption that the currently planned predator control activities at ATST will achieve a Mild Predation scenario, the USFWS estimates that 45 actively breeding pairs will reside at the ATST site at the time when Auwahi Wind would assume ATST site management. If the proposed predator control strategy

(Section 6.3.5) achieves the Mild Predation scenario, the realized benefit after an additional 10 years is projected to be 34 adult petrels (Table 6-5b). If the proposed predator control strategy (Section 6.3.5) achieves the Minimal Predation scenario, the realized benefit after an additional 10 years is 66 adult petrels, (Table 6-5b). If either worst-case scenario occurs (i.e., the proposed predator control only achieves a Mild Predation demographic condition or Tier 3 take occurs), Auwahi Wind's commitment to mitigation at both Kahikinui and ATST (if necessary) ensures with the addition (if necessary) ensures with an additional two years of predator control at either Kahikinui or ATST (if necessary as indicated by the population modeling) that all take will be appropriately mitigated.

As described in the ATST HCP, the approximately 328-acre (133-ha) ATST mitigation area surrounding the Haleakalā Observatories, adjacent to the western perimeter of Haleakalā National Park, will be managed by the National Science Foundation to compensate for impacts to the Hawaiian petrel. The ATST mitigation area will be fenced with ungulate-proof fence, ungulates will be removed from within the fence line, and predator control and monitoring efforts will be completed. Predator control conducted under the ATST HCP will consist of short-term cat trapping and rodent control conducted around the petrel colony (ATST 2010). Predator trapping will involve placement of traps within and adjacent to the colony. The placement of traps would be based on topography, access, and the location of burrows, to avoid disturbance or other adverse impacts to petrels. In addition to cat trapping, the NSF will also install and maintain a rodent control grid within and adjacent to the petrel colony for the 50-year life of the ATST project (ATST 2010).

Burrow monitoring under the ATST HCP will be conducted in accordance with "Standard Operating Procedure for Surveying Uau Burrows" (Hodges 1994, pp. 14-18) and Hodges (2001, p. 311), currently implemented at Haleakalā National Park. Petrel burrows within the mitigation area plus will be monitored at least twice per month for direct and indirect signs of activity and fledging, based on standard definitions provided in the above referenced document. The ATST HCP assumes that with the implementation of these mitigation measures a net benefit for petrel take under the associated ITP/ITL will be reached 6 to 10 years after construction. At that point, the ATST project would no longer be required to continue predator trapping and burrow monitoring efforts. Under this alternative scenario Auwahi Wind would take over these mitigation activities at the ATST site once a net mitigation benefit for that project has been reached. This alterative could be implemented if Tier 3 mitigation is required. The duration of ongoing maintenance and monitoring would be determined based on the level of mitigation required in coordination with the USFWS and DOFAW.

Table 6-5b. Population and Net Benefit Projections for Three Predator Control Scenarios at ATST

	Moderate Predation	Mild Predation	Minimal Predation
Year 11	45.0	45.0	45.0
Year 12	42.0	44.0	45.4
Year 13	39.2	43.0	45.8
Year 14	36.5	42.1	46.2
Year 15	34.1	41.2	46.6
Year 16	31.8	40.3	47.1
Year 17	29.7	39.4	47.5
Year 18	27.7	38.5	47.9

Table 6-5b. Population and Net Benefit Projections for Three Predator Control Scenarios at ATST (continued)

	Moderate Predation	Mild Predation	Minimal Predation
Year 19	25.8	37.7	48.3
Year 20	24.1	36.8	48.8
Number of Breeding Adults after 20 years	48.2	73.7	97.6
Total number of adults after 20 years	64.3	98.2	130.1
Benefit from Moderate to Mild	33.9		
Benefit from Moderate to Minimal	65.8		

6.3.4 Immigration

All population models rely on key assumptions. In the population projections based on the deterministic matrix models, Auwahi Wind assumed that the mitigated population was closed (i.e., no emigration or immigration) in order to calculate lambda. However, given the active Haleakalā National Park population adjacent to this population, this assumption is likely to be violated, as has been found in other seabird populations experiencing cat predation (Bonnaud et al. 2009). Therefore, our estimate is likely to be conservative because petrels may "wander" or "prospect," visiting a number of potential breeding sites, including established colonies, former breeding sites, and uncolonized sites. The presence of breeding birds has shown to be one of the strongest indicators that a potential breeding site is both safe and productive (Podolsky and Kress 1989). Thus, assuming that the managed Haleakalā breeding population serves as a source population for peripheral breeding colonies, it is likely that pre-breeders from Haleakalā may prospect and ultimately be recruited to the Kahikinui Forest Project colony and vice versa.

Predator control would both protect and enhance the existing colony at the Kahikinui Forest Project, and therefore immigration into and out of the population over time would likely increase over the term of the ITP/ITL.

6.3.5 Breeding Colony Habitat Management and Predator Control

Predator control has a positive impact on the survival of adult and young petrels and can be accomplished through trapping or installation of predator-proof fencing. Even an individual predator can be extremely destructive to a population of colony-nesting seabirds given the long lifespan, low annual productivity, and other reproductive characteristics of these species which make the replacement of depredated adults a slow process (Simons 1984, 1985). Predation accounted for approximately 41 percent of all bird and egg fatalities documented between 1961 and 1996 in Haleakalā National Park (Hodges and Nagata 2001). Similarly, annual monitoring of nests at Haleakalā National Park has shown that predation by cats and mongooses causes more than 60 percent of all egg and chick mortality in some years (Simons 1998 as cited in Carlile et al. 2003). Rats also prey upon Hawaiian petrels and their eggs. Predator removal has been shown to both improve petrel nesting activity and nesting success, as well as adult survival (Hodges and Nagata 2001). Current data from Haleakalā National Park suggest that a predator trapping and ungulate removal regime (in the absence of predator exclusion fencing) can contribute to a self-sustaining petrel population (Haleakalā National Park, unpublished data).

Initially, options considered for predator control at Kahikinui included the installation of a predator-proof fence and/or predator trapping. Based on a site visit conducted in October 2011 with recognized predator-fence and vertebrate pest control expert Steve Sawyer of Ecoworks , it was

determined that construction of a predator-proof fence is not a viable option for Kahikinui due to the substrates present and the extreme weather conditions at the site (Sawyer, pers. comm. 2011). The substrates, which range from basalt lava to light, highly mobile ash and small rocks, would not provide a solid, secure foundation to hold the structural integrity of the fence. Installation of the fence may require blasting or more extensive excavation with heavy machinery. Additionally, a higher level fence maintenance would be required to ensure fence integrity because of the potential for damage due to the accumulation of light materials on the fenceline and weather events. Thus, mitigation at Kahikinui will be based on predator trapping. If over the 20 year management period, advances in predator fence technology result in the availability of a fence suitable for Kahikinui installation of such a fence may be considered, in consultation with, and approval by USFWS and DOFAW, for tier 3 mitigation.

A detailed predator trapping and monitoring regime will be outlined in a separate petrel management plan which Auwahi Wind is currently developing, and which USFWS and DOFAW will promptly review and (following incorporation of any necessary changes) approve, prior to the construction of the vertical portions of the WTGs. The plan will be based on the known spatial distribution of the petrel burrows within the management area. The management plan will describe the type of mitigation methods to be used, the timing of mitigation efforts (e.g., trapping and monitoring), the spatial arrangement of the traps, and other logistics associated with implementing mitigation activities (i.e., costs, topographical challenges, weather-related concerns, cultural and archaeological resources concerns, access, and visual concerns). Trapping and monitoring protocols will be consistent with protocols established by the NPS for managing the Haleakalā National Park colony (Bailey pers. comm. 2010; Hodges and Nagata 2001), and will also take into consideration recommendations of other recognized experts in seabird colony management including Ecoworks. Though the likelihood of capturing petrels in traps is very low, Auwahi Wind will also work with DOFAW and the USFWS to develop guidelines for the care, rehabilitation, and release of any captured Hawaiian petrels. Auwahi Wind may need to revise elements of the management plan for the mitigation area over time based on the best available information. Changes to the management activities will be made with approval of the USFWS and DOFAW and updates will be provided as part of the annual report.

As previously identified, Auwahi Wind will conduct post-construction fatality monitoring to assess take of Covered Species. If it is apparent that the take levels specified for Tiers 1 or 2 are likely to be exceeded, Auwahi Wind will begin implementing the next tier of mitigation prior to reaching that next take level. For example, if it appears likely that the Tier 1 take level will be exceeded, Auwahi Wind will begin implementing the Tier 2 mitigation measures prior to reaching the Tier 1 take limit.

Auwahi Wind will initiate predator control on the parcel of the Kahikinui Forest Project that contains the required number of burrows for both Tier 1 and Tier 2 to ensure a net benefit, as demonstrated by the population projection, and may include Tier 3 depending on burrow distribution. All burrows identified in the 2011 petrel survey will be available for the Auwahi Project. Trapping will be conducted for 20 years unless results indicate trapping is no longer required for this population. The benefits of trapping are likely to carry beyond the trapping period because of the time delay before additional cats and mongoose move into the area (Bailey pers. comm. 2010). The timeline for implementing petrel mitigation is outlined in Table 6-6.

6.3.6 Monitoring

Burrows will be monitored following NPS methods. Auwahi Wind will evaluate the number of active burrows and reproductive success on their mitigation parcel. Monitoring will occur annually for the first 3 years. An additional 5 years of monitoring will occur at certain points during the life

Table 6-6. Estimated Petrel Mitigation Timeline

Date	Event
Summer 2011	Petrel burrow surveys
Fall 2011	Identify management area and predator control method
March 2012	Project construction initiated
Spring/Summer 2012	Comprehensive burrow survey
December 2012	Project in commercial operation
Fall 2012 (or prior to vertical construction of WTGs)	Finalize petrel management plan
Winter 2012-2031	Initiate and execute predator management and monitoring

of the mitigation. Actual survey years will depend on information gathered from the initial 3 years and other information gained about petrel biology.

Measured rates of reproductive effort, reproductive success, and adult and juvenile survival at Kahikinui will be compared to vital rates measured at the ATST petrel mitigation control site, pursuant to USFWS request. The National Science Foundation has proposed six years of monitoring at 30 active burrows within this control site which is also located on Haleakalā. This comparison will provide a measure of fledglings and adults accrued. Fledglings accrued will be the net increase in pair productivity of petrels over that of baseline productivity estimates for petrels under unmanaged conditions. Likewise, the adults accrued will be the difference in adult survival rates at the managed site (Kahikinui) over that under unmanaged conditions. Reproductive effort, reproductive success, and juvenile and adult survival rates agreed to by the Agencies may be used in place of control site monitoring data.

6.3.7 Net Benefit

The Kahikinui Forest Project is a long-term effort that, among other goals, seeks to protect and enhance existing petrel colonies and to create and restore petrel habitat on Maui. Through the implementation of predator control measures within the Kahikinui Forest Project, (and, if necessary, the ATST site), Auwahi Wind's mitigation strategy is projected to produce/protect enough petrels within the 20 years of mitigation to offset potential take. Therefore, the overall numbers of Hawaiian petrels will not be reduced as a result of the Project. Predator control will increase survival and reproductive success of the Hawaiian petrel occupying the mitigation site relative to levels that would have occurred in the absence of the mitigation action. In ideal situations, the benefits of the proposed mitigation efforts (e.g., enhanced petrel reproductive success) would be compared to the conditions at a control site. In order for a control site to provide adequate and appropriate baseline data for comparison, the following conditions need to be met: the control site must currently experience the same environmental and biological conditions as the mitigation site (e.g., the same predation pressures); the control site's petrel population needs to have a similar demographic make-up (e.g., age structure) as the mitigation site; and, the control site must not receive any mitigation support over the time period of comparison to the mitigation site (i.e., the control site must remain unmanaged for the duration of Auwahi Wind's period of responsibility). Given that the first two conditions will be difficult to meet on Maui and that meeting the third condition will hamper the recovery of the species at the control site, Auwahi Wind concluded that the best solution is to assess the benefits of the proposed mitigation comparing, based on monitoring results, differences between reproductive success and survival at the mitigation site and the baseline conditions provided in the peer-reviewed literature (Tables 6-5a and b). In order to test the assumption that the baseline conditions presented in this HCP are representative of local

conditions, Auwahi Wind will compare the results of monitoring at the ATST control site to the baseline population model parameters for the duration of the ATST monitoring. If the conditions at the ATST site differ from the assumptions of the baseline population model, Auwahi Wind will adjust their mitigation targets accordingly, in consultation with DOFAW and USFWS.

A net benefit to the species will be realized by these mitigation efforts because new immigrating adults recruiting into the focal colony will more likely produce offspring than they would in non-managed areas. Additional net benefit to the species will be realized by these mitigation efforts because new immigrating adults recruiting into the focal colony will be producing offspring in this protected environment that have not been accounted for in the population projections. In addition, components of the mitigation efforts (e.g., installation of predator-proof fencing and predator eradication) may continue to benefit the focal colony beyond the term of the ITP/ITL. Finally, the assessment of potential impacts (Section 5.2) assumes that all WTGs will operate continuously (24 hours a day, 7 days a week), and the proposed mitigation measures are based on the potential impacts resulting from these operational considerations. However, the WTGs are expected to be curtailed (turned off) on a regular basis between approximately 23:00 and 06:00 hrs (or 29 percent of a 24-hour day) due to the low demand for power from MECO during that time period. This time period partially overlaps with the timing of peak petrel movement activity through the Project (Hamer 2010a). As a result, the actual amount of take caused by the WTGs likely will be less than estimated in this HCP. Auwahi Wind has not adjusted projected take to account for this reduction in operational activity; rather, the predicted curtailment is presented as support for the notion that the estimated take represents a worst-case scenario and that the probability of triggering Tier 3 take and mitigation is low.

6.3.8 Measures of Success

Petrel mitigation will be considered successful if:

- Predator control is implemented
- Predator control methods are successful in capturing predators.
- Mitigation efforts result in one more fledgling or adult than that required to compensate for the requested take of the required tier (see monitoring discussion above in Section 6.3.6).

6.3.9 Costs

Costs and estimated time of payment for the petrel mitigation measures described above are provided in Table 6-2. Costs for predator control and monitoring were based on conducting these activities for an approximately 300-600 -acre (81-121 ha) parcel. Ultimately the location and configuration of the trapping grid will depend on the distribution of burrows within the colony, topographic and substrate characteristics of the site, and other logistics with the objective being to avoid any adverse impacts to the colony. Monitoring costs were based on parameters provided by the LHWRP, NPS, and Ecoworks. Once the required net benefit is achieved for each tier outlined above, Auwahi Wind will be deemed to have fulfilled mitigation requirements for the Hawaiian petrel. Auwahi Wind Project's predator control measures will continue for the duration of the 20-year petrel mitigation period unless monitoring indicates the frequency can be reduced. Any changes would require the approval of DOFAW and USFWS.

6.3.10 Contingencies

In the event that measured benefits at the Kakininui Forest Project are not enough to cover take under Tiers 2 or 3, should these levels be triggered, Auwahi Wind will focus mitigation efforts on

one or more of the alternate mitigation sites described below, in consultation with the USFWS and DOFAW (Sections 6.3.10.1-6.3.10.3; Figure 6-1). Selection of site and mitigation focus will depend on agency recommendations and timing, such that Auwahi Wind mitigation activities will integrate with and enhance ongoing management actions at the selected site. Selection of a contingency mitigation site will be determined in conjunction with finalization of the petrel management plan. Should mitigation at a contingency site be needed by Auwahi Wind later in the permit term, the contingency sites and activities described below will be considered if they are still available and are not committed to another entity for mitigation at that time. If a contingency site is not available, the Applicant will request a permit amendment to cover an additional site.

6.3.10.1 Additional Management Activities at the Kahikinui Forest Project

If additional mitigation is required for Tier 3, Auwahi Wind will consider implementing rodent control at the Kahikinui Forest Project in order to increase the reproductive success of the petrels, thereby reducing the number of active burrows required for mitigation. Under this contingency, approximately $50,000 would be provided at the colony for rodent control. Subsequent years of rodent control use may be needed to achieve mitigation targets and the net benefit to the species.

6.3.10.2 Haleakalā National Park

Another alternative for petrel mitigation would be to provide funding or assist the NPS with management and monitoring efforts of the Hawaiian petrel colony in the crater or another more remote location within Haleakalā National Park (Figure 6-1). One area that has been identified as a potential predator control location is along the southern rim of the crater (Bailey pers. comm. 2010). Under this option, Auwahi Wind would contribute funds toward or assist with implementing predator control and monitoring. Currently predator control efforts include established trap lines that are managed along the edges of colonies, the entrance road, and gulches where predators may potentially travel. Trapping and monitoring protocols will follow the protocols that have already been established by the NPS for managing the colony and being implemented (Hodges and Nagata 2001; Bailey pers. comm. 2010 and 2011). Annual costs are assumed to be comparable to those established for the Kahikinui Forest Project.

6.3.10.3 DOFAW Pooled Partnership Funding

Should a DOFAW pooled-partnership restoration funding opportunity for petrel mitigation at the Kahikinui Forest Project become available during the term of this HCP, Auwahi Wind may consider contributing an agreed-upon amount to the partnership in lieu of individual petrel mitigation at the Kahikinui Forest Project.

6.3.11 Contingency Funds

Auwahi Wind will establish a $250,000 cost overrun contingency fund for the petrel for the mitigtion described for Tiers 1–3, if needed, to ensure the funds are available should actual costs be higher than estimated here. The funding of this contingency fund will be assured through the letter of credit described in Section 9.4.

6.4 NĒNĒ

The recovery plan for nēnē (USFWS 2004) lists protection and management of habitat, predator control, research, establishment of additional populations, captive breeding, and outreach and education as recovery actions needed to address these limiting factors. Therefore, as recommended by USFWS and DOFAW, Auwahi Wind will contribute $25,000 to Haleakalā National Park (Park) to build a rescue pen and predator fence to support egg and gosling (and adult) rescue at the Park.

Nēnē are particularly vulnerable to predation during nesting and before the goslings fledge and the nēnē population at the Park is subject to high predation of eggs and goslings by cats, rats, and mongooses. In addition, because of adverse weather conditions at the Park, many eggs and goslings are lost to inclement weather. Funds to support egg and gosling rescue at Haleakalā National Park would help the Park better address these issues and is an action recommended by the Nēnē Recovery Action Group. This contribution of $25,000 is commensurate with the requested take of 5 nēnē over the 25-year permit term. This management activity will contribute to increasing reproductive success of the Park nēnē population, and therefore will provide a net benefit to the species.

6.5 BLACKBURN'S SPHINX MOTH

6.5.1 Mitigation Plan

Auwahi Wind anticipates that direct impacts to larvae and adult Blackburn's sphinx moths will be avoided to the maximum extent possible but that indirect impacts to individuals could occur. Mitigation for Blackburn's sphinx moth was developed based on permanent habitat impacts. This proposed mitigation is consistent with the measures identified in the USFWS' recovery plan for this species (USFWS 2005c). The specific mitigation measures and calculations for mitigation impacts are outlined below.

The Recovery Plan lists planting of 'aiea as a conservation action for the Blackburn's sphinx moth (USFWS 2005c). Therefore, Auwahi Wind will provide funding to the LHWRP for 'aiea outplanting in addition to other native species in the Auwahi Forest Restoration Project, where the moth is already known to occur (USGS 2006). The LHWRP will restore dryland forests, which will benefit native wildlife in general, and will enhance fitness for Blackburn's sphinx moth by planting approximately 250 stems of 'aiea per acre of mitigation.

Mitigation calculations were based on Blackburn's sphinx moth and botanical surveys conducted in March and April 2011 (see Section 5.4 for details). Impacts of the project to Blackburn's sphinx moth occur on degraded habitats, some of which include remnant native plants. Pursuant to guidance from the USFWS, acreage affected by permanent disturbance was separated into degraded habitat with some native species and degraded habitat (Greenlee pers. comm. 2011). Based on this separation, permanent impacts to degraded habitat with some natives will be mitigated at the rate of 2 acres (0.8 ha) restored for every acre of permanent impact; thus, the 0.3 acres of permanent impact to degraded habitat with some native species will result in 0.6 acre (0.2 ha; 0.3 acres x 2 = 0.6 acre) of mitigation. Permanent impacts to degraded habitat will be mitigated at a rate of 0.2 (0.08 ha) of restored habitat for every acre of permanent impact to degraded habitat; thus, the 27.7 acres (11.2 ha) of permanent impact will result in 5.5 acres (2.2 ha; 27.7 acres x 0.2 = 5.5 acres) of mitigation. In total, 6 acres (2 ha) will be targeted for habitat restoration.

Auwahi Wind will provide $144,000 (6 acres x $24,000 per acre, Table 6-2) to the LHWRP to restore 6 acres (2 ha) of dryland forest at the Auwahi Forest Restoration Project. The restoration of native habitat at the Auwahi Forest Restoration Project will mitigate any potential direct or indirect impacts associated with the Project for the Blackburn's sphinx moth by protecting and enhancing suitable habitat. The initial payment for the first 3 acres of restoration will be made to the LHWRP within 30 days of permit issuance and the remaining funds paid within 3 months. The 6 acres would be planted within 3 years of the payment to the LHWRP. All costs provided in Section 6.0 are estimates based on costs provided by the LHWRP. The Applicant is committed to providing the funds necessary to complete the required mitigation and to ensuring that the proposed mitigation plan is carried out.

6.5.2 Net Benefit

The restoration completed for the Blackburn's sphinx moth mitigation will provide a net benefit to the species because native habitat will replace degraded vegetative communities providing no or little habitat for the species. The noxious tree tobacco larval host plant is being replaced by the native larval host plant 'aiea. 'Aiea is considered superior to the non-native host plant because it is more resistant during drought conditions and is longer lived than tree tobacco (USFWS 2005c). In addition, the 'aiea will be planted in the Auwahi Forest Restoration Project, which will also provide a variety of nectar species. Through natural regeneration on this land, benefits from this mitigation should occur beyond the lifespan of this Project.

6.5.3 Measures of Success

Blackburn's sphinx moth mitigation will be considered successful if:

- Funding is provided to LHWRP.
- USFWS and DOFAW received annual updates until the restoration is completed.
- The specified restoration is carried out, including the planting of approximately 250 stems of 'aiea per acre of mitigation.

7.0 MONITORING AND REPORTING

Monitoring and reporting will address legal compliance with the provisions and take limitations of the HCP and the associated ITP/ITL, and effectiveness of the mitigation efforts. Monitoring will ensure that the authorized levels of take are not exceeded, and that the effects of take are minimized and mitigated as outlined in the HCP. Monitoring will also assess the success of the HCP's mitigation program. The HCP's adaptive management strategy (Section 9.6) provides a mechanism for modifying or adding minimization measures or adjusting mitigation as deemed necessary by monitoring results. Annual reports will be provided to USFWS and DLNR to allow them to independently verify that Auwahi Wind has performed required tasks and activities according to the provisions of the HCP. As part of agency compliance monitoring, DOFAW may conduct independent monitoring tasks sufficient to determine compliance, including independent assessment of searcher efficiency, carcass removal, and net recovery benefit targets and criteria. Pursuant to HRS 195D, and prior agreement, all costs required for that compliance monitoring shall be paid by the applicant. The permittee's representative would review the protocols proposed for DOFAW's compliance monitoring to verify that the protocols measure the same objectives as the ongoing monitoring.

7.1 PROJECT-SPECIFIC TAKE

7.1.1 Monitoring Direct Take

A post-construction monitoring plan (PCMP) will be implemented as a means to document impacts to the Covered Species as a result of operation of the Project, and to ensure compliance with the authorized provisions and take limitations of the HCP and the associated ITP/ITL (Appendix E). The monitoring protocol is consistent with post-construction monitoring being conducted, or proposed, for other wind projects in Hawai'i and elsewhere in the continental United States (Erickson et al. 2004; Arnett 2005; Kerns et al. 2005; KWP 2008, 2009; Tetra Tech 2008; Arnett et al. 2009; SWCA 2010). Any changes to the protocol from the baseline provided herein would require review and approval by USFWS and DLNR.

Key components of the post-construction fatality monitoring plan include:

- Use of Auwahi Wind technical staff and/or third-party contractors trained by experienced biologists with expertise in wind turbine-bird/bat interaction studies and implementing wind energy post-construction monitoring protocol;
- Standardized carcass searches conducted during the initial 2-year post-construction monitoring period under the operating wind turbines approximately once per week from March through July and then two times per week during the higher bat activity period and petrel fledging period in July through November. In December to February, surveys will be conducted monthly and thereafter as determined necessary based upon the initial monitoring. Search intensity may be modified based on the result of the initial monitoring period;
- Carcass removal and searcher efficiency trials to adjust observed fatality numbers for bias associated with the removal of carcasses by scavengers or other means and the ability of searchers to locate carcasses, respectively;

- A Wildlife Education and Incidental Reporting Program for reporting incidental observations of Project-related fatalities within the wind farm site and the generator-tie line made by onsite staff;
- Downed Wildlife Protocol for the recovery, handling, and reporting of downed wildlife (Appendix E); and
- After the initial 2 years of monitoring, monitoring efforts may be reduced in frequency, with approval of DOFAW and USFWS, if available data suggest a low frequency or potential for fatalities of Covered Species (Appendix E). The Wildlife Education and Incidental Reporting Program will supplement the post-construction mortality monitoring to report potential wildlife injuries or fatalities.

The Wildlife Education and Incidental Reporting program will be executed for contractors, Project staff members, and other ʻUlupalakua Ranch staff who are on site on a regular basis. Staff members will be provided with printed reference materials that include: photographs of each of the Covered Species and information on their biology and habitat requirements; threats to the species onsite; and measures being taken for their protection under this HCP. This training enables staff to identify the Covered Species that may occur in the Project area, record observations of these species, and take appropriate steps for documentation and reporting when any Covered Species is encountered during construction or operation of the Project including when downed birds or bats are found. The Wildlife Education and Incidental Reporting program will facilitate incidental reporting of observations within the wind farm site, as well as within the generator-tie line corridor where Auwahi Wind and ʻUlupalakua Ranch staff are regularly present during the course of normal Project and ranch operations. Incidental reporting will inform the Project post-construction monitoring program (Appendix E) of any wildlife fatalities that occur outside of standardized fatality surveys within the Project, as well as provide supplementary information on impacts associated with the generator-tie line where standardized post-construction monitoring will not occur. The program will be prepared by a qualified biologist and will be approved in advance by the USFWS and DOFAW. Over the term of this HCP, the program will be updated as necessary.

The protocol for recovery, handling, and reporting of downed wildlife has been developed in cooperation with the USFWS and DOFAW. Regular Project staff will be trained in this protocol during the wildlife education briefings and will be responsible for documenting observed fatalities or injury to wildlife. The USFWS and DOFAW will be notified promptly upon discovery of an injured or dead state- or federal-listed species. The Downed Wildlife Protocol is included in the Project post-construction monitoring plan (Attachment 1 of Appendix E). This protocol includes:

- Procedures to follow upon the discovery of a downed seabird or bat including a prioritized contact list of DOFAW and USFWS staff; and
- Guidelines for handling, if permitted, injured wildlife or carcasses.

Federal- or state-listed species found injured or dead will be left in place for collection by USFWS or DOFAW personnel or collected and frozen if directed by USFWS or DOFAW. Non-listed species may be collected by staff members included on the USFWS Special Purpose Permit and the DOFAW Protected Wildlife Permit issued for the Project, which grant permission and include provisions for handing native wildlife.

7.1.2 Estimating Indirect Take

Monitoring of direct take will also be used to assess Project-related indirect take. It is assumed that take of an adult bird or bat during the breeding season may result in the indirect loss or take of a dependent young. Thus, for every seabird or bat carcass detected during the breeding season, modifiers will be applied to estimate indirect take to account for the likelihood that a given adult is reproductively active, the likelihood that the loss of a reproductively active adult results in the loss of its young, and average reproductive success (Section 5.2).

7.2 NON-FATALITY MONITORING

7.2.1 Hawaiian Hoary Bats

Monitoring for Hawaiian hoary bats will occur at both the Project site and the mitigation site. Auwahi Wind will conduct bat acoustic monitoring during the first 2 years of operation at the Project. Monitoring at the mitigation site will be accomplished by using radio telemetry of Hawaiian hoary bats (Section 6.2.2, Tier 2 Mitigation).

7.2.2 Hawaiian Petrels

Petrel burrows will be monitored following methods used by NPS. Auwahi Wind will evaluate the number of active burrows and reproductive success on their mitigation parcel. Monitoring will occur annually for the first 3 years. An additional 5 years of monitoring will occur at certain points during the life of the mitigation. Actual survey years will be determined in consultation with and subsequent approval from DOFAW and USFWS and will depend on information gathered from the initial 3 years and other information gained about petrel biology.

7.3 REPORTING

Auwahi Wind will prepare and submit annual reports summarizing the results of post-construction monitoring and mitigation conducted to date. Report components will include:

- A summary of post-construction fatality monitoring conducted to date including a description of survey protocol implemented, any adjustments made subsequent to the previous reporting period, and a summary of turbine operational parameters;
- A summary of direct take, including both observed and adjusted levels, for each species and associated indirect take calculations;
- A summary of other downed wildlife documented and incidental observations (fatalities documented independently of the standardized searches);
- Results of the carcass removal and searcher efficiency trials;
- A discussion of the efficacy of the current monitoring protocols and whether or not adjustments need to be made;
- A summary of HCP mitigation efforts conducted to date and the success of these efforts based on the results of mitigation monitoring;
- Recommended changes to the mitigation plan, if any, based on the results of mitigation monitoring;
- A discussion of changed circumstances or adaptive management measures, if necessary.

- Survival of ʻaiea, ʻiliahi, and red ʻilima fenced within the Project disturbance area will be documented at the end of construction as required by USFWS; and
- Annual survival of 10 outplanted ʻaiea, ʻiliahi, and red ʻilima for 3 years following outplanting as required by USFWS.

Annual reports will be submitted to the USFWS and DOFAW by August 31 of each year to coincide with DOFAW's fiscal year end. Auwahi Wind will confer with the USFWS and DOFAW following the submittal of the annual report to review the results and discuss future HCP implementation issues. Annual reports will also be made available to the ESRC.

In accordance with the Project Downed Wildlife Protocol (Attachment 1 of Appendix E), USFWS and DOFAW biologists will be notified by phone within 24 hours of the discovery of a dead or injured individual of the Covered Species. A Downed Wildlife Incident Report (Attachment 3 in Appendix E) will be filed within 3 business days and cumulative adjusted take will be reported to the USFWS and DOFAW within 3 weeks. All non-covered avian species will be documented, following the protocol for downed Covered Species. Auwahi Wind will consult with the USFWS and DOFAW to review the results of post-construction monitoring annually in relation to anticipated maximum anticipated take limits to assess how close the Project is to exceeding established tiers, and will discuss changed circumstances or adaptive management measures as necessary.

8.0 ALTERNATIVES

Section 10(a)(2)(A)(iii) of the ESA requires that alternatives to the incidental take of listed species be considered and that reasons such alternatives are not implemented be discussed. The following section describes alternatives that were evaluated during the selection of the proposed Project design.

8.1 ALTERNATIVE 1: NO ACTION ALTERNATIVE

Under the federal No Action alternative, Auwahi Wind would not be granted the ITP and thus the Auwahi Wind Project would not be constructed or operated. Under this alternative, there would be no additional impact to the Covered Species as no project component would be built. The Ulupalakua Ranch would continue current operations and there would be no change to the existing on-site conditions, nor risk to the Covered Species associated with collision with WTGs or other project structures.

8.2 ALTERNATIVE 2: PROPOSED ACTION

Based on high-resolution wind resource maps developed by the Hawai'i Wind Working Group (2004), the Auwahi parcel of 'Ulupalakua Ranch was identified as a suitable location for a wind farm project as it has a consistent wind power density regime. The Auwahi parcel is also located in a remote and undeveloped portion of the island, and is zoned for agriculture, within which wind farms are considered a compatible use. The Proposed Action is described in detail in Section 1.3 – Project Description.

8.3 ALTERNATIVE 3: REDUCED PERMIT TERM

Alternative 3 includes the issuance of an ITP to authorize incidental take of the Covered Species in association with construction and operation of the Auwahi Wind project and implementation of the proposed HCP. However, under Alternative 3, the term of the ITP and the operational life of the project would be 21 years rather than the 25 years identified under the Proposed Action. Alternative 3 would provide Auwahi Wind with less operational flexibility than the Proposed Action during the construction, operation, or decommissioning period. The Proposed Action conservatively covers an approximately 1 year construction period, the minimum 20-year operating period of the wind farm and an additional 4 years of operation if the life of the turbines expands beyond 20 years before decommissioning, whereas Alternative 3 only covers one year for construction and a maximum of 20 years for operation. Both alternatives conservatively assume that turbines are spinning the entire year of construction.

The types of impacts associated with construction and operation of the Auwahi Wind project under Alternative 3 on wildlife would be the same as under the Proposed Action given that the same construction, operation, and decommissioning activities would occur. Impacts would be minimized through implementation of the avoidance and minimization measures listed in Section 4.2 and take would be comparable for operation and decommissioning. However, authorized take levels for Hawaiian hoary bats and Hawaiian petrel would be less due to the reduced permit term. Take associated with turbine operation was calculated on an annual basis; therefore, potential take of Hawaiian petrels and Hawaiian hoary bats was calculated by multiplying the annual rates of take (Tables 5-1 and 5-4 for bats and petrels, respectively) by 21 years rather than 25 years as under the Proposed Action. Take of the nēnē and Blackburn's sphinx moth under Alternative 3 is the same as under the Proposed Action because these species have a low likelihood of occurring in the vicinity

of the Auwahi Wind project (nēnē) or because impacts are associated with construction of the project (Blackburn's sphinx moth). Authorized take levels under Alternative 3 are presented in Table 8-1.

Table 8-1. Requested ITP Authorization for ESA-listed Species under Alternative 3

Species	Requested Take Over the 25-year HCP Period
Hawaiian petrel	Tier 1: 17 adults; 6 chicks
	Tier 2: 28 adults; 10 chicks
	Tier 3: 55 adults; 19 chicks
Hawaiian hoary bat	Tier 1: 4 adults; 2 young
	Tier 2: 8 adults; 3 young
	Tier 3: 16 adults; 6 young
Hawaiian goose	5 adults
Blackburn's sphinx moth	6 acres

Mitigation for these effects would be the same as under the Proposed Action; however, Tier 3 mitigation for petrels and bats would be reduced due to the lower total take For the Hawaiian hoary bat this would involve mitigating for a smaller acreage in the Waihou Mitigation Area, the Kahikinui Forest Project, or the Auwahi Forest Restoration Project. The mitigation acreage for both alternatives for these sites will be calculated on a per-bat basis; therefore, this alternative would result in mitigation area for 3 fewer bats than the Proposed Action. Likewise, depending on the mitigation option selected for petrels (fencing and/or predator control at Kahikinui), Alternative 3 would involve protecting fewer burrows from predators. The number and arrangement would be dependent on the location of burrows. This alternative is analyzed in detail as Alternative 3 in the NEPA EA for the Auwahi Wind Project.

8.4 ALTERNATIVE 4: OFF-ISLAND MITIGATION

Under the Off-island Mitigation Alternative mitigation for the Hawaiian petrel under the HCP would occur outside of Maui. Under this alternative, Auwahi Wind would provide funding to Hawai'i Volcanoes National Park (HVNP) on Hawai'i Island for management of the petrel colony at Mauna Loa. The main colony currently supports approximately 90 petrel burrows of which 60 are active; there are also two subcolonies totaling 30 active burrows that are currently unmanaged. Construction of a predator-proof fence around the main colony has been proposed but funding had not been secured (Hu pers. comm. 2011). If this alternative were executed, Auwahi Wind would provide funding to HVNP toward fence installation, based on the level of mitigation required in coordination with the USFWS and DOFAW, plus additional funding for annual monitoring and maintenance of the fence. If the fence were to be constructed by the time mitigation at the Mauna Loa site is needed, Auwahi Wind would consider providing funding to the HVNP to implement predator control and burrow monitoring at the two outlying subcolonies. The duration of predator control and burrow monitoring required for Auwahi Wind under this alternative would be determined based on the level of mitigation required in coordination with the USFWS and DOFAW.

This alternative was initially considered because Mauna Loa supports a sufficient number of petrel burrows for mitigation activities to produce the required benefits to compensate for the requested take authorization, and it is already the subject of an established petrel management program. Thus

it provided a level of comfort in that there is an existing level of knowledge of the population. However, the USFWS and DOFAW concluded that because take authorization under the ITP would impact the Maui petrel population, mitigation directly aimed at benefiting petrels on Maui was more appropriate. Therefore, the Off-island Mitigation Alternative is not considered further here.

8.5 ALTERNATIVE 5: ALTERNATE PROJECT SIZES

The state EISPN describes the variations in the generating capacity that have been considered throughout the planning phase of the proposed project. However, the amount of wind-generated energy that the existing electrical grid can accept is limited. Consequently, MECO has determined that the grid can accept no more than approximately 21 MW of energy, as is currently proposed. A further reduction in generating capacity would make the Project not economically feasible for Auwahi Wind.

As noted in Chapter 1 Auwahi Wind considered three WTG models: the 1.5-MW GE, 2.3-MW Siemens, and 3.0-MW Siemens models. The dimensions of the GE and Siemens WTGs differ, with tower heights of 262 ft (80 m) and blade lengths ranging from 135.3 to 166 ft (41.25 to 50.5 m). Total height from ground level to the tip of the blade would range from 398 feet (121.3 m) to 428 feet (130.5 m). The dimensions of the two Siemens WTGs are the same; however, the 3.0 WTG is a gearless direct-drive machine that is more efficient than the 2.3 WTG, which has a gear box. Due to their different capacities each WTG model would result in a different numbers of turbines required to meet the 21-MW generating capacity of the wind farm: 15 1.5-MW GEs, 10 2.3-MW Siemens, and 8 3.0-MW Siemens. Final turbine model selection was based on constructability, reliability, performance, and availability and minimization of impacts to threatened and endangered species. Ultimately, the 1.5-MW GE and 2.3-MW Siemens models were not selected because they would be less efficient and would require greater ground disturbance and therefore result in greater impacts on natural resources including birds and bats than the 3.0-MW Siemens model.

9.0 PLAN IMPLEMENTATION

9.1 RESPONSIBILITIES

This HCP will be administered by Auwahi Wind. As necessary Auwahi Wind will seek guidance from USFWS and DLNR/DOFAW in addition to other experts in the area of conservation biology associated with other government agencies (e.g., NPS, USGS), academia, various conservation organizations or partnerships, and consulting firms. As appropriate, any issues that arise during plan implementation may be brought before the ESRC for consideration.

Auwahi Wind will meet with the USFWS, DLNR/DOFAW, and ESRC annually to provide an update on plan implementation, including the status and effectiveness of monitoring and mitigation efforts and observed levels of incidental take. These meetings will also provide an opportunity to consider the need for adaptive management measures or modifications to monitoring protocols or mitigation strategies. The USFWS, DLNR/DOFAW, and ESRC may request additional meetings should the need to discuss immediate concerns or questions arise.

9.2 SCOPE AND DURATION

The HCP is designed to authorize potential incidental take of four Covered Species as a result of construction and operation of the Project for a permit term of 25 years. The HCP and corresponding ITL and ITP may be amended or extended, if necessary, in accordance with then-applicable laws and regulations.

9.3 CHANGED CIRCUMSTANCES, UNFORESEEN CIRCUMSTANCES, AND NO SURPRISES POLICY

The USFWS' "No Surprises" Rule (50 CFR 17.22, 17.32) provides that once an incidental take permit has been issued, and so long as the HCP is being properly implemented, the USFWS will not require the commitment of additional conservation or mitigation measures by the permittee (including additional land, water, or financial contribution, or additional restrictions on the use of land, water, or other natural resources) beyond the level provided in the HCP, without the permittee's consent.

To implement these assurances, an HCP must identify and analyze reasonably foreseeable "Changed Circumstances" that could affect a species or geographic area during its term (50 CFR 17.3). Should such a Changed Circumstance occur, the permittee is required to implement the measures specified in the HCP to respond to this change.

In contrast, "Unforeseen Circumstances" are events affecting a species or geographic area covered by the HCP that: (1) could not reasonably have been anticipated by the applicant or USFWS/DLNR during the development of the HCP, and (2) result in a substantial and adverse change in the status of a Covered Species. The USFWS bears the burden of demonstrating that Unforeseen Circumstances exist, using the best scientific and commercial data available. If an Unforeseen Circumstance occurs during the term of the HCP, and if the USFWS determines that additional conservation and mitigation measures are necessary to respond to such Unforeseen Circumstances, then the USFWS may require more conservation measures of the permittee, but only if such measures are limited to modifications within conserved habitat areas, if any, or the HCP's operating conservation program for the affected species, and if such measures maintain the original terms of the HCP to the maximum extent possible (50 CFR 17.22). DLNR provides similar assurances, but

without differentiating between Changed Circumstances and Unforeseen Circumstances. These assurances are specified in HRS Section 195D-23.

9.3.1 Changed Circumstances

The following discussion identifies the Changed Circumstances which are reasonably foreseeable by Auwahi Wind, the USFWS and DLNR. Any changes in the mitigation measures implemented for any of the Covered Species due to these scenarios will be performed under the budget established for mitigation expenses in this HCP which includes funding available for the tier of mitigation required, contingency funds and the letter of credit if mitigation actions have not been fully achieved or unmitigated take remains.

- *Listing of New Species*: In the event that a new species on Maui becomes listed, Auwahi Wind will evaluate the likelihood of incidental take of the species due to Project operation. If incidental take appears possible, Auwahi Wind will reinitiate consultation with the USFWS and DLNR/DOFAW to discuss whether mitigation measures in place provide a net benefit to the newly listed species or if additional measures are warranted. If warranted, Auwahi Wind would then seek coverage for the newly listed species under an amendment to the existing HCP. Should any of the Covered Species become delisted over the life of the Project, Auwahi Wind will continue to perform mitigation measures for that species in accordance with the HCP, unless the USFWS and DLNR/DOFAW agree that such actions may be discontinued.

- *Designation of Critical Habitat*: If the USFWS designates Critical Habitat for one of the Covered Species, and such Critical Habitat may be adversely modified by the Covered Activities, the USFWS may consider this to be a Changed Circumstance. If the USFWS makes such a determination, it will reevaluate the incidental take permit and may revise the activities covered by it to ensure that the activities allowed by the permit are not likely to result in adverse modification of any designated Critical Habitat. Auwahi Wind will implement such necessary modifications until such time as it has applied for and the USFWS has approved an amendment of the incidental take permit in accordance with applicable statutory and regulatory requirements, or until the USFWS notifies Auwahi Wind that the modifications are no longer required.

- *Hurricane*: Hurricanes periodically strike or affect the Hawaiian Islands. As a result, and given climatic trends which point toward increased cyclonic storms in this part of the Pacific Ocean, the likelihood of a hurricane striking Maui during the term of the HCP is sufficient to warrant treating it as a Changed Circumstance. Hurricanes can affect the activities covered by the HCP in several ways. First, they can result in significant damage to or destruction of Auwahi Wind facilities. Second, they may pose a threat to the Covered Species by causing injury or death either directly, or indirectly through the destruction of habitat. Finally, they can alter the natural and built environment in areas surrounding Auwahi Wind facilities in ways that increase or decrease the potential effects of those facilities on the Covered Species. Auwahi Wind will construct its facilities consistent with applicable codes and industry standards, which are intended to avoid significant damage in severe weather conditions. Should a hurricane strike Maui during the term of the HCP, any resulting effects on the Covered Species will be considered based on the best available information at the time, and the HCP habitat enhancement and management efforts may be modified should Auwahi Wind, USFWS and DLNR determine that such a response is necessary.

- *Invasive Species*: Introduced alien species of both plants and animals have had, and will continue to have, a detrimental effect on the Covered Species. The likelihood that the threat from this source will increase during the term of this HCP is sufficient to warrant treating this threat as a Changed Circumstance. The habitat enhancement and management measures to be implemented through this HCP could be compromised by new and/or increased populations of invasive species. Should that occur during the term of this HCP, Auwahi Wind will consult with USFWS and DLNR to determine what responsive changes Auwahi Wind should implement, if any, to the habitat enhancement and management measures.
- *Wildfire*: Wildfires periodically burn on Maui. If during the term of this HCP a wildfire burns the Hawaiian hoary bat or Blackburn's sphinx moth mitigation sites, Auwahi Wind will consult with the USFWS and DLNR, and if the agencies deem it to be necessary and appropriate, Auwahi Wind will fund post-fire restoration to ensure that the HCP mitigation objectives are met.

9.3.2 Unforeseen Circumstances and "No Surprises" Policy

Unforeseen circumstances include circumstances that were not anticipated by Auwahi Wind or the USFWS and DLNR/DOFAW during the preparation of the HCP that result in a substantial and adverse change in the status of the Covered Species (50 CFR § 17.3). Should the USFWS determine, based on considerations outlined in 50 CFR § 17.22(b)(5)(iii)(c) that unforeseen circumstances have arisen during the permit term, the USFWS and DLNR will notify Auwahi Wind in writing should the USFWS or DLNR believe that any unforeseen circumstance has arisen.

The Hawaiian petrel, Hawaiian hoary bat, nēnē, and Blackburn's sphinx moth are considered adequately addressed under this HCP and are, therefore, covered by the USFWS's "No Surprises" assurances. In the event that it is demonstrated by the USFWS and DLNR/DOFAW that unforeseen circumstances exist during the life of the Project, and additional conservation and mitigation measures are deemed necessary to respond to unforeseen circumstances, the USFWS may require additional measures of Auwahi Wind where the HCP is being properly implemented, but only if such measures are limited to modifications within conserved habitat areas, if any, or the HCP's operating conservation program for the affected species, and if such measures maintain the original terms of the HCP to the maximum extent possible.

Notwithstanding the foregoing paragraph:

- The USFWS and DLNR shall not require the commitment of additional land, water, or financial compensation by Auwahi Wind without the consent of Auwahi Wind or impose additional restrictions on the use of land, water, or natural resources otherwise available for use by Auwahi Wind under the original terms of the HCP, including additional restrictions on covered actions that are permitted under the HCP.
- The USFWS and DLNR shall have the burden of demonstrating that such unforeseen circumstances exist, using the best scientific and commercial data available. Their findings must be clearly documented and based upon reliable technical information regarding the status and habitat requirements of the affected species.
- In determining whether any event constitutes an unforeseen circumstance, the USFWS and DLNR will consider, but not be limited to, the following factors: 1) size of the current range of affected species; 2) percentage of range adversely affected by the HCP; 3) percentage of

range conserved by the HCP; 4) ecological significance of that portion of the range affected by the HCP; 5) level of knowledge about the affected species and the degree of specificity of the species' conservation program under the HCP; and 6) whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the affected species in the wild.

- The USFWS and DLNR shall not require additional mitigation for a species from the HCP permittee where the terms of a properly functioning HCP agreement were designed to provide an overall net benefit for that species and contained measurable criteria for the biological success of the HCP which have been or are being met.
- Nothing in this policy shall be construed to limit or constrain the USFWS, DLNR, or any other governmental agency from taking additional actions at its own expense to protect or conserve a species included in an HCP.

9.4 FUNDING AND ASSURANCES

The ESA and HRS require that HCPs detail the funding that will be made available to implement the proposed monitoring and mitigation plans. Measures requiring funding for HCP implementation typically include activities associated with Project implementation (e.g., pre-construction surveys or post-construction monitoring), as well as on-site and off-site mitigation measures (e.g., acquisition of mitigation lands, restoration, or contributions to research), and measures to respond to foreseeable Changed Circumstances.

Section 10(a)(2)(B)(iii) of the ESA requires an HCP applicant to ensure that adequate funding for the plan will be provided. Similarly, HRS Section 195D-4(g) requires the applicant to guarantee that adequate funding for the plan will be provided. However, Section 195D-4(g) also requires the applicant to "post a bond, provide an irrevocable letter of credit, insurance, or surety bond, or provide other similar financial tools, including depositing a sum of money in the endangered species trust fund created by section 195D-31, or provide other means approved by the board, adequate to ensure monitoring of the species by the State and to ensure that the applicant takes all actions necessary to minimize and mitigate the impacts of the take."

Auwahi Wind will post a letter of credit for an amount sufficient to cover the costs of implementing all of its obligations under this HCP. This letter of credit will be posted within sixty (60) days of issuance by USFWS of the ITP, and issuance by DLNR of the ITL. The take authorization contained in the ITP and ITL is not effective until Auwahi Wind provides to the FWS and DLNR executed copies of the letter of credit containing terms acceptable to the Service and DLNR. An estimate of the costs for implementing the HCP was provided in Table 6-2.

9.5 ADAPTIVE MANAGEMENT

The U.S. Department of the Interior defines adaptive management as a structured approach to decision making in the face of uncertainty that makes use of the experience of management and the results of research in an embedded feedback loop of monitoring, evaluation, and adjustments in management strategies (Williams et al. 2009). Uncertainties may include the lack of biological information for the Covered Species, lack of knowledge about the effectiveness of mitigation or management techniques or the anticipated effects of the Project. Adaptive management is a required component of HCPs that allows for flexibility over time during the implementation of the HCP as new information is gained. Adaptive management requires explicit and measurable objectives, and identifies what actions are to be taken and when.

Uncertainties exist in the anticipated effect of the operation of the Project on the estimated take levels for Hawaiian hoary bats (Section 6.2) and Hawaiian petrels (Section 6.3). Because of the limited data available for estimating collision risk for these species, Auwahi Wind created an adaptive management/tiered structure to ensure that mitigation was proportional to take. This tiered structure clearly states that if the take within a tier is reached, the next level of mitigation will automatically be initiated, i.e., adaptive management is engaged. Approaching the Tier 3 take limit will trigger additional consultation with the USFWS and DLNR/DOFAW.

Additionally, mitigation for the Hawaiian hoary bat is being adaptively managed by using the research results from Tier 2 mitigation to inform Auwahi Wind about amount of mitigation needed to mitigate the bats requested in the Tier 3 level of take.

Any changes in the mitigation measures will be made in consultation with and approval from USFWS and DOFAW. The avoidance and minimization measures described in Section 4 will be employed for the duration of the Auwahi Wind project except if evidence clearly demonstrates that removing the avoidance or minimization measure will not appreciably increase take. Tables illustrating mitigation efforts and adaptive management options are included in Section 6. Monitoring of seabird mitigation efforts is intended to inform the Applicant, USFWS, and DOFAW whether these efforts are adequately compensating for take. If monitoring reveals that a particular mitigation effort is not achieving the necessary level of success, the Applicant will consult with USFWS and DOFAW and require agencies approval to develop and implement a revised mitigation strategy to meet mitigation requirements. As long as take levels remain within the take tiers identified in Section 5, any actions performed in response to this adaptive management process would be performed under the mitigation budget established for the project. Adaptive management measures do not trigger the need for an amendment.

To ensure accurate measurement of take, carcass detection rates will be adjusted based on searcher efficiency and scavenger activity trials. Thus, mitigation will match incidental take on a continuous basis to ensure the long-term biological goals of the HCP are accomplished over the life of the Project. Should the net benefit provided by the mitigation implemented for a tier level exceed what was needed for that level of take (e.g., petrel mitigation at Tier 1 produces more than 19 adults and 7 chicks), the additional net benefit from the mitigation will be incorporated into the mitigation planning for the next higher tier if reached; all take will be mitigated.

9.6 REVISIONS AND AMENDMENTS

It is necessary to establish a procedure whereby the ITP/ITL can be amended. However, it is important that the cumulative effect of any amendments will not jeopardize any threatened or endangered species. Amendments must be evaluated based on their effect on the species as a whole. The USFWS and DLNR must be consulted on all proposed amendments that may affect any federal- or state-listed species.

9.6.1 Minor Amendments to the HCP

Minor amendments involve routine administrative revisions, minor changes to the operation and management program, minor changes to the post-construction monitoring and mitigation monitoring programs, minor revisions to the mitigation plan, or minor changes to the development area and design that do not diminish the level or means of mitigation. Such minor amendments do not materially alter the terms of the ITP/ITL. Upon the written request by Auwahi Wind, the USFWS and DLNR are authorized to approve minor amendments to the HCP.

9.6.2 Major Amendments to the HCP

Other amendments will be considered a major amendment to the ITP/ITL. Examples of a major amendment would be adding a new species to the list of Covered Species, or extending the HCP and ITP/ITL beyond its original 25-year term. A major amendment requires submittal to USFWS and DLNR of a written application, and implementation of all permit processing procedures applicable to an original ITP/ITL. A request for an amendment or extension should be submitted a minimum of 6 months prior to the expiration of the ITP/ITL. The HCP will remain valid and in effect during the processing of this request if the renewal or extension is processed during the original permit term.

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