July 16, 2015

Aaron Nadig and Jodi Charrier
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard
Room 3-122, Box 50088
Honolulu, HI 96850

Angela Amlin
Department of Land and Natural Resources
Hawaii Division of Forestry and Wildlife
Kalanimoku Building
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Honolulu, HI 96813

Re: Request for Amendment to United States Fish and Wildlife Service ("Service") Endangered Species Act ("ESA") Section 10(a)(1)(B) Incidental Take Permit (TE-27260A-0) dated January 15, 2012 (the "Permit") and the Hawai'i Department of Land and Natural Resources ("DLNR") Incidental Take License (ITL-15) dated January 5, 2012 (the "License") issued to Kaheawa Wind Power II, LLC ("KWP") in connection with the development and operation of the Kaheawa Wind Power II Wind Generation Facility (the "Project"), located in Ukumehame, Maui, HI.

Dear Mr. Nadig, Ms. Charrier and Ms. Amlin:

We are writing on behalf of KWP II under the above-referenced federal Permit and state License, which authorize the incidental take of the nēnē (*Branta sandvicensis*); Hawaiian petrel, ʻUaʻu (*Pterodroma sandwichensis*); Hawaiian hoary bat, ʻŌpeʻapeʻa (*Lasiurus cinereus semotus*); and the threatened Newell's shearwater, ʻAʻo (*Puffinus auricularis newelli*) in connection with the operation of the Project.

The purpose of this letter is to request that the Service and DLNR approve an amendment to the Permit and the License, respectively, authorizing anticipated increased incidental take of the Hawaiian hoary bat and nēnē over the life of the Project. This amendment would also increase mitigation for Hawaiian hoary bat and nēnē to compensate for the increased incidental take of those two species and provide a net conservation benefit for those species. This amendment also outlines the long term fatality monitoring protocol for the Project and amends the funding assurances language in the event of take of Newell's shearwater.

The requested Permit and License amendments will require conforming changes to the Kaheawa Wind Power II Wind Energy Generation Facility Habitat Conservation Plan, dated December 2011 ("HCP"), including Sections 1.1, 3.8.3.2, 3.8.4.3, 5.2, 5.2.4.1, 5.2.4.3, 5.2.4.4, 5.2.4.5, 5.2.5, 5.2.5.1, 5.2.5.2, 5.2.5.3, 5.2.5.4, 5.3, 5.3.3.1, 5.3.4.1, 6.0, 6.4.4, 6.4.6, 6.5.3, 6.5.3.1, 6.5.3.2, 6.5.4, 7.2.1.1, 7.3, and 7.4; and HCP Appendices 6, 10, 27, and 28. Conforming changes to the Implementing Agreement also are proposed. The proposed amendments to each of the documents are attached.

Current Permit and License Provisions

A. Nene

1. Permit

Condition H of the Permit provides that the anticipated level of incidental take authorized for nēnē is:

(iii) Up to thirty (30) Hawaiian geese (adults, subadults, fledglings, goslings, eggs) over the 20-year permit term, may be incidentally taken in the form of harm (injury or mortality) as a result of collision with vehicles, cranes, meteorological towers, construction cranes, or wind turbines (tower, nacelle, rotor blades). Up to a total of two (2) Hawaiian geese (adults, subadults, fledglings, nestlings) over the 20-year permit term, may be incidentally taken in the form of capture as a result of interactions with predator capture systems.

2. License

The License provides that the anticipated level of incidental take authorized for nēnē is:

	5-year limit	20-year limit
Tier 1	8 adults/immatures and 1 fledgling	18 adults/immatures and 3 fledglings
Tier 2	12 adults/immatures and 3 fledglings	27 adults/immatures and 3 fledglings

B. Hawaiian hoary bat

1. Permit

Condition H of the Permit provides that the anticipated level of incidental take authorized for the Hawaiian hoary bat is:

> (iv) Up to fourteen (14) Hawaiian hoary bats (adults, juveniles) over the 20-year permit term, may be incidentally taken in the form of harm (injury or mortality) as a result of collision with cranes, meteorological towers, construction cranes, or wind turbines (tower, nacelle, rotor blades).

On May 20, 2014, FWS approved a minor modification to the Permit providing that "Up to eleven (11) Hawaiian hoary bats may be incidentally taken in the form of harm (injury or mortality) over the 20-year term, due to collision with project structures. Tier 1 = 7 bats. Tier 2 = 11 bats." The purpose of this modification was to eliminate the distinction between juvenile and adult bats, for purposes of authorized incidental take.

2. License

The License provides that the anticipated level of incidental take authorized for the Hawaiian hoary bat is:

	5-year limit	20-year limit
Tier 1	7 bats ~~6 adults/immatures and 3 juveniles~~	7 bats ~~6 adults/immatures and 3 juveniles~~
Tier 2	11 bats ~~9 adults/immatures and 5 juveniles~~	11 bats ~~9 adults/immatures and 5 juveniles~~

On May 20, 2014, DLNR approved a minor modification to the License providing that "Up to eleven (11) Hawaiian hoary bats may be incidentally taken in the form of harm (injury or mortality) over the 20-year term, due to collision with project structures. Tier 1 = 7 bats. Tier 2 = 11 bats." The purpose of this modification was to eliminate the distinction between juvenile and adult bats, for purposes of authorized incidental take.

KWP requests that the Permit and the License be revised as set forth below.

Proposed Permit and License Language

A. Permit

The revised Condition H provides for an increased amount of take authorized under the Permit for nēnē and Hawaiian hoary bats. We propose that Conditions H(iii) and H(iv) of the Permit be changed as follows:

> (iii) Up to ~~thirty (30)~~ forty-eight (48) Hawaiian geese (adults, subadults, fledglings, goslings, eggs) over the 20-year permit term, may be incidentally taken in the form of harm (injury or mortality) as a result of collision with vehicles, cranes, meteorological towers, construction cranes, or wind turbines (tower, nacelle, rotor blades). Up to a total of two (2) Hawaiian geese (adults, subadults, fledglings, nestlings) over the 20-year permit term, may be incidentally taken in the form of capture as a result of interactions with predator capture systems.
>
> (iv) Up to ~~fourteen (14)~~ eighty (80) Hawaiian hoary bats (adults, juveniles) over the 20-year permit term, may be incidentally taken in the form of harm (injury or mortality) as a result of collision with cranes, meteorological towers, construction cranes, or wind turbines (tower, nacelle, rotor blades).

B. License

The revised License provides for an increased amount of incidental take authorized for nēnē as follows:

	5-year limit	20-year limit
Tier 1	8 adults/immatures and 1 fledgling	18 adults/immatures and 3 fledglings
Tier 2	12 adults/immatures and 3 fledglings	27 adults/immatures and 3 fledglings
Tier 3	n/a	up to 40 nēnē
Tier 4	n/a	up to 48 nēnē

The revised License provides for an increased amount of incidental take authorized for the Hawaiian hoary bat as follows:

	5-year limit	20-year limit
Tier 1	~~6 adults/immatures and 3 juveniles~~ 7 bats	~~6 adults/immatures and 3 juveniles~~ 7 bats
Tier 2	~~9 adults/immatures and 5 juveniles~~ 11 bats	~~9 adults/immatures and 5 juveniles~~ 11 bats
Tier 3	n/a	up to 40 bats
Tier 4	n/a	up to 80 bats

Support for Proposed Amendment

A. Permit

Service regulations authorize amendments to the Permit. 50 C.F.R. §13.23. Section 7.7 of the HCP and Section 12.2 of the Implementing Agreement also contemplate that amendments to the HCP are acceptable upon approval from the Service. Data gathered during the first three years of the Permit support the proposed increase in authorized incidental take of Hawaiian hoary bats and nēnē.

To date, three (3) nēnē fatalities have been documented at KWP II. The total projected adjusted take (observed take[1] plus unobserved take[2] plus indirect take[3]) for the nēnē is 48 Hawaiian geese total.

To date, three (3) Hawaiian hoary bat fatalities have been documented at KWP II. The total projected adjusted take (observed take plus unobserved take plus indirect take) for the Hawaiian hoary bat is 80 individuals.

The proposed amendments to the Permit and HCP require compliance with the National Environmental Policy Act ("NEPA"). NEPA regulations (40 C.F.R. §1502.9) require supplemental documentation if: (i) The agency makes substantial changes in the proposed action that are relevant to environmental concerns; or (ii) There are significant new circumstances or information relevant to environmental concerns and bearing on the

[1] Fatalities found that are attributable to the project.
[2] Fatalities that may have occurred but that are not found for various reasons, including vegetation cover and scavenging.
[3] It is possible that an adult killed by collision could have dependent young or eggs. The loss of an adult with dependent young may result in the loss of dependent young, or "indirect take" that is attributable to the project.

proposed action or its impacts. A supplemental Environmental Assessment (EA) will be prepared for the proposed changes to the Permit and HCP. The supplemental EA will provide additional information and analysis of potential effects and proposed mitigation associated with the proposed increase in the amount of authorized incidental take of the Hawaiian hoary bats and nēnē; and the modifications to the monitoring protocol.

B. License

Section 7.7 of the HCP and Section 12.2 of the Implementing Agreement contemplate amendments to the HCP and the License. Compliance with HRS Chapter 195D, and approval by DLNR and the Hawai`i Endangered Species Recovery Committee (ESRC), are required for the requested amendments to the License, HCP and Implementing Agreement.

If you have any questions or wish to discuss this request, please do not hesitate to contact me. Thank you for your consideration and attention in connection with this matter.

Very truly yours,

[SunEdison/KWPII]

cc:

Amendment to the Kaheawa Wind Power II Wind Energy Facility Habitat Conservation Plan

On May 8, 2015, Kaheawa Wind Power II, LLC submitted a request to the U.S. Fish and Wildlife Service ("Service") and the Hawaii Department of Land and Natural Resources ("DLNR") for an amendment to Incidental Take Permit (TE-27260A-0) dated January 15, 2012 and the Hawai'i Department of Land and Natural Resources Incidental Take License (ITL-15) dated January 5, 2012 (collectively, the "Permits"). The requested amendment (the "ITP/ITL Amendment") would increase the take authorized under the Permits for the Hawaiian hoary bat and nēnē. Upon approval of the ITP/ITL Amendment, conforming and needed changes to the Kaheawa Wind Power II Wind Energy Generation Facility Habitat Conservation Plan ("HCP") shown below are effective. This document (the "HCP Amendment") reflects the revisions needed to conform to the ITP/ITL Amendment.

Revisions to HCP

Upon the effective date of the ITP/ITL Amendment, the following changes[1] will be incorporated into the HCP.

HCP Section 1.1 (*Summary*)

Kaheawa Wind Power II LLC ("KWP II LLC" or the "Applicant") proposes to construct and operate a new 21-megawatt (MW) wind energy generation facility near Kaheawa Pastures above Mā'alaea in the southwestern portion of the Island of Maui, Hawai'i. The proposed project, known as Kaheawa Wind Power II (KWP II), is situated on approximately 143 acres (58 ha) of State Conservation Land southeast of the existing First Wind 30-MW Kaheawa Wind Power (KWP) project (see Figures 1.1 and 1.2). KWP commenced operation in June 2006. Like the KWP project, KWP II would supply wind-generated electricity to Maui Electric Company Ltd. (MECO).

The project components of KWP II will consist of:

- 14 General Electric (GE) 1.5-MW wind turbine generators (WTGs)
- sharing of the existing operations and maintenance building (O&M) with KWP
- one 5,000 ft^2 maintenance building next to the existing KWP O&M building
- Installation of a 60,000-gallon tank adjacent to the existing O&M building at KWP. If a tank is not installed, the proposed project would use bottled water and portable pumped toilets similar to the KWP facility.
- one substation
- underground cables carrying electrical power from the individual wind generators to a new electrical substation
- a battery energy storage system (BESS)
- an overhead electrical collection line across Manawainui Gulch connecting the collection system with the new substation
- a short overhead electrical transmission line connecting the substation to the uppermost of the two existing MECO 69 kV transmission lines through the area
- a communications system of underground fiber optic cables connecting to the existing KWP communications tower
- One permanent meteorological tower and one guyed temporary 65-meter test tower erected prior to construction of the WTGs. The temporary tower will be removed within three months of completing construction.
- service roadways to connect the new WTGs and other facilities to the existing main access road serving KWP

These components would disturb approximately 43 acres (17.4 ha) of land or approximately 30% of the project area; the remainder would remain undisturbed.

For the past two years, the Applicant has collected meteorological data at the KWP II site to determine suitable areas for the proposed WTGs. The data show that the most favorable areas are to the west and south of the KWP turbines. Because of the characteristics of the prevailing winds, constructability and other factors, the Applicant has determined that the "Downroad" area is the best site for the KWP II project. Under the selected layout, 14 WTGs would be constructed along the existing KWP access road below the existing WTGs (see Figure 1.3, and Figure 4.1).

Construction and operation of the KWP II project has potential to result in the incidental take of four Federally and State-listed threatened and endangered species: the Hawaiian petrel (*Pterodroma sandwichensis*), Newell's shearwater (*Puffinus auricularis newelli*), nēnē or the Hawaiian goose (*Branta sandvicensis*), and Hawaiian hoary bat (*Lasiurus cinereus semotus*). Hereafter, these four species are collectively referred to as the "Covered Species." These species

[1] Red underlined text is text being added to the HCP. Red text shown with strikethrough is text being removed from the HCP. Where useful, additional and unchanged text is provided for context within a section.

are known to fly in the vicinity of the project area and could be injured or killed if they collide with a WTG or other project component. No other listed, proposed, or candidate species has been found or is known or expected to be present in the project area. Adjusted take estimates at KWP II for all species consider both direct and indirect take. Direct take comprises individuals that are killed or injured colliding with turbines or associated structures on site. Indirect take considers that it is possible that adult birds killed through on-site collisions could have been tending to eggs, nestlings or dependent fledglings, or adult bats could have been tending to dependent juveniles. In such cases, the loss of these adults would then also lead to the loss of the eggs or dependent young. Loss of eggs or young would be "indirect take" attributable to the proposed project. Observed direct takes documented at the existing KWP facility include three Hawaiian petrels, nine nēnē and two Hawaiian hoary bats.

The Applicant is seeking an Incidental Take Permit (ITP) in accordance with Section 10(a)(1)(B) of the federal Endangered Species Act (ESA) of 1973, as amended, and an Incidental Take License (ITL) in accordance with Chapter 195-D, Hawai'i Revised Statutes. These permits are issued by the U.S. Fish and Wildlife Service (USFWS) and State Department of Land and Natural Resources (DLNR), respectively. The requested take for KWP II is summarized in the table below.

Table 1.1 Requested Take for KWP II at Tier 1 and Tier 2.

Common Name	Scientific Name	Tier	Annual Take Limit	Five Year Take Limit	Twenty Year Take Limit
ʻUaʻu (Hawaiian petrel)	*Pterodroma sandwichensis*	Tier 1	4 adults/ immatures and 3 chicks/eggs	8 adults/ immatures and 4 chicks/eggs	19 adults/ immatures and 9 chicks/eggs
		Tier 2	up to 8 adults/ immatures and 4 chicks/eggs	up to 16 adults/ immatures and 8 chicks/eggs	up to 29 adults/ immatures and 14 chicks/eggs
ʻAʻo (Newell's shearwater)	*Puffinus auricularis newelli*	Tier 1	2 adults/ immatures and 2 chicks/eggs	2 adults/ immatures and 2 chicks/eggs	2 adults/ immatures and 2 chicks/eggs
		Tier 2	up to 5 adults/ immatures and 3 chicks/eggs	up to 5 adults/ immatures and 3 chicks/eggs	up to 5 adults/ immatures and 3 chicks/eggs
Nēnē (Hawaiian goose)	*Branta sandvicensis*	Tier 1	4 adults/ immatures and 1 fledgling	8 adults/ immatures and 1 fledgling	18 adults/immatures and 2-3 fledglings
		Tier 2	up to 6 adults/immatures and 1 fledgling	up to 12 adults/ immatures and 3 fledglings	up to 27 adults/ immatures and 3 fledglings
		Tier 3	n/a	n/a	up to 40 nēnē
		Tier 4	n/a	n/a	Up to 48 nēnē
ʻŌpeʻapeʻa (Hawaiian hoary bat)	*Lasiurus cinereus semotus*	Tier 1	~~4 adults/ immatures and 2 juveniles~~ [2]	7~~6~~ ~~adults/immatures and 3 juveniles~~[2]	7~~6~~ ~~adults/immatures and 3 juveniles~~[2]
		Tier 2	~~up to 9 adults/ immatures and 5 juveniles~~[3]	11~~up to 9 adults/ immatures and 5 juveniles~~[3]	11~~up to 9 adults/ immatures and 5 juveniles~~[3]

[2] This was revised to be equivalent to 7 bats in a clarification letter from USFWS and DOFAW (2014-TA0260), dated May 20, 2014. The annual take limit was also removed.
[3] This was revised to be equivalent to 11 bats in a clarification letter from USFWS and DOFAW (2014-TA0260), dated May 20, 2014. The annual take limit was also removed.

Tier 3	n/a	n/a	up to 40 bats
Tier 4	n/a	n/a	Up to 80 bats

This HCP supports the issuance of these permits, and describes how the Applicant will avoid, minimize, mitigate and monitor the incidental take of threatened and endangered species that may occur during construction and operation of the proposed project. Efforts to minimize the potential impacts the facility may have on these listed species have already been incorporated into the site design and configuration. The general and species-specific mitigation measures the Applicant is proposing are intended to increase knowledge of the species' biology and distribution, enhance populations, or restore degraded native habitat. Mitigation measures are required to provide a net benefit to the species as required under state law. Mitigation measures are briefly summarized in the table below for the Covered Species.

HCP Table 1.2 (*Proposed Mitigation for Covered Species: Tier 1 and Tier 1I Take Scenarios*)

Tier 1 mitigation	Tier 2
Hawaiian Petrel	
Tier 1. 1. Implement a comprehensive plan for seabird colony management at Makamaka'ole, on West Maui near lower Kahakuloa Valley, that would include predator proof fencing an enclosure, eradication within the enclosures, social attraction and artificial burrows. The success of the social attraction project in establishing a breeding and growing colony will be determined after 5 years and if unsuccessful, additional measures will be implemented till mitigation is commensurate with the requested take. AND/OR 2. Participate in the management of the Hawaiian petrel colony breeding in the crater of Haleakalā in an approximately 220 ac (89 ha) area with approximately 100 burrows. This would include contributing to contracting the labor and purchasing equipment (e.g., traps and bait) required to conduct predator trapping in this area (or a section thereof, depending on mitigation requirement), and to conduct monitoring to document success. AND/OR 3. Provide support for colony-based protection and productivity enhancement for Hawaiian petrels at the ATST mitigation site after 2016 when ATST mitigation obligations are fulfilled.	Tier 1 mitigation may be adequate to offset Tier 2 levels of take, if additional mitigation is needed, management will be initiated, or if already initiated for Tier 1 mitigationexpanded to an area known to be occupied by unprotected burrows
Newell's Shearwater	
Tier 1 1. Implement a comprehensive plan for seabird colony management at Makamaka'ole, on West Maui near lower Kahakuloa Valley, that would include predator proof fencing an enclosure, eradication within the enclosures, social attraction and artificial burrows. The success of the social attraction project in establishing a breeding and growing colony will be determined after 5 years and if unsuccessful, additional measures will be implemented till mitigation is commensurate with the requested take. AND/OR 2. Implement predator exclosure and social attraction scenario at an alternative site in East Maui, or implement predator exclosure at an in-situ site at upper Kahakuloa or alternative site on East Maui, if deemed feasible. AND/OR 3. Provide support for colony-based protection and productivity enhancement, or social attraction and predator exclusion for Newell's shearwaters on Molokai or Lanai.	Progress through Tier 1 mitigation alternatives, which were developed to offset Tier 1 and Tier 2 take.

Nēnē	
1. Fund the building of a new release pen to accommodate spillover of nene from other pens or participate in the translocation of eggs, adults or family groups from Kaua'i. Additional funding for management of the new pen for the first five years will be provided regardless of take, this includes support for logistics, DOFAW staffing, predator control and vegetation management activities. Perform systematic visual observations of nēnē activity within KWP II site to document how nēnē use the project area following construction.	1. Extend management activities at pen constructed for Tier 1, including support for logistics, DOFAW staffing predator control and vegetation management. Monitor and model benefits of action to confirm mitigation offsets Tier 2 take.
Hawaiian Hoary Bat	
1a. Conduct surveys to document bat occupancy at different habitat types (e.g., ridges vs. gulches) and elevation ranges at KWP II and vicinity to support Maui bat research. 1b. Restoration of bat habitat at acreage commensurate with the requested take.	1a. Continue surveys to document bat occupancy at different habitat types (e.g., ridges vs. gulches) and elevation ranges at KWP II and vicinity to support Maui bat research. 1b. Restoration of additional bat habitat at acreage commensurate with the requested take.

Table 1.3. Proposed Tier 3 and Tier 4 Mitigation for Nēnē and Hawaiian Hoary Bats

Nēnē
1. Provide additional funding at an existing pen or at a site where nēnē regularly forage or nest to increase survival rates and productivity. Monitor and model benefits of action to confirm mitigation offsets take.
Hawaiian Hoary Bat
1. Restore bat habitat or implement other management measures at an approved conservation site commensurate with the requested take. AND/OR 2. Fund or support bat research that will provide life history information and aid in the recovery of the species.

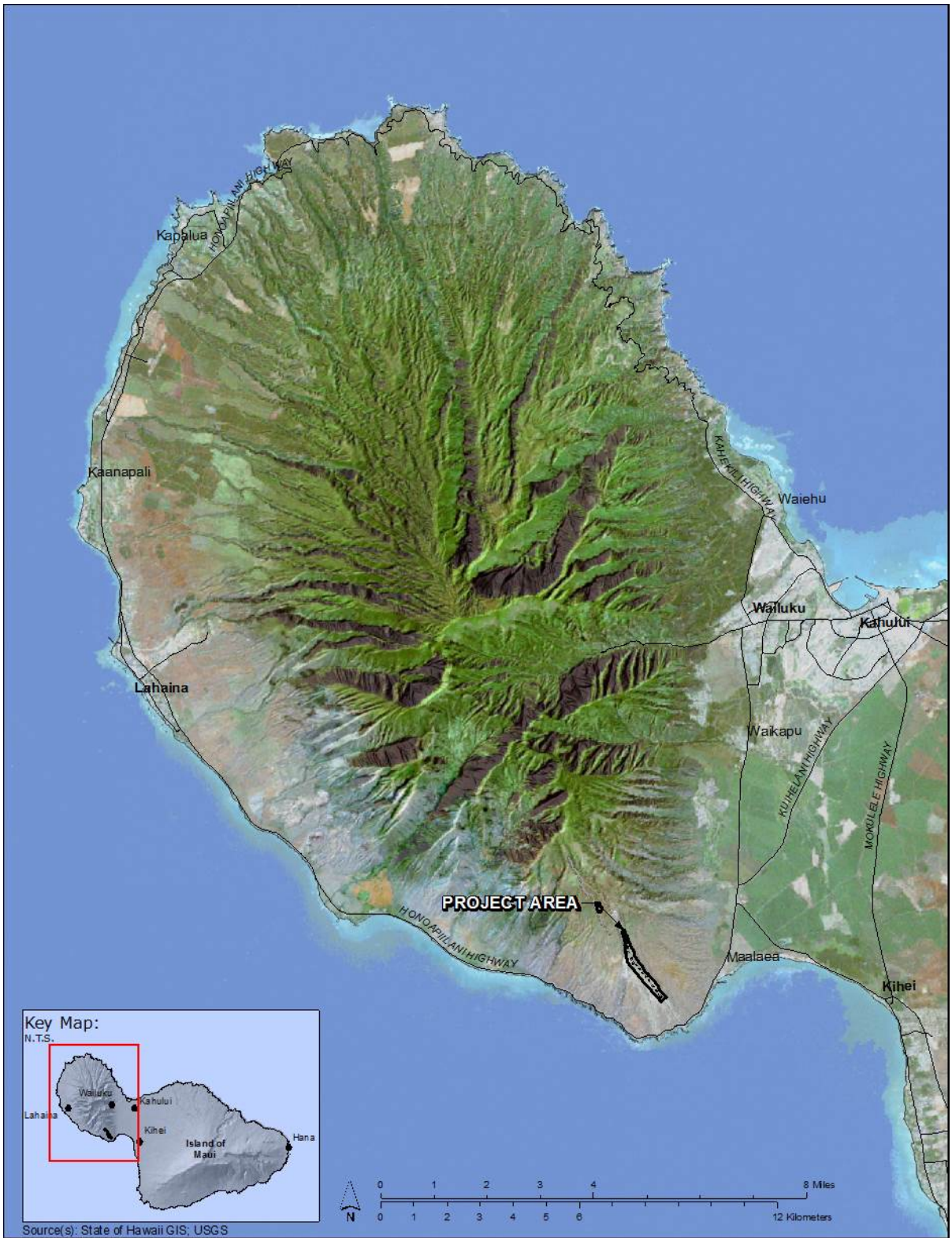

Figure 1.1 KWP II Project Location Map.

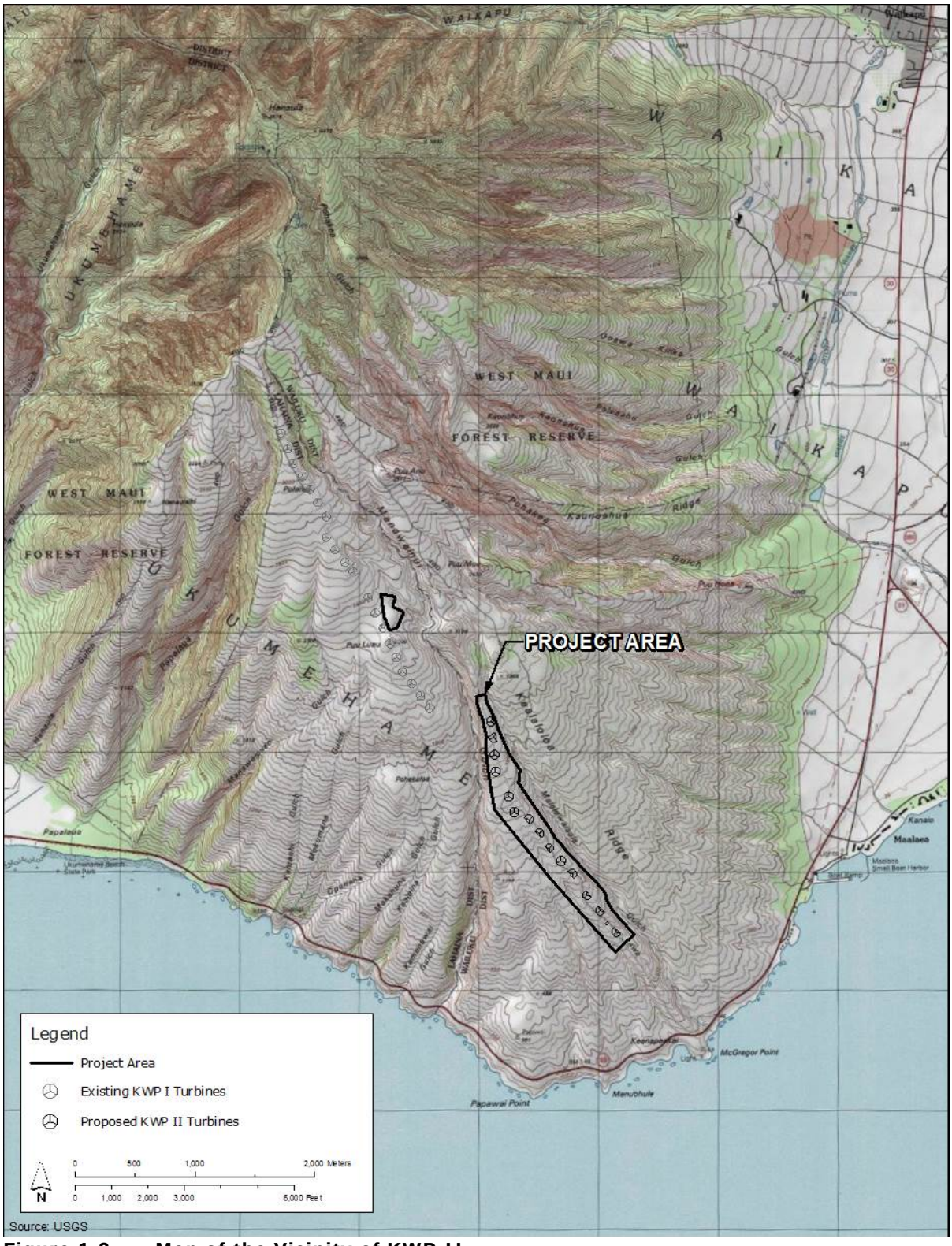

Figure 1.2 Map of the Vicinity of KWP II.

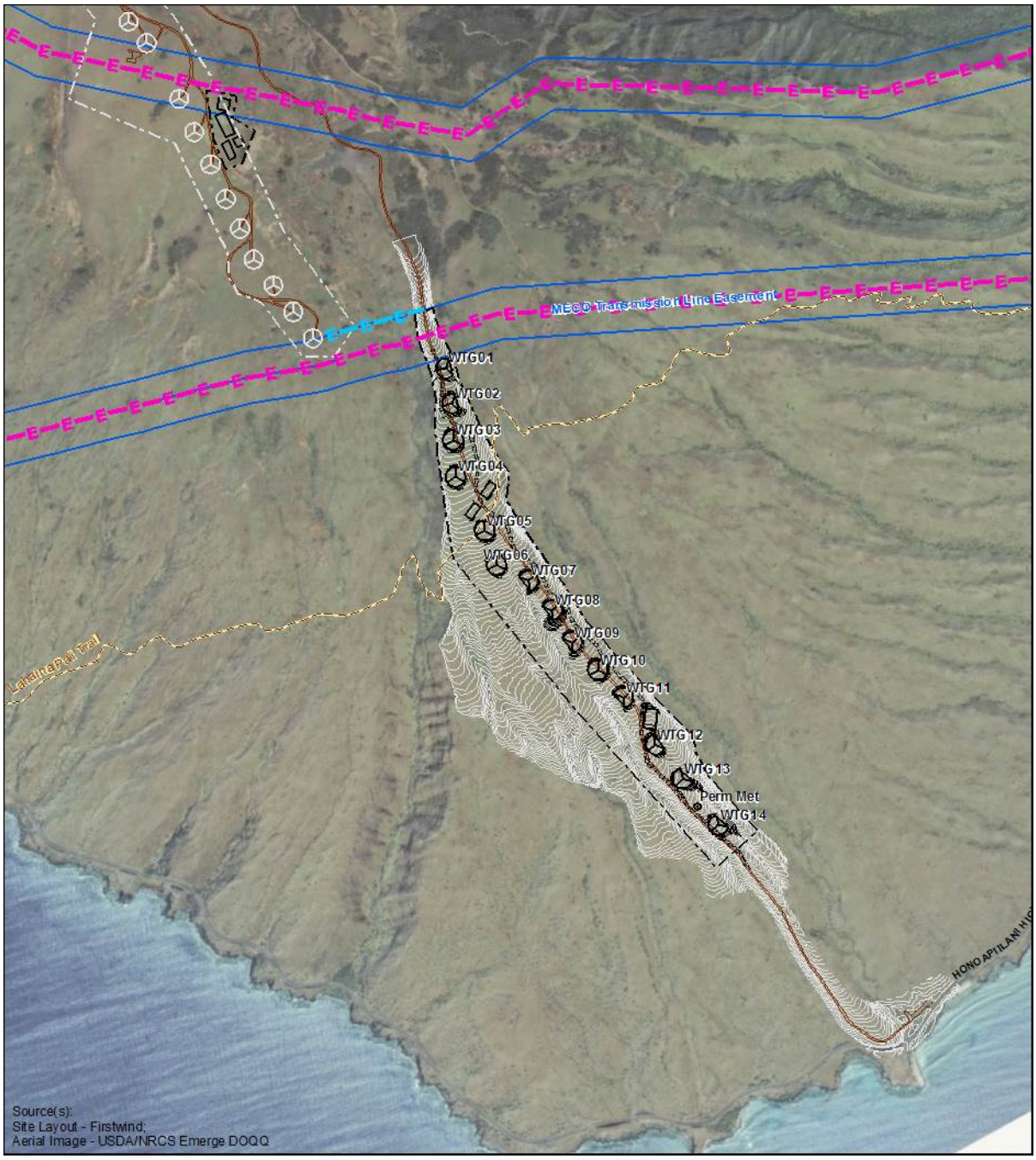

Figure 1.3 Site layout.

Additionally, the HCP outlines a monitoring protocol to determine the actual take of each species after the facility begins operating. Most importantly, this HCP incorporates adaptive management provisions to allow for modifications to the mitigation and monitoring measures as knowledge is gained during implementation.

HCP Section 3.8.3.2 (*Current Threats to Nēnē*)

Current threats to nēnē include predation by non-native mammals, exposure in high-elevation habitats, insufficient nutritional resources for both breeding females and goslings, a lack of lowland habitat, human-caused disturbance and mortality (e.g., road mortality, disturbance by hikers), behavioral problems related to captive propagation, and inbreeding depression (USFWS, unpubl.; USFWS 2004a). Predators of nēnē eggs and goslings include dogs, cats, rats and mongoose. Dogs and mongoose are also responsible for most of the known cases of adult predation (USFWS 2004a). Nēnē have also been negatively impacted by human recreational activities (e.g., hikers and hunters). In recent years, nēnē have been struck and killed by golf balls and vehicles (USFWS 2004a).

Starvation and dehydration can be major factors in gosling mortality. Approximately 81.5% of gosling mortality in Haleakalā National Park during the 1994 to 1995 breeding season was due to starvation and dehydration (USFWS 2004a). From 2005 to 2007, between 30 to 50% of the goslings at the Hakalau Forest Unit died due to drought and/or exposure (USFWS, unpubl.). A lack of adequate food and water supplies also seems to be a limiting factor in Hawai'i Volcanoes National Park (USFWS 2004a).

For nēnē populations to survive they must be provided with generally predator-free breeding areas and sufficient food resources; human-caused disturbance and mortality must be minimized; and, genetic and behavioral diversity maximized. At the same time, it is recognized that nēnē are highly adaptable, successfully utilizing a gradient of habitats ranging from highly altered to completely natural, which bodes well for recovery of the species.

~~Nine~~ Twenty-one nēnē fatalities at KWP have been observed since the beginning of operations at KWP in 2006 to May 2015 (Kaheawa Wind Power LLC 2008b, 2009, 2014). ~~Section 5.2.4.1 provides additional information concerning these fatalities.~~

HCP Section 3.8.4.3 (*Occurrence of the Hawaiian Hoary Bat in West Maui and the Project Area*)

On Maui, this bat is believed to occur primarily in moist, forested areas, although little is known about its exact distribution and habitat use on the island, especially in the West Maui Mountains. No Hawaiian hoary bats were recorded in the area of the proposed wind turbines during nighttime visual studies using night vision equipment conducted in summer 1999 (Day and Cooper 1999) or fall 2004 (Cooper and Day 2004).

Hawaiian hoary bats are not expected to breed or roost in the project area due to the lack of trees in the grassland dominated landscape. Bats are likely to be using the KWP II area for foraging only.

Since the HCP for KWP was approved and the existing facilities began operation in the summer of 2006, KWP has carried out regular bat monitoring in accordance with the provisions of its HCP. The results of these observations as summarized below have greatly increased the information that is available on the presence of the Hawaiian hoary bat at Kaheawa Pastures and confirm that the species is present in low numbers in the KWP project area. Due to their proximity to each other and some similarities in habitat structure at KWP and KWP II, it is expected that bat activity at KWP II will likely be comparable.

Visual Surveys for Flying Bats at KWP. In accordance with the provisions of the KWP HCP, KWP biologists carried out regular crepuscular and nocturnal surveys aimed at recording bat activity at Kaheawa Pastures from June 2006 through June 2007. During this period, KWP biologists performed 32 surveys totaling nearly 116 hours of observation effort in and around the KWP site and adjacent countryside. Initially, surveys were conducted in the vicinity of each of the wind turbines on the site; however, the survey area was extended to include some of the adjacent gulches (Kaheawa Wind Power LLC 2007). The sites were surveyed during winter and spring seasons and under a range of weather and survey conditions. Though there often appeared to be abundant aerial insect prey and favorable wind conditions for flight in the sheltered gulch areas (and occasionally on the plateaus), no positive observations of Hawaiian hoary bats were made during either survey period (Kaheawa Wind Power LLC 2007, 2008a). Two separate bat sightings were reported by contractors between July 2007 and June 2008. One observation occurred on the access road below the Pali Trail on February 20, 2008 and the other at the Operations and Maintenance building on April 5, 2008 (Kaheawa Wind Power LLC 2008b; Appendix 4). KWP biologists conducted interviews and in both cases identification of these individuals could not be confirmed, but these sightings are consistent with other confirmed records of occurrence in the project area.

Visual Surveys for Downed Bats. ~~KWP biologists also looked for bats as part of their year-round monitoring aimed at documenting all downed (i.e., injured or dead) Covered Species in the project area. On September 26, 2008, a single dead bat was found near WTG 8. Injuries to the bat suggested it had died of physical trauma, presumably having collided with a turbine rotor or the tower. The second downed bat was found in April 2011.~~ As of May 1 2015, a total of eight Hawaiian hoary bat fatalities have been documented at KWP and three have been documented at KWP II.

Acoustic Monitoring of Bat Activity at KWP. ~~Since~~ From August 2008 to June 2010, four to eight Anabat detectors (Titley Electronics, NSW, Australia) ~~have been~~ were deployed at various locations in Kaheawa Pastures (Figure 3.5; Kaheawa Wind Power LLC 2009). Bat detectors were placed from ground level to 15 ft. (4.6 m). On average Anabat detectors are considered to have a detection radius of approximately 98 ft. (30 m) although it can often be less depending on site conditions, weather, and other factors. Given the paucity of data on bat distribution in Hawai'i, the primary goal of these detectors was to determine bat absence/presence in the area and subsequently quantify bat activity if detected. These detectors do not document bat activity in the rotor swept zone which typically begins at heights above 98 ft (30 m). Surveys conducted at wind farms in the continental U.S. typically exhibit notably higher frequencies of detection of migratory tree-roosting bat from detectors placed at tree height (<20 m or 66 ft) versus those placed within the rotor swept zone (RSZ) (>40 m or 131 ft), particularly where surveys have been conducted

throughout the spring through fall seasons, and not just during migration periods (Robert Roy, unpublished data). For example, at the Sheffield Wind in Vermont, where detectors were deployed year round in 2006, a total of 881 calls were recorded from detectors at tree height, while only 68 calls were recorded within the RSZ. Calls at tree height were over an order of magnitude more than calls detected within the RSZ. This dataset extends beyond the migration period and thus captures the foraging activity of tree-roosting bats at different heights, which is an area of greater concern in Hawai'i. Most other studies typically only sample for migratory tree-roosting bats during the migration period, these data provide good information on the causes of bat mortality during migration, but may be less applicable to Hawai'i. During the fall migration season, Baerwald and Barclay (2009) documented that hoary bats are more active at 30m (98 ft) than at ground level; however, in a Wisconsin study, Redell et al. (2006) reported no significant difference in activity levels of so-called "low-frequency" species (including hoary bats) with increasing height above ground level.

At KWP and KWP II, bat call sequences were mostly detected between the months of May and November (Table 3.5; Figure 3.5).

Thirty-nine bat passes, were recorded by the four to seven detectors over the sampling period from August 2008 to June 2010 (see Table 3.5 for data and definitions). This equates to a detection rate of 0.011 passes/detector/night (39 bat passes/3436 detector nights). This is less than 2% of the detection rates measured during a study being conducted by U.S. Geological Survey (USGS) at Hakalau National Wildlife Refuge on the Island of Hawai'i (0.66 bat passes/detector/night) (Bonaccorso, unpub. 2008).

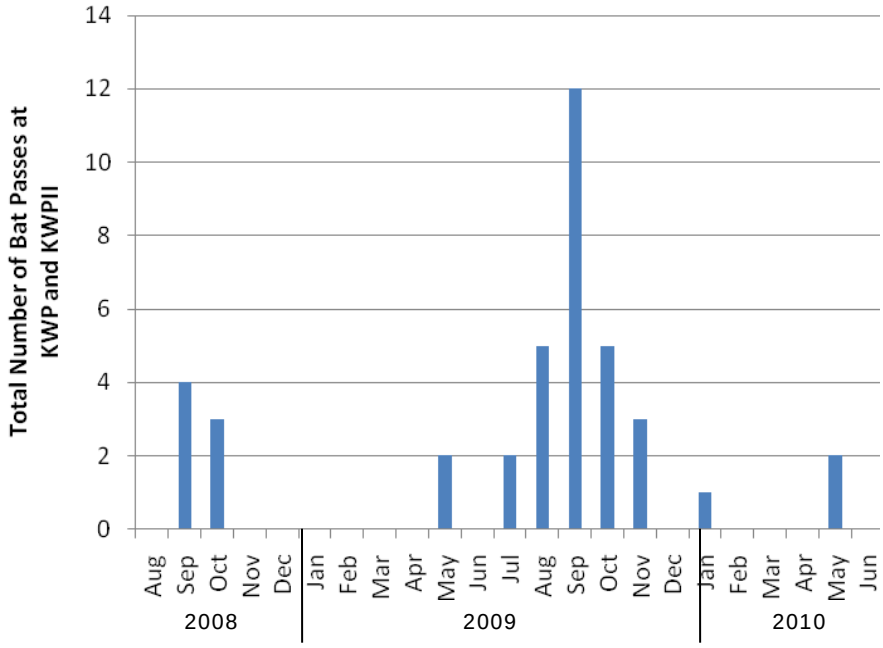

Figure 3.5 Temporal Distribution of Anabat Detections at KWP and KWP II from August 2008 to June 2010.

Table 3.5 Results of Acoustical Bat Monitoring at KWP.

Detector ID #	Location	Survey dates	Operation Days	Total Passes	Total Detection Rate
1	KWP I	08/08/08-11/11/08	86	2	***0.02***
2	KWP I	08/08/08-11/05/08	86	3	***0.03***
3	KWP I	08/07/08-11/05/08	82	2	***0.02***
4	KWP I	08/07/08-11/12/08	89	0	0.00
5	KWP I	11/12/08-04/07/09	138	0	0.00
6	KWP I	11/12/08-04/15/09	138	0	0.00
7	KWP I	11/14/08-04/16/09	159	0	0.00
8	KWP I	11/14/08-04/04/09	72	0	0.00
9	KWP I	04/28/09-05/27/10	343	1	0.00
10	KWP I	05/17/09-06/30/10	394	12	***0.03***
11	KWP I	05/07/09-05/27/10	307	0	0.00
12	KWP I	04/28/09-05/27/10	366	4	***0.01***
13	KWP I	06/02/09-05/27/10	324	1	0.00
14	KWP II	06/03/09-06/30/10	375	12	***0.03***
15	KWP II	06/03/09-05/27/10	314	2	***0.01***
16	KWP I	06/03/09-10/23/09	66	0	0.00
17	KWP I	06/24/10-06/30/10	7	0	0.00
18	KWP II	05/27/10-06/30/10	35	0	0.00
19	KWP I	06/27/10-06/30/10	5	0	0.00
20	KWP II	05/27/10-06/30/10	16	0	0.00
21	KWP II	05/28/10-06/30/10	34	0	0.00
		Total detector nights	**3,436**		
		Total passes	**39**		
		Overall detection rate	**0.011**		

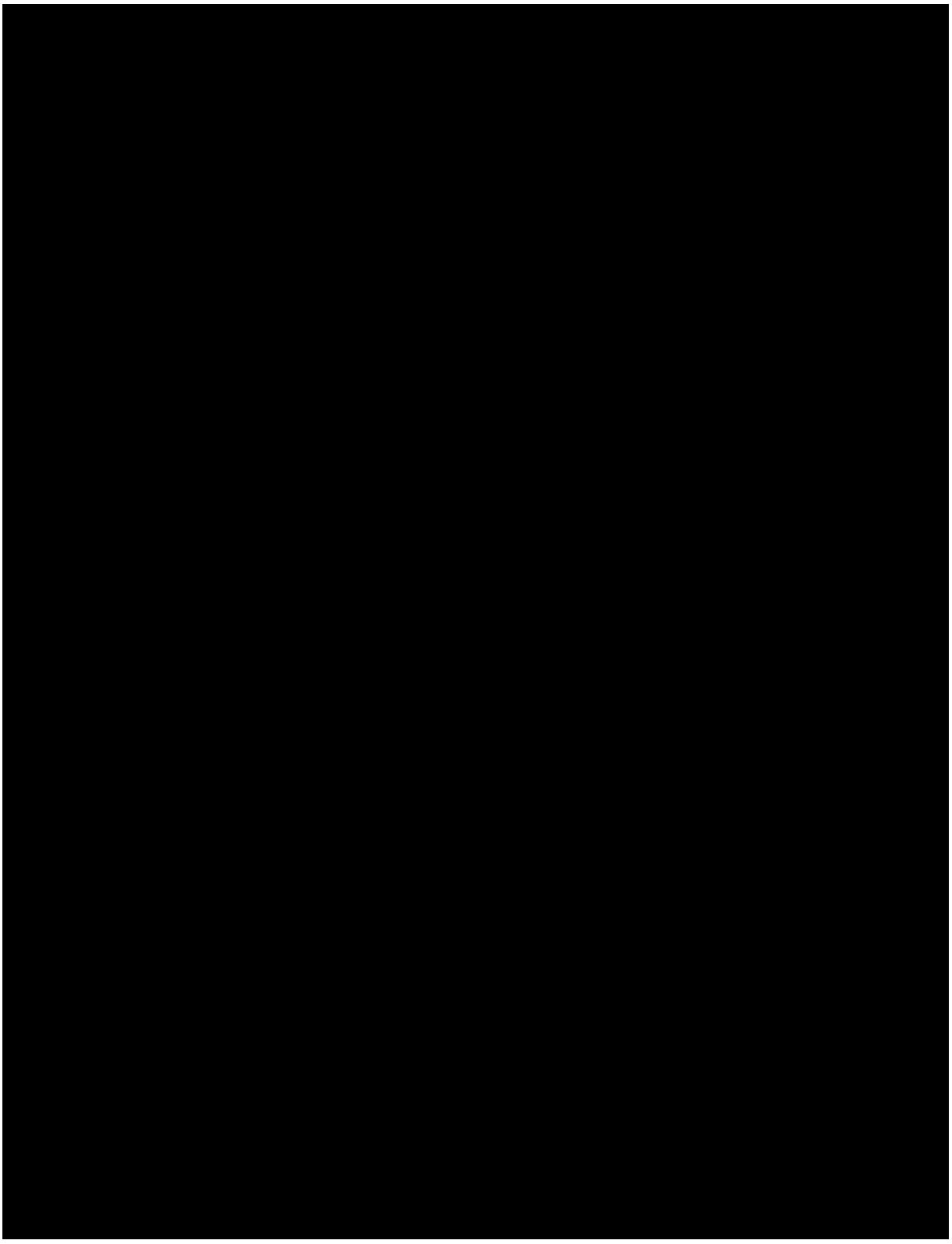

Figure 3.6 Locations of Anabat Detectors at Kaheawa Pastures.

A similar pattern was observed for data collected from 2011 to 2012 (Figure 3.7) also using Anabat detectors (Titley Electronics, NSW, Australia).

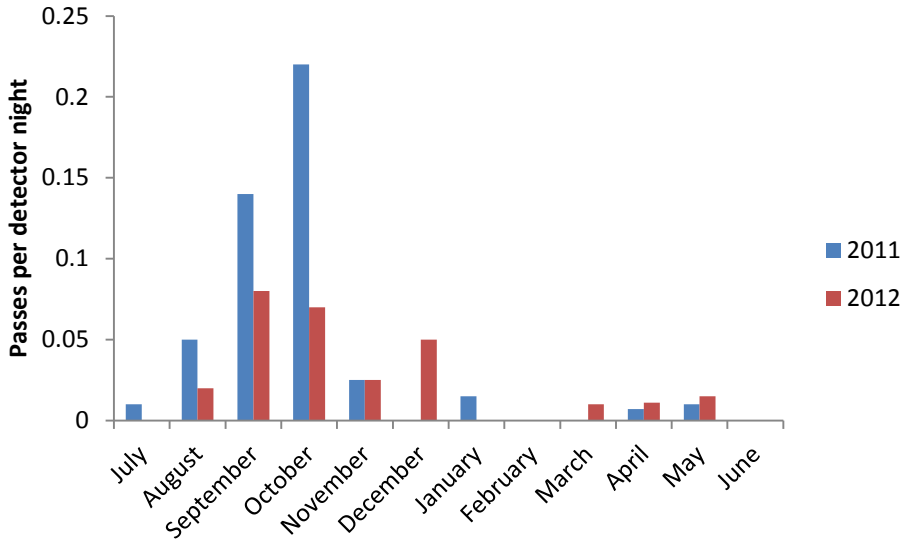

Figure 3.7 Bat Activity at KWP I and KWPII from FY2011 to FY2012.

From October 2013 to January 2015, 17 Wildlife Acoustic bat detectors (SM2BAT+) were deployed at KWP and KWPII. The proportion of nights with bat detections peaked in September and October showing a similar seasonal trend as the bat activity data collected from 2008 - 2010 and 2011 – 2012 (see Figures 3.5, 3.7, and 3.8). Due to differences in the sensitivity of the acoustic detectors and microphones used for the different equipment, the data from October 2013 to January 2015 cannot be directly compared with data collected with Anabat detectors from 2008 to 2012.

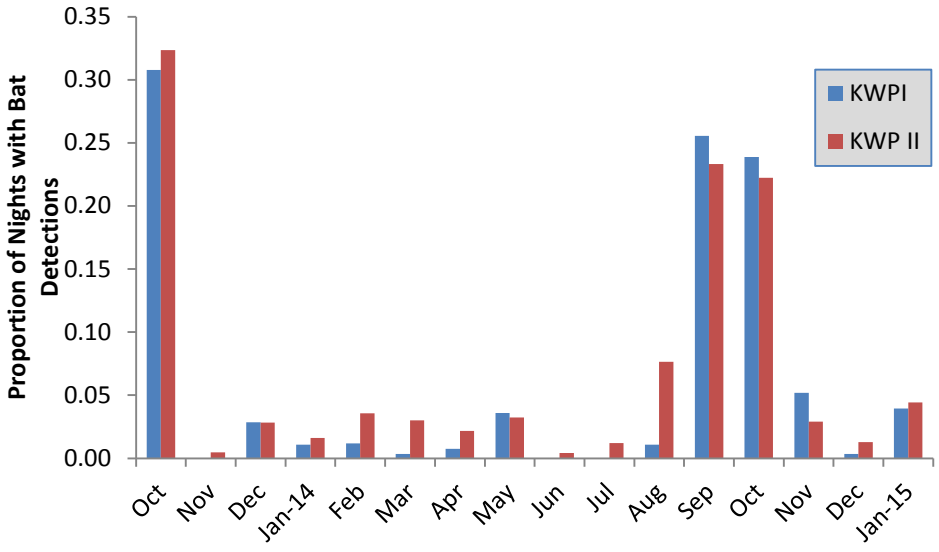

Figure 3.8 Proportion of Nights with Bat Detections at KWP I and KWPII from October 2013 to January 2015 (575 Total Nights per Detector for 17 Detectors).

HCP Section 5.2 (*Estimating Project-related Impacts*)

Preconstruction Tier 1 and Tier 2 Estimates for Covered Species

In the State of Hawai'i, wind-powered generation facilities are relatively new; thus, few wildlife monitoring impact studies have been conducted to document the direct or indirect impact of wind energy facilities on particular species. However, post-construction monitoring to document downed wildlife has been conducted at the KWP facility since operations began in June 2006 (Kaheawa Wind Power 2008b, 2008c) and suggests that avian mortality resulting from the proposed KWP II project may occur at a lower rate than has occurred at facilities in the continental U.S. This information is based upon the best available insight into the potential risk to wildlife posed by WTGs in the Downroad KWP II project area, as well as the take estimates made for the KWP project. No Covered Species were found downed or dead during the first year of construction and operation of the KWP project (Kaheawa Wind Power 2007a, 2007b). From the second to fifth years of monitoring, KWP documented observed direct take of three listed species: three adult Hawaiian petrels, nine full-grown nēnē, and two Hawaiian hoary bats (Kaheawa Wind Power 2008b, 2008c, 2009). Other documented fatalities include six white-tailed tropic birds, two short-eared owls, one great frigate bird, four ringed-necked pheasants, six black francolins, two gray francolins, two Eurasian skylarks, two spotted doves, one barn owl and one Japanese white-eye have collided with the towers or turbine rotors at KWP. .

Construction and operation of the KWP II project would create the potential for the Covered Species to collide with the WTGs, temporary and permanent met towers, overhead collection lines and cranes used for construction of the turbines. Estimating the potential for each Covered Species to collide with these project components (i.e., "direct take") was done using the results of the on-site surveys, information about the proposed project design, and the results of post-construction monitoring at the adjacent KWP facility. The fatality estimates for the Covered Species at KWP II considered the species occurrence at KWPII compared to KWP and the average annual rate of take of that species known to be occurring at KWP.

In addition to "direct take," collision with project components can also result in the "indirect take" of Covered Species. It is possible that adult birds directly taken during certain times of the year could have been tending to eggs, nestlings or dependent fledglings, or that adult bats could have been tending to dependent juveniles. The loss of these adults could then also lead to the loss of eggs or dependent young. Loss of eggs or young would be "indirect take" attributable to the proposed project. Methods for determining indirect take are described in detail in Section 5.2.1.

Estimated annual mortality resulting from the KWP II project for each of the Covered Species is provided in the following sections. Included for each species is an estimate of the amount of indirect take expected to occur based on the expected level of direct take. As discussed in Section 7.2 (Monitoring), the "total direct take" attributed to the KWP II project will be the sum of observed direct take (actual individuals found during post-construction monitoring) and unobserved direct take based on searcher efficiency and scavenging trial results. The latter will account for individuals that may be killed by collision with project components but that are not found by searchers for various reasons, including vegetation cover and scavenging. The equations discussed are presented below:

Total Direct Take = Observed Take + Unobserved Take

Total Adjusted Take = Total Direct Take + Indirect Take

"Total direct take" will be calculated based on the best available estimator approved by the agencies at the time. An example of an estimator, proposed in Huso (2008) is presented below.

$$\hat{m}_{ij} = \frac{c_{ij}}{\hat{r}_{ij}\hat{p}_{ij}\hat{e}_{ij}}$$

where

- $\mathbf{m_{ij}}$ Estimated mortality
- $\mathbf{r_{ij}}$ Estimated proportion of carcasses remaining after scavenging
- $\mathbf{e_{ij}}$ Effective search interval
- $\mathbf{p_{ij}}$ Estimated searcher efficiency
- $\mathbf{c_{ij}}$ Observed take

A detailed protocol of how monitoring will take place at KWP II (including methods of quantifying searcher efficiency and scavenging rates) is provided in Section 7.2 and Appendix 2.

Sections 5.2.2 through 5.2.5 identify anticipated levels of direct and indirect take for each of the Covered Species. Due to the very low observed levels of activity at KWP II for most of the Covered Species, the mortality modeling provides very low estimated rates of direct take. For most species, based on the modeling, annual mortality is expected to average less than one individual per species per year over the life of the project. To account for the stochastic nature of take over time, where take in any given year may be higher or lower than the expected long-term average, 1-year, 5-year, and 20-year take limits are proposed (e.g., take for Species A could be authorized as three individuals in any given year but not more than five individuals total every 5 years and not more than 10 individuals for 20 years). Short-term take limits (1-year and 5-year limits) also provide benchmarks for the monitoring of take and will enable mitigation efforts to be tailored to respond to more immediate events. Twenty-year limits, however, are believed to be a better reflection of the long-term amount of take expected.

Post-construction monitoring will be used to determine "total direct take" attributable to the project on an annual basis. "Total direct take" and "indirect take" of each Covered Species will be identified as "Tier 1," or "Tier 2." The amount requested to be authorized by the ITP and ITL will cover the "total adjusted take," essentially the sum of "total direct take" and "indirect take". For each species, the annual **Tier 1** level of take was estimated based on the expected average annual mortality, rounded up to the nearest whole integer, and then adjusted to account for expected levels of unobserved direct take. For example, modeling suggests nēnē mortality will occur at an average rate of approximately 0.5 adults per year. To identify the annual Tier 1 level of take requested to be authorized, this was first rounded up to one adult per year (i.e., almost 2x). Then, based on assumptions concerning unobserved direct take, it was expected that the discovery of one nēnē mortality in a given year would lead to an assessment of total direct take for that year of two nēnē. So, while the modeling suggests that nēnē mortality will occur at a rate of roughly one adult bird every two years, because it cannot be known if or in what years mortality will occur and because of assumptions concerning unobserved direct take, it is necessary to have the annual Tier 1 take authorization for nēnē allow the total direct take of a minimum of two adult birds in any given year. In addition, to allow for the uneven distribution of take over time, it is possible for two birds to be taken in any one year, followed by no take in the subsequent years. Hence, an observed take of two birds in one year is possible and likely to be rounded up to a total direct take of three to four birds after all the adjustments have been applied. Therefore, for some of the Covered Species, a direct take of up to four birds is requested for the *annual* Tier 1 level of take. The 5-year and 20-year Tier 1 levels, being of a longer-term duration, however, are expected to more closely reflect the expected *annual average* mortalities.

A **Tier 2** rate of take would be that which exceeds the authorized Tier 1rate. A Tier 2 rate of take is 1.5 to 2 times the Tier 1 rate of take over a **5-** or **20**-year period. Because of expected annual variability in actual rates of take, this HCP proposes that different levels of take be authorized. Any take occurring in excess of the one-year, 5-year, and 20-year Tier 1 limits could be

considered a “Tier 2” rate. However, it would be possible for rates of take to occur so unevenly that take could qualify as “Tier 2” in one year and “Tier 1” over the corresponding 5-year term. Therefore, Tier 2 rates of take identified over 5-year and 20-year terms will be used to make adjustments to mitigation efforts because they will have incorporated some averaging of annual variability, while Tier 2 rates measured over one-year terms will be used as “early warnings” that adjustments to mitigation efforts may become necessary and to spur investigation into why a Tier 2 rate of take occurred and whether steps can be taken to reduce future take. If post-construction monitoring indicates that take has exceeded the 5-year or 20-year Tier 1 take limit for any species, the Applicant would be determined to be at a Tier 2 rate of take and would implement Tier 2 mitigation.

Post-Construction Tier 3 and Tier 4 Estimates for Nēnē and the Hawaiian Hoary Bat

Post-construction fatality monitoring at KWPII in 2013 and 2014 and the use of fatality estimation modeling has determined that the estimated rates of take of nēnē and the Hawaiian hoary bat are higher than originally anticipated. The Tier 2 take levels for both species are expected to be exceeded before the end of the ITP/ITL terms. Therefore, an increase in take authorizations for nēnē and the Hawaiian hoary bat is being requested and additional take Tiers (i.e., “Tier 3” and “Tier 4”) are added to the HCP for these two Covered Species.

For Tier 3 and Tier 4 take 1-year and 5-year limits are eliminated. Tier 4 for both species represents the 20-year take limit. Intensive monitoring from 2013-2014 allowed a rate of take to be estimated for each species which was extrapolated over the remainder of the ITP/ITL permit terms to determine an estimated total 20-year take. The 20-year requested take will be equivalent to the estimated Total Adjusted Take where:

Total Direct Take = Observed Take + Unobserved Take

Total Adjusted Take = Total Direct Take + Indirect Take

Observed take, unobserved take, direct take, and indirect take are defined in Section 5.2.1 above.

The requested 20-year take estimate consists simply of a requested authorized level of take for a certain number of individual bats or nēnē, and is not broken up into adults/immatures (total direct take) and fledglings/juveniles (indirect take). This single number was derived by identifying the number of young expected to be associated with the adults lost to collisions, and then estimating how many of those young would have survived to adulthood after accounting for natural mortality. This number of potential adults is then added to the estimated total direct take to yield the expected total adjusted take.

For example, if the total adjusted take is estimated to be 4 adult/immature bats (direct take) and 2 juveniles (indirect take), and assuming that 48% of juveniles survive to adulthood, the 2 juveniles convert to 0.96 adults (2 x 0.48 = 0.96) which is rounded to 1 adult. This 1 adult is then added to the estimated direct take of 4 adult/immature bats resulting in a total adjusted take (and requested take) of 5 bats.

HCP Section 5.2.4.1 (Nēnē Collision Risk and Avoidance Behavior – Estimating Direct Take for Tier 1 and Tier 2)

Nēnē at KWP are commonly observed displaying avoidance behavior and maneuverability in the vicinity of project structures and moving rotors (Spencer pers. comm.; Kaheawa Wind Power 2008b, 2008c). While this indicates that the geese generally see and avoid the WTGs, nine nēnē mortalities from wind turbine collisions have been observed from ~~since~~ June 2006, when the 20 KWP WTGs became operational, to December 2011. The first incident in October, 2007 occurred during an ordinary period of strong trade winds. The second and third incidents were closely correlated with abrupt changes in local weather that included increases in local wind speeds and cloud cover associated with large scale weather events that may have significantly reduced visibility of the WTGs. This suggests that nēnē may be more vulnerable to collisions with turbines, met towers, and other structures during periods of strong winds and low visibility. Circumstances surrounding the fourth fatality are unknown; the carcass was in an advanced stage of deterioration by the time it was discovered. Five observed mortalities occurred in 2011, largely attributed to the increased number of nēnē present at one particular site where hydroseeding had taken place.

After adjusting the observed direct take at KWP for the effects of searcher efficiency and carcass removal by scavengers, the estimated total direct take at this facility after five years of operation has been 12.8 birds (Appendix 16). However, the take has not been evenly distributed over the years, 2011 was an abnormally high year for nēnē take with more than twice the take of any of the previous years (Table 5.6). This has been attributed to the hydroseeding of a work area at KWP which attracted nēnē to feed in this area which resulted in a greater number of collisions with the turbines in 2011. No future hydroseeding is expected in the coming years and based on the consequences observed, other alternatives will be implemented if erosion control is needed, to avoid attracting nēnē to the project area.

Table 5.6 Estimated Total Direct Take for Nēnē at KWP.

Year	2007	2008	2009	2010	2011
Adjusted Direct Take for Nene	0	3.1	1.2	1.2	7.3

Consequently, to calculate the expected rate of take at KWPII, the average rate of take at KWP is calculated based only on years 2007 – 2010. The total adjusted direct take for 2007-2010 is 5.5 birds over 4 years, or 1.4 birds/year or 0.07 birds/turbine at KWP. As nēnē are encountered less frequently the KWP II area than at KWP (35% of all nēnē sightings have been made in the Downroad area vs. 65% of sightings at KWP, see Section 3.8.3.3), the risk of nēnē colliding with the turbines is assumed to be 0.54 (=35/65) times the risk at KWP per turbine. This results in an expected mortality of 0.04 birds/turbine/year or 0.5 birds/year for all 14 turbines combined at KWPII.

In addition to collisions with WTGs, some potential exists for nēnē to collide with the temporary and permanent met towers and construction equipment, such as cranes during the construction phase of the project. To date, no nēnē have been found to have collided with met towers at KWP. Potential for the birds to collide with met towers is essentially accounted for in the estimated rate of take extrapolated from the KWP data since the rate of take at KWP was developed by dividing the sum of all project-related take (take caused by met towers was zero) and dividing that by the number of turbines.

No nēnē collided with any cranes during the construction phase of that project. As discussed for the two seabird species, the one permanently stationed crane is not expected to pose a collision threat to the nēnē because it is expected to be used during the daytime and stored in a horizontal position at ground level when not in use. Nēnē should also be able to avoid collisions with the overhead collection lines while flying and the new collection lines will be strung with marker balls

to increase their visibility. No nēne collisions with the overhead lines already on site have been documented thus far. Because nēnē are comparatively large birds, the potential for construction or maintenance vehicles to strike downed nēnē is considered to be negligible because of the proposed staff training measures and project road speed limit of 10 mph.

Concerns that immediate revegetation measures conducted on site may present foraging opportunities for nēnē, thereby attracting nēnē to the vicinity of the turbines, have arisen during discussions with DLNR and USFWS. However, based on observations by KWP biologists, nēnē are attracted to grass used in immediate revegetation mainly during the early emergent phase of growth and hence revegetation measures will be a source of attraction for only a short period of time. Nēnē in flight have also been documented to exhibit avoidance behavior around turbines (Kaheawa Wind Power 2008b, 2008c), hence the risk to nēnē due to attraction resulting from revegetation with grasses is considered minimal.

Based on the above, it is estimated the total proposed KWP II project would result in an average direct take of 0.5 nēnē/year.

HCP Section 5.2.4.3 (*Indirect Take of Nēnē for Tier 1 and Tier 2*)

It is assumed that adult nēnē are most likely to collide with turbines and associated structures during non-breeding periods (May through July) or at the end of their breeding period when the adults and young may travel as family groups. Nēnē are highly territorial during the breeding season (Banko et al. 1999) and males are likely to be defending nesting territories while the females are incubating. Upon hatching, both parents would be attending to heavily dependent young; adult nēnē also molt while in the latter part of their breeding period and are therefore flightless for four to six weeks (USFWS 2004a). These adults attain their flight feathers at about the same time as their goslings (USFWS 2004a). Consequently, such birds are more likely to be in flight within KWP II only when goslings have already fledged.

Indirect take to account for loss of dependent young will be assessed for adult nēnē only when mortality occurs during the breeding season (August to April). Adults found during the months of October through March will be assumed to have had a 60% chance of having been actively breeding because 60% of the population has been recorded to breed in any given year (Banko et al. 1999). Adult nēnē mortality that occurs outside the peak breeding season (April, August and September) will be assumed to have had a 25% chance of breeding. Male and female nēnē care for their young fairly equally, so indirect take would be assessed equally to the direct take of any male or female adult nēnē found during the breeding season. Because breeding nēnē are not expected to collide with WTGs prior to the fledging of their young, it is assumed that the number of young possibly affected by loss of an adult would be based on the average number of fledglings produced per pair (studies indicate that average number of fledglings produced annually per pair of nēnē is 0.3 (Hu 1998)).

Based on these assumptions, as indicated in Table 5.7 below, the amount of indirect take that would be assessed for each direct take of an adult nēnē during the months of October through March is 0.09. Amount of indirect take assessed for each direct take of an adult bird during the remainder of the breeding season would be 0.04 (life history data presented can be found in Appendix 7).

Table 5.7 Calculation of Indirect Take of Nēnē

Nēnē	Season	No. fledglings per pair (A)	Likelihood of breeding (B)	Parental contribution (C)	Indirect (A*B*C)
Adult, any gender	Oct-Mar	0.3	0.60	0.5	0.09
Adult, any gender	April, Aug and Sep	0.3	0.25	0.5	0.04
Adult, any gender	May–July	--	0.00	--	0.00
Immature	All year	--	0.00	--	0.00

HCP Section 5.2.4.4. (Estimating Total Adjusted Take for Nēnē – Tier 1 and Tier 2)

Based on estimated rates of direct and indirect take, annual take of this species resulting from project operations is expected to be no more than 0.55 birds or essentially one bird per year. This is based on the expected rate of 0.5 adults/year with assessment for indirect take (0.5 + (0.09 fledglings/year x 0.5) = 0.55).

The DLNR and ESRC have recommended that annual take limits allow for at least one **observed** take a year. Because of assumptions concerning unobserved direct take, any one nēnē found to have collided with a project component in a year will lead to an assessment of total direct take for that year of greater than one that likely would be rounded up to two birds (based on expected results from take monitoring and subsequent adjustments for searcher efficiency and scavenging rates). Moreover, as take may be distributed unevenly over the years (see Section 5.2), based on the above, the Applicant suggests the ITP and ITL should allow for a total direct take of at least four adult nēnē and the indirect take of one fledgling for any given year for the duration of the project (see below for calculation of indirect take). The requested Tier 1 take is one and a half times the calculated expected take to accommodate any factors that have not yet been considered in the risk assessment (such as a slow increase in the resident nēnē population over time which may increase the risk of take).

While the birds attributed to unobserved take would be assumed and, therefore, of unknown age or gender, for the purposes of this HCP it will be assumed that all birds taken through "unobserved direct take" will be of adults. Because nēnē could be flying through the project area at any time of year, the likelihood of an "unobserved take" of nēnē being in breeding condition is 37.5% based on a breeding period of 4.5 months (a one-month incubation period followed by parental care for 3.5 months; 4.5/12 = 0.375).

Consequently, following the above table, indirect take will be assessed to nēnē lost through "unobserved direct take" at the rate of 0.06 fledglings/nēnē (0.3 x 0.375 x 0.50 = 0.0563).
In addition to the annual rate of take, a 5-year and 20-year take limit based on the expected multi-year average rate of take are also proposed. This calculation does not use a multiple of the annual rate of take because the actual expected take will vary year to year (e.g., take for Species A could be authorized as three individuals in any given year but not more than five individuals total every five years and 15 adults every 20 years). See Section 5.2 for a detailed explanation. Expected rates of take and rates of take requested to be authorized by the ITP and ITL through the expected 20-year life of the project are summarized below, along with rates of take considered to qualify as "Tier 2."

Expected Rate of Take

Annual average	0.5 adults/immatures and 0.05 fledglings	0.55 birds/year
20-year project life	11 adults/immatures and 1 fledgling	

Requested Tier 1 ITL Authorization

Annual limit of take	4 adults/immatures and 1 fledgling	5 birds/year
5-year limit of take	8 adults/immatures and 1 fledgling	
20-year limit	18 adults/immatures and 2-3 fledglings	

Tier 2 Take Rate

One-year period	>4-6 adults/immatures and >1 fledgling
5-year period	>8-12 adults/immatures and >2-3 fledglings
20-year period	>18–27 adults/immatures and >2-3 fledglings

The most current statewide population estimate for nēnē is between 1,300 and 1,500 individuals, with 315 birds occurring on Maui (DOFAW, unpubl.). For the entire population statewide, the Tier 1 rate (1.05 birds/yr) and Tier 2 rate of take (1.5 birds/yr) requested for nēnē over the 20-year period represents a take of 0.08% and 0.12% of the population per year. In the unlikely event that all the requested take were to occur at once, it will impact roughly 1.62% (Tier 1) and 2.31% (Tier 2) of the species' population, respectively. This is not expected to cause a decline in the status of the species. For the island of Maui, the Tier 1 rate of take represents 0.3% of the island's population per year and the Tier 2 rate represents 0.5% of the island's population per year. In the unlikely event that all the requested take were to occur at once, it will impact roughly 15.56% of the island's population at Tier 1 and the Tier 2 rate represents 22.22% of the island's population. Should take occur at Tier 2 levels and persist indefinitely, this could result in a decline of the local population that has been established in the vicinity of the Hana'ula release pen. However, when considered in light of the proposed mitigation, Tier 1 and Tier 2 mitigation are expected to exceed the requested take at the required tier well before the end of the permit term and for this reason, no significant adverse impacts to the species' overall populations are anticipated.

HCP Section 5.2.4.5 (*Estimating Tier 4 Total Adjusted Take for Nēnē Based On Post-Construction Fatality Monitoring Data*)

Estimating Total Direct Take

As of February 2015, three nēnē mortalities have been recorded at KWPII. These occurred on April 22, 2014, December 22, 2014, and February 23, 2015. Extrapolation of these data using the Evidence of Absence Model (Huso et al. 2015) results in a 20-year expected total direct take of 46 adults/immatures at the 80% credibility level (see Appendix 27 for calculations).

Estimating Indirect Take

The three documented takes of nēnē at KWPII were recorded in April and December 2014, and February 2015. Using Table 5.7, indirect take for these three individuals is assessed at 0.22 fledglings (0.09 + 0.04 + 0.09 = 0.22).

In fiscal year 2016, fatality monitoring for the project will be reduced. It is projected that five more fatalities will be found with the reduced monitoring (Appendix 27). If indirect take of 0.09 fledglings is assess for each projected observed take (Table 5.7), an indirect take of 0.45 fledglings will be assessed. A total indirect take of 0.67 fledglings (0.22 + 0.45 = 0.67) is expected from documented and anticipated observed takes for the duration of the project.

The remaining 38 adults/immatures that may be directly taken would be considered unobserved take. Based on information provided in Section 5.2.4.4, indirect take will be assessed to nēnē lost through "unobserved direct take" at the rate of 0.06 fledglings/nēnē. The indirect take for 38 adults would be 2.28 fledglings. Adding in the indirect take of 0.67 fledglings from observed fatalities, the total fledglings indirectly taken would be 2.95, rounded to 3 fledglings.

Estimating Total Adjusted Take (Direct Plus Indirect Take)

Nēnē mature at age two for males and age three for females and an annual mortality rate is estimated at 20% (i.e., an annual survival rate of 80%, see Appendix 5 for life history information). Assuming all 3 fledglings would mature at age 2, after applying an annual survival rate of 80% for two years, 1.92 adults (rounded to two adults) can be expected after 2 years. The addition of this indirect take of two adults to the expected total direct take of 46 individuals results in a total adjusted take, and therefore a requested take, of 48 individuals for the Tier 4 limit.

Requested Tier 4 ITL/ITP Authorization

20-year take 48 nēnē

The most current statewide population estimate for nēnē (from 2012) is between 2,457 and 2,547 individuals, with 416 birds occurring on Maui (Nene Recovery Action Group 2012, unpubl.). For the entire population statewide, the Tier 4 estimated take (at an annual rate of 2.4 birds/yr) requested for nēnē over the 20-year period represents a take of 0.1% of the population per year. In the unlikely event that the entire requested take were to occur at once, it would impact roughly 2% of the species' population. This would not be expected to cause a decline in the status of the species. For the island of Maui, the annual rate of take represents 0.5% of the island's population per year. In the unlikely event that the entire requested take were to occur at once, it would impact roughly 11.5% of the island's population. The possibility of all take occurring within a year is unlikely given the rates of take observed as of February 2015 at KWPII (3 years of operation) and KWP (9 years of operation). Further, the mitigation is expected to offset the impacts of the take and provide an additional environmental benefit. Therefore, no adverse effect to the species population is expected.

HCP Section 5.2.5 (*Hawaiian Hoary Bat*)

Low rates of activity by Hawaiian hoary bats have been measured at KWP (see Section 3.8.4.3). The lack of visual observations and low recorded activity levels at KWP suggest that only a small number of bats utilize the general area. Bats are not expected to breed or roost at KWP II due to the lack of trees. Due to the similarity in terrain between KWP and KWP II, the estimated mortality at KWP II for Tier 1 and Tier 2 estimates were extrapolated from ~~is expected to be similar to~~ the mortality rates at the existing KWP site. Hawaiian hoary bats breed from 0 to 4,200 feet (1280 m) in elevation (Menard 2001), so it is possible that vola~~e~~nt juveniles occur in the project area in the latter portion of the breeding season.

5.2.5.1 Collision Risk and Other Potential Causes of Take at KWP II (Direct Take Estimates for Tier 1 and Tier 2)

The potential for take of the Hawaiian hoary bat is believed to be very low based on the surveys that have been conducted at the KWP and KWP II project areas, the limited available information regarding the species occurrence on West Maui, and the apparent relatively low susceptibility of resident (versus migrating) bats to collisions with wind turbines in general. However, the occurrence of at least a few individuals in the project area has been documented, and two observed fatalities have been recorded at the KWP facility over five years of project operation.

The two fatalities recorded at KWP from 2006 to 2011 equate to a total direct take of 6 bats after adjustments for unobserved take, resulting in an average of 1.2 bats/year for KWP or 0.06 bats/turbine/year (Kaheawa Wind Power 2011, Appendix 16). Extrapolating this rate to KWP II results in an average direct take of 0.84 bats/year for all 14 turbines at KWP II.

Potential for bats to collide with met towers or cranes is considered to be negligible because they would be immobile and should be readily detectable by the bats through echolocation. Of 64 wind turbines studied at Mountaineer Wind Energy Center in the Appalachian plateau in West Virginia, bat fatalities were recorded at operating turbines, but not at a turbine that remained non-operational during the study period. This supports the expectation that presence of the stationary structures, such as an un-guyed lattice met tower and crane, should not result in bat fatalities (Kerns et al. 2005). No bats have been found to have collided with the guyed met towers at KWP after five years of operation or with any cranes during the construction phase of that project. No downed bats have been found during the weekly searches of the permanent met tower at the Kahuku Wind Power site which was erected in the winter of 2010. Potential for the bats to collide with met towers is also essentially accounted for in the estimated rate of take extrapolated from the KWP data since the rate of take at KWP was developed by dividing the sum of all project-related take (take caused by met towers was zero) and dividing that by the number of turbines.

5.2.5.2 Indirect Take for Tier 1 and Tier 2

Hoary bats are thought to move to higher elevations during the months of January through March (Menard 2001), and so may be less prevalent in the project area during those months. However given the lack of empirical data and for the purposes of the HCP, it is assumed that levels of bat activity on site remain constant throughout the year. Consequently, adult bats are considered to have equal potential to collide with turbines throughout the year and regardless of breeding status.

Hawaiian hoary bats breed between April and August (Menard 2001). Females are solely responsible for the care and feeding of young, and twin pups are typically born each year, although single pups sometimes occur. To date, no breeding records for Hawaiian hoary bat exist for Maui, however, any female bats directly taken from April through August will be examined and, if determined to be lactating, indirect take will be assessed. No indirect take will be assessed for female bats found at other times of year, or for male or immature bats found at any time of year. The rate at which indirect take will be assessed for lactating female bats found during the months of April through August is 1.8 juveniles per adult female as indicated in Table 6-14 below (life history data presented can be found in Appendix 5).

Table 5.8 Calculating Indirect Take for the Hawaiian Hoary Bat.

Hawaiian hoary bat	Season/ Breeding Condition	Average no. of juveniles per pair (A)	Likelihood of breeding (B)	Parental contribution (C)	Indirect take (A*B*C)
Female	Lactating	1.8	1.0	1.00	1.80
Female	Not lactating	--	0.0	--	0.00
Male	All year	--	0.0	0.00	0.00
Immature	All year	--	0.0	--	0.00

5.2.5.3 Estimating Total Tier 1 and Tier 2 Take for the Hawaiian Hoary Bat

As indicated, the average rate of direct take of Hawaiian hoary bats as a result of project operations is expected to be 0.84 bats/yr. The implementation of low wind speed curtailment is anticipated to further reduce take by at an average of70% (Arnett et al. 2009, 2010), thus the expected take is0.25 bats/yr. Indirect take associated with this level of direct take would result in a maximum of 0.45 juveniles per year (=0.25 x 1.8) resulting in a total adjusted take of 0.70 bats/year or essentially one bat per year (see Table 5.8, life history data presented can be found in Appendix 7).

As with the other species addressed in this HCP, the DLNR and ESRC have recommended that annual take limits allow for at least one **observed** take a year. Again, because of assumptions concerning unobserved direct take, any one Hawaiian hoary bat found to have collided with a project component in a year will lead to an assessment of total direct take for that year of greater than one likely to be rounded up to four bats (based on expected results from take monitoring and expected subsequent adjustments for searcher efficiency and scavenging rates). Existing literature on adjusting total direct take for bats suggests that a ratio of one observed take to three unobserved takes is not unreasonable and may be conservative (e.g., Arnett 2005; Jain et al. 2007; Fiedler et al. 2007).

While the other bats taken under these scenarios would be assumed and, therefore, of unknown age or gender, for the purposes of this HCP it will be assumed that all Hawaiian hoary bats taken through "unobserved direct take" will be adults and will have a 50% chance of having been female (based on the sex ratio of males to females during the breeding season). In addition, because bats most likely would be flying through the project area from April through November, spanning a period of eight months, the likelihood of a female bat having dependent young is assumed to be 13%. This is based on the information that Hawaiian hoary bats have one brood a year, and are expected to have dependent young one month out of the eight months (parental care of one month after birth; NatureServe 2008) present on site. Further, parental care is limited to a period June through September. Consequently, indirect take will be assessed to bats lost through "unobserved direct take" at the rate of 0.1 juveniles/bat (0.5 x 0.13 x 1.8 = 0.12).

As an example, indirect take assessed to a total direct take of 4 bats (1 observed direct take + 3 unobserved direct takes) is assumed to be no more than 2.1 juveniles. Consequently, the Applicant suggests the ITP and ITL should allow for a total direct take of up to four adult or volent juvenile Hawaiian hoary bats and the indirect take of up to two dependent juvenile bats for any given year for the duration of the project. A 5-year and 20-year take limit based on the expected multi-year average rate of take are also proposed. This calculation does not use a multiple of the annual rate of take because the actual expected take will vary year to year (e.g., take for Species A could be authorized as three individuals in any given year but not more than five individuals total every five years and 15 adults every 20 years); see Section 5.2 for a detailed explanation. Expected rates of take and rates of take requested to be authorized by the ITP and ITL through the expected 20-year life of the project are summarized below, along with rates of take considered to qualify as "Higher."

Expected Rate of Take

Average	0.25 adults and 0.45 juveniles	0.70 bats/year
20-year project life	5 adults and 3 juveniles (assuming half of all direct take is female)	

Requested Tier 1 ITL Authorization

~~Annual limit of take~~	~~4 adults/immatures and 2 juveniles 6 bats/year~~[4]
Five-year limit of take	7 ~~6 adults/immatures and 3 juveniles~~[4]
20-year limit	7 ~~6 adults/immatures and 3 juveniles~~[4]

Tier 2 Take Rate

~~One-year period~~	~~5-9 adults/immatures and 3-5 juveniles~~[5]
5-year period	11 ~~7-9 adults/immatures and 3-5 juveniles~~[5]
20-year period	11 ~~7-9 adults/immatures and 3-5 juveniles~~[5]

The most recent population estimates for Hawaiian hoary bat have ranged from several hundred to several thousand (Tomich 1969; Menard 2001). The Recovery Plan for the Hawaiian Hoary Bat (USFWS 1998) states "since no accurate population estimates exist for this subspecies and because historical information regarding its past distribution is scant, the decline of the bat has been largely inferred." Although overall numbers of Hawaiian hoary bats are believed to be low, they are thought to occur in the greatest numbers on the islands of Hawai'i and Kaua'i (Menard 2001).

It is difficult to gauge the effect that take of Hawaiian hoary bat resulting from the proposed project may have on the population of this species because its population is not known. The identified Tier 1 level of take is low and so it seems unlikely that take at this rate would result in a significant impact on the overall population of the Hawaiian hoary bat. Tier 2 levels of take may begin to impact the Maui population, if the population is very small, although this seems unlikely to occur given the relatively low habitat availability on the site and low activity levels. In any case, such take would not likely impact the status of the species on other islands where populations are assumed to be more robust. The Applicant's proposed mitigation for the anticipated take (see Section 6.5) will contribute to restoration of native bat habitat and should result in an overall net conservation benefit for the species.

[4] This was revised to be equivalent to 7 bats in a clarification letter from USFWS and DOFAW (2014-TA0260), dated May 20, 2014. The annual take limit was also removed.
[5] This was revised to be equivalent to 11 bats in a clarification letter from USFWS and DOFAW (2014-TA0260), dated May 20, 2014. The annual take limit was also removed.

HCP SECTION 5.2.5.4 (*Estimating Total Take (Tier 4) for the Hawaiian Hoary Bat*)

Based on fatality monitoring at KWP from 2006 to 2014 and at KWPII from 2012 to 2014, and recent bat acoustic monitoring from 2013 to 2015 (see Section 3.8.4.3), Hawaiian hoary bats are likely to occur year round at KWPII. Table 5.10 identifies the months where fatalities have been documented at KWP and KWPII.

Table 5.10. Total Hawaiian Hoary Bat Fatalities by Month for KWP and KWPII.

	Number of Fatalities		
	KWP	KWPII	Total
Jan	0	0	0
Feb	1	1	2
Mar	0	1	1
Apr	3	0	3
May	1	0	1
Jun	0	0	0
Jul	0	0	0
Aug	0	0	0
Sep	2	0	2
Oct	0	0	0
Nov	0	1	1
Dec	1	0	1
Total	**8**	**3**	**11**

Estimating Direct Take

As of October 2014, three (3) fatalities have been recorded at KWPII on March 13, 2013, November 5, 2013, and February 26, 2014. Extrapolation of these data using the Evidence of Absence Model (Huso et al. 2015) results in a 20-year (Tier 4) estimated total direct take of 87 bats at the 80% credibility level (see Appendix 27 for calculations).

Low-wind speed curtailment (LWSC) began at KWP II in July 2012 at 5 m/s and continued through December 1, 2012. In 2013 and 2014 LWSC began on March 14 and February 27, respectively and continued through December 4 and 16, respectively. In, 2015 LWSC began in February 15 and was then increased from 5.0 m/s to 5.5 m/s on July 28, 2014 and will continue at 5.5 m/s between February 15 and December 15 for the duration of the 20 year permit. LWSC is expected to reduce overall potential direct take based on results from various studies on the mainland.

Arnett et al. (2011) conducted studies on the mainland quantifying the effects of low wind speed curtailment on bat mortality. Their studies indicate that most bat collisions occur at relatively low wind speeds, and consequently the risk of fatalities may be significantly reduced by curtailing operation on nights when winds are light. Their research shows that bat fatalities were reduced by an average of 82 percent (95 percent CI: 52 – 93 percent) in 2008 and by 72 percent (95 percent CI: 44 – 86 percent) in 2009 when cut-in speed was increased to 5 m/s and turbine blades were feathered at lower wind speeds. Subsequent studies have also shown significant reductions in fatalities at Fowler Ridge, Indiana (Good et al. 2011) feathering alone below normal cut-in speed of 3.5 m/s reduced fatalities by 36 percent, below 4.5 m/s by 57 percent and below 5.5 m/s by 73 percent (16 percent increase from 4.5 to 5.5 m/s). An anonymous study in USFWS Region 3 showed a fatality reduction from 47 percent to 72 percent for cut-in speeds of 4.5 and 5.5 m/s, respectively, (a 25 percent additional reduction from 4.5 to 5.5 m/s) (Figure 5.1).

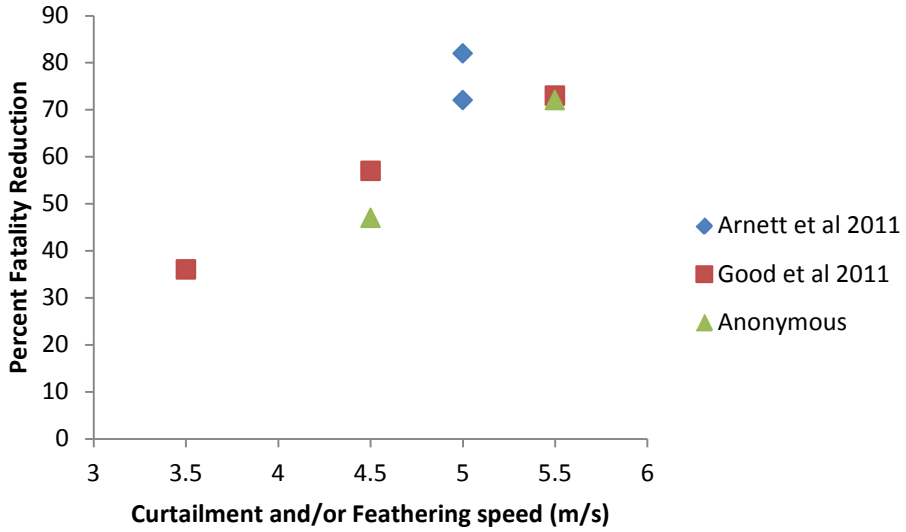

Figure 5.1. Percent Fatality Reduction in Various Studies on the Mainland.

KWP II proposes that by increasing LWSC from 5.0 to 5.5 m/s the subsequent estimated direct take should be reduced by at least 15%. Based on the three observed fatalities, the estimated take at the 80% credibility level as of April 2015 stands at 16 bats, therefore take not yet accrued is estimated to be 71 bats (87 – 16 = 71). Applying a 15% reduction to the remaining fatality that has yet to occur results in an estimated fatality of 60.4 bats (71 - (71 x 0.15) = 60.4).

Thus the total direct take is estimated to be 76.4 (60.4 + 16 = 76.4) bats rounded up to 77 bats.

Estimating Indirect Take

Given that fatalities at KWP and KWPII are distributed throughout the year (Table 5.10), it is assumed that adult bats have equal potential to collide with turbines throughout the year regardless of breeding status.

Three (3) fatalities at KWPII were documented during the non-breeding season in February, March, and November. No bats were taken during the parental care season and none of the three fatalities were of lactating individuals; therefore, no indirect take (i.e., consideration of young) was assessed for the documented fatalities.

The remaining estimated 61 fatalities (Table 5.11) for the purposes of estimating indirect take will fall under "unobserved direct take". Calculation of indirect take for "unobserved direct take" follows the same calculations described in Section 5.2.5.3 above where indirect take is assessed to bats lost through "unobserved direct take" at the rate of 0.1 juveniles/bat. Based on these calculations, an indirect take totaling 6.1 juveniles (61 x 0.1 = 6.1, Table 5.11) is estimated.

The expected indirect take from unobserved direct take is therefore 6.1 juveniles

Estimating Total Adjusted Take (Direct Plus Indirect Take)

For purposes of indirect take, juvenile bats are converted to adults based on a conversion rate of 2.1 juveniles to 1 adult (USFWS and DLNR Letter to First Wind 2014-TA-0258, dated May 20, 2014). This converts the total indirect take of 6.1 juveniles to 2.9 adults rounded to 3 adults. Adding these three adults to the estimated total direct take of 77 bats, results in an estimated total adjusted take of 80 bats.

The Tier 4 take limit is 69 bats greater than the Tier 2 limit of 11 bats (see Section 5.2.5.3 footnote no. 2).

Requested Tier 4 ITL/ITP Authorization

20-year take estimate	80 bats

The most recent population estimates for Hawaiian hoary bat have ranged from several hundred to several thousand (Tomich 1969; Menard 2001). The Recovery Plan for the Hawaiian Hoary Bat (USFWS 1998) states "since no accurate population estimates exist for this subspecies and because historical information regarding its past distribution is scant, the decline of the bat has been largely inferred." Hoary bats are thought to occur in the greatest numbers on the islands of Hawai'i and Kaua'i (Menard 2001). Recent studies on the Island of Hawai'i have indicated, based on acoustic data, that the population there is either stable or increasing (Gorresen et al. 2013). However, no population estimates were provided. Bats on the Island of Hawai'i are habitat generalists and occur from sea level to the highest peaks on the island (Gorresen et al. 2013).

The size of the Hawaiian hoary bat population on Maui also is not known. Therefore, it is difficult to gauge the impact that the take of Hawaiian hoary bats resulting from the proposed project may have on the species. The projected yearly rate of take is 4 bats per year. The annual rate of take of 4 adults/year translates to approximately 9 juveniles a year (using a ratio of 2.1 juveniles to one adult) (see Section 5.2.5.3). Because the Hawaiian hoary bat is reproductively mature in one year and a female Hawaiian hoary bat produces on average 1.8 pups a year, it will take the offspring of approximately five reproductively active females each year to replace the lost individuals. Assuming the Maui bat population is similarly stable or increasing as on the Island of Hawai'i, and similarly widespread over all habitats, significant impacts to the Maui population from this estimated yearly rate of take at KWPII are not anticipated. Furthermore, the proposed mitigation (see Section 6.5), portions of which have already been implemented, will contribute to 1) preventing the degradation of, and 2) improving the quality of, native bat foraging and roosting habitat.

HCP Section 5.3 (*Cumulative Impacts*)

The only other wind project that has been proposed on Maui is the 21 MW Auwahi Wind Farm at ʻUlupalakua Ranch located on the leeward slope of Haleakalā on the southern coast of East Maui. A Draft EIS was released for this project in February 2011 (Tetra Tech EC, Inc. 2011a) and Auwahi Wind Energy LLC prepared a Draft HCP in June 2011 (Tetra Tech EC, Inc. 2011b) to obtain an ITP and ITL. Four state and federally listed wildlife species have been identified as having the potential to be adversely impacted by construction and operation of the Auwahi project: the Hawaiian hoary bat, Hawaiian petrel, nēnē, and Blackburn's sphinx moth. Mitigation measures to compensate for the take of these Covered Species at the proposed Auwahi Wind Farm have been developed in cooperation with USFWS, DOFAW, and the ESRC. If the project is ultimately approved, there is a potential for cumulative impacts to these species.

The proposed construction and operation of the Advanced Technology Solar Telescope (ATST) at the Haleakalā High Altitude Observatory Site has the potential to impact the endangered Hawaiian petrel. The National Science Foundation prepared a final HCP in October 2010 pursuant to the requirements of the ESA and HRS 195D that estimates incidental take of 35 Hawaiian petrel individuals (30 fledglings and 5 adults) over a six-year period (NSF 2010). An EA to address impacts of the ITL and associated conservation measures was also prepared (NSF 2011).

At a broader scale, KWP II represents one of many projects of various types that can be expected to occur on the Island of Maui. Some of the causes of decline of the Covered Species (such as mammal predation, bright light disorientation, and loss of nesting or roosting habitats) may be on the increase due to continued real estate development on Maui, and will likely continue increasing in the future. Even when conducted in compliance with all applicable local, State and Federal environmental regulations, there is the potential for cumulative impacts to occur from these projects because many do not trigger review under endangered species provisions and thus are not required to meet the "net environmental benefit" standard. By implementing this HCP, KWP II will ensure that the net effects of this project will contribute to the recovery of the covered Species, and thus not contribute to cumulative impacts that may occur as a result of these other developments.

Take for the Covered Species has been authorized on Oʻahu, Maui and Kauaʻi through several HCPs and Safe Harbor Agreements (SHAs) (Table 5.9). Under a Safe Harbor Agreement, property owners voluntarily undertake management activities on their property to enhance, restore or maintain habitat benefiting species listed under the ESA. These agreements assure property owners they will not be subjected to increased property use restrictions if their efforts attract listed species to their property or increase the numbers or distribution of listed species already on their property. The USFWS issues the Applicant an "enhancement of survival" permit which authorizes any necessary future incidental take through Section 10(a)(1)(A) of the ESA. Accordingly, all impacts associated with these Section 10 permits have been mitigated.

Updated cumulative effects analyses for nēnē and the Hawaiian hoary bat are found in Sections 5.3.3.1 and 5.3.4.1 below.

HCP Section 5.3.3.1 (*Nēnē - Updated*)

Incidental take of nene has been authorized or requested at several locations on Maui (Table 5.10). From 2006 to January 2015, KWP LLC observed direct take of twenty-one full-grown nēnē (Kaheawa Wind Power 2008b, 2009; First Wind and KWP LLC 2011). From 2005 to 2011, two nēnē fatalities have been documented at Piʻiholo Ranch, while 48 nēnē have been released at this site (DOFAW 2008). Take has also been authorized for this species at the Auwahi Wind Farm due to the potential for colliding with WTGs and other project components. Other developments on Maui with the potential to have cumulative impacts to nēnē include developments that decrease nesting and foraging habitat, as well as golf courses which may attract nēnē to the area, increasing their vulnerability to vehicular collisions or golf ball strikes (Mitchell et al. 2005).

Proposed mitigation measures for nēnē at KWP, KWP II, and Auwahi Wind sites are expected to more than offset the estimated incidental take either approved or requested, and will contribute to

the species' recovery by providing a net conservation benefit, as required by State law. Similar measures are expected for other developments on Maui with the potential to impact nēnē. Given the expectation that impacts of any future projects will include mitigation to provide a measurable net benefit for nēnē, the cumulative impact of take authorized for KWP II combined with previously and future authorized take is not expected to result in a significant cumulative impact to the species.

HCP Section 5.3.4.1 (*Hawaiian Hoary Bat - Updated*)

The only other authorized take of Hawaiian hoary bats on Maui are at the KWP I facility and Auwahi Wind Farm. As of June 2015, a total of eight Hawaiian hoary bat fatalities have been documented at KWP I; three have been documented at KWP II and five at Auwahi Wind Power (Auwahi Wind Energy LLC, 2014, USFWS pers.com.).

Other developments on Maui with the potential to have cumulative impacts to the Hawaiian hoary bat include resort or recreational developments, farming, road construction, pesticide use, and other developments that decrease nesting and roosting habitat. It is however not known at this time if any of these activities will result in any direct take of the Hawaiian hoary bat.

On O'ahu, take of Hawaiian hoary bats has been authorized for the Kahuku Wind Power facility and Kawailoa Wind Power (Table 5.9). The Na Pua Makani draft HCP has recently been submitted to the USFWS and requests incidental take authorization for 51 Hawaiian hoary bats on O'ahu. Mitigation for these projects consists of funding for research and funding for appropriate management measures.

Because an accurate population estimate for this species is not available (see Section 3.8.4), it is difficult to gauge whether the take of Hawaiian hoary bat will result in a significant impact to the overall population. Research was the main component of Kaheawa Wind Power I mitigation due to the need for research to help determine some basic life history parameters and identify effective management measures, which in turn will help guide future management and recovery efforts. Kahuku Wind Power, Auwahi Wind Project and KWP II will mitigate for bats by restoring forest habitat to increase or improve bat foraging and roosting habitat and possibly by funding further bat population and ecology research. This is expected to increase survival and reproductive success commensurate with take and provide a net benefit to the species. Kawailoa Wind Power's mitigation for the anticipated take of Hawaiian hoary bat will also contribute to restoration of native bat habitat (either wetland or forest) with a research component and is anticipated to have the same benefits. Similar mitigation measures are assumed for Na Pua Makani on O'ahu. Therefore, there is no anticipated significant impact to the Hawaiian hoary bat.

Table 5.10 Current Take authorizations for Nēnē and Hawaiian Hoary Bat on Maui, Kaua'i, and O'ahu (additional take is being or will be requested for KWP I, Kahuku and Kawailoa).

Permittee	Permit Duration	Location	Species Covered	No. of Permitted Take Over Permit Duration
Habitat Conservation Plan Permits				
Kaheawa Wind Power I	01/30/2006-01/30/2026	Mā'alaea, Maui	Hawaiian hoary bat	20
			Nēnē	60
Kahuku Wind Power	05/27/2010-05/27/2030	Kahuku, O'ahu	Hawaiian hoary bat	32
Kawailoa Wind Power	2012-2032	Oahu	Hawaiian hoary bat	60
Auwahi Wind Farm	2012-2037	Maui	Hawaiian hoary bat	19 adults and 8 young
			Nēnē	5
Safe Harbor Agreement Permits[a]				
USDA Farm Bill Conservation Programs [b]	09/12/2007-09/12/2017	Statewide	Nēnē	Various
Pi'iholo Ranch	09/21/2004-09/21/2054	Makawao, Maui	Nēnē	>0 [a]

[a] The SHA is expected to result in a net conservation benefit. Incidental take is authorized for all covered activities on the property under the ESA Section 10(a)(1)(A) and an HRS Chapter 195-D ITL.

HCP Section 6.0 (*Mitigation for Potential Impacts and Selection of Mitigation Measures*)

The proposed mitigation program for KWP II was influenced greatly by the approved mitigation program for KWP and the data that has been collected by KWP biologists since operations commenced. In coordination with biologists from DLNR and USFWS, the Applicant will build upon the existing KWP mitigation program, or perform other appropriate mitigation measures, to achieve the biological goals and objectives identified in Chapter 4.

The following principles were followed in selecting the proposed mitigation measures:

- The level of mitigation in general should be commensurate with the level of requested take for required tier and provide a net benefit to the species.
- Mitigation should be species-specific and, to the extent practicable, location or island-specific.
- Mitigation measures should be practicable and capable of being done given currently available technology and information.
- Mitigation measures should have measurable goals and objectives that allow success to be assessed.
- Mitigation measures should be consistent with or otherwise advance the strategies of the respective species' draft or approved recovery plans.
- Mitigation measures that serve to directly "replace" individuals that may be taken (e.g., by improving breeding success or adult and juvenile survival) are preferred, though efforts to improve the knowledge base for poorly documented species also have merit, particularly when the information to be gained can benefit future efforts to improve survival and productivity.
- Off-site mitigation measures to protect breeding or nesting areas for birds, and roosting areas for bats, located on otherwise unprotected private land are preferred over those on public land, and sites on state land are preferred over those on federal land.
- Measures to decrease the level of take resulting from a private activity unrelated to the project (e.g., rescue/rehabilitation of downed seabirds outside the project area as a result of disorientation by outdoor lights not related to the proposed project) may be considered if agreed upon by the agencies.
- Alternate or supplemental mitigation measures should be identified for future implementation if monitoring shows the level of take is found to be higher (or lower) than anticipated. See appendix 26 for further information on triggers and timelines for contingencies and Tier 2 mitigation.

The following sections provide details of the measures proposed, and these are summarized in Table 6.1 and 6.10. The estimated cost for each measure is presented in Appendix 6. Should alternate mitigation measures or locations be identified or otherwise become available that would present the Applicant with a greater chance of meeting the biological goals and objectives of this HCP, the Applicant reserves the right to propose such alternate mitigation instead of the measures identified below if such mitigation receives approval from the USFWS and DLNR. All mitigation measures chosen for the project will be subject to review by DLNR and USFWS over the lifetime of the project and may be , modified, or continued without modification, depending on measured levels of take and the success of mitigation measures, and as agreed upon by the Applicant, USFWS and DLNR. As discussed, the Covered Species considered to have potential to be incidentally taken during operation of the KWP II project include the Hawaiian petrel, Newell's shearwater, nēnē, and Hawaiian hoary bat. The mitigation proposed to compensate for impacts to these species is based on anticipated levels of incidental take as determined through on-site surveys, modeling, and the results of post-construction monitoring conducted at KWP.

Table 6.1 Proposed Mitigation for Covered Species: Tier 1 and Tier 2 Take Scenarios

Tier 1 mitigation	Tier 2
Hawaiian Petrel	
Tier 1. 1. Implement a comprehensive plan for seabird colony management at Makamakaʻole, on West Maui near lower Kahakuloa Valley, that would include predator proof fencing an enclosure, eradication within the enclosures, social attraction and artificial burrows. The success of the social attraction project in establishing a breeding and growing colony will be determined after 5 years and if unsuccessful, additional measures will be implemented till mitigation is commensurate with the requested take. AND/OR 2. Participate in the management of the Hawaiian petrel colony breeding in the crater of Haleakalā in an approximately 220 ac (89 ha) area with approximately 100 burrows. This would include contributing to contracting the labor and purchasing equipment (e.g., traps and bait) required to conduct predator trapping in this area (or a section thereof, depending on mitigation requirement), and to conduct monitoring to document success. AND/OR 3. Provide support for colony-based protection and productivity enhancement for Hawaiian petrels at the ATST mitigation site after 2016 when ATST mitigation obligations are fulfilled.	Management will be initiated, or if already initiated for Tier 1 mitigation expanded to an area known to be occupied by unprotected burrows.
Newell's Shearwater	
Tier 1 1. Implement a comprehensive plan for seabird colony management at Makamakaʻole, on West Maui near lower Kahakuloa Valley, that would include predator proof fencing an enclosure, eradication within the enclosures, social attraction and artificial burrows. The success of the social attraction project in establishing a breeding and growing colony will be determined after 5 years and if unsuccessful, additional measures will be implemented till mitigation is commensurate with the requested take. AND/OR 2. Implement predator exclosure and social attraction scenario at an alternative site in East Maui, or implement predator exclosure at an in-situ site at upper Kahakuloa or alternative site on East Maui, if deemed feasible. AND/OR 3. Provide support for colony-based protection and productivity enhancement, or social attraction and predator exclusion for Newell's shearwaters on Molokai or Lanai.	Progress through Tier 1 mitigation alternatives, which were developed to offset Tier 1 and Tier 2 take.

Nēnē	
1. Fund the building of a new release pen to accommodate spillover of nene from other pens or participate in the translocation of eggs, adults or family groups from Kaua'i. Additional funding for management of the new pen for the first five years will be provided regardless of take, this includes support for logistics, DOFAW staffing, predator control and vegetation management activities. Perform systematic visual observations of nēnē activity within KWP II site to document how nēnē use the project area following construction.	1. Extend management activities at pen constructed for Tier 1, including support for logistics, DOFAW staffing predator control and vegetation management. Monitor and model benefits of action to confirm mitigation offsets Tier 2 take.
Hawaiian Hoary Bat	
1a. Conduct surveys to document bat occupancy at different habitat types (e.g., ridges vs. gulches) and elevation ranges at KWP II and vicinity to support Maui bat research. 1b. Restoration of bat habitat at acreage commensurate with the requested take.	1a. Continue surveys to document bat occupancy at different habitat types (e.g., ridges vs. gulches) and elevation ranges at KWP II and vicinity to support Maui bat research. 1b. Restoration of additional bat habitat at acreage commensurate with the requested take.

Table 6.10. Proposed Tier 3 Mitigation for Nēnē and Hawaiian Hoary Bats

Nēnē (Tier 3 and 4)
1. Provide additional funding at an existing pen or at a site where nēnē regularly forage or nest to increase survival rates and productivity. Monitor and model benefits of action to confirm mitigation offsets take. AND/OR 2. Provide additional funding to implement predator control in known nēnē nesting areas.
Hawaiian Hoary Bat (Tier 3 and 4)
1. Restore bat habitat or implement other management measures at an approved conservation site commensurate with the requested take. AND/OR 2. Fund or support bat research that will provide life history information and aid in the recovery of the species.

Tier 1 and Tier 2 Mitigation for Covered Species

Possible rates of incidental take for all species discussed in this document have been identified as "Tier 1," and "Tier 2." These take levels were previously defined in Section 5.2. Initial yearly mitigation efforts are designed to compensate for requested take at the 20-year Tier 1 level. Later in the project, total adjusted take as estimated through post-construction monitoring will be used to determine which tier take is occurring at and the necessary levels of mitigation required to achieve mitigation success.

The proposed seabird and nēnē mitigation will include funding measures intended to increase populations of these species. Measures intended to increase seabird population sizes will generally be aimed at eliminating predation through exclusion and/or eradication of predators from a breeding area. Reducing or eradicating predators can dramatically increase adult and juvenile survival, leading to increased productivity, (e.g., Ebbert and Byrd 2002; Pascal et al. 2008; Hu et al. 2001; Hodges and Nagata 2001), thus compensating for any individuals that may be incidentally taken by the project.

The Applicant proposes to provide mitigation for nēnē primarily by improving survival and productivity of the existing nēnē populations at a release pen or at Hana'ula and the KWP project areas through predator control. This will enhance efforts to establish separate breeding populations on Maui as recommended by the Draft Revised Recovery Plan for the species (USFWS 2004a).

Proposed mitigation for the Hawaiian hoary bat consists of funding studies intended to provide a better understanding of the status and distribution of the species on Maui in order to facilitate future State, Federal, or private conservation and management efforts. Funding will also be provided to restore native plant habitat to increase foraging or roosting sites for the Hawaiian hoary bat. The estimated cost for each measure for the Covered Species is presented in Appendix 6. As mitigation efforts may occur on state land for any of the Covered Species, all required permits will be obtained before any mitigation measures commence.

Because authorized take of some of the Covered Species has the potential to occur early in the project, but the benefits expected from mitigation efforts would not be fully realized until some later point in time, it is possible that take could occur before mitigation measures have allowed for increases in productivity. This would result in a lag between the time of incidental take and intended replacement, possibly resulting in a slight loss of productivity by the species over that time. Therefore, the proposed levels of mitigation are also intended to compensate for possible loss of productivity by incidentally taken, sexually mature adult birds for the anticipated lag-period.

Results of post-construction monitoring will be used to determine annually whether take is occurring at Tier 1 or Tier 2 rates. In general, mitigation efforts will be adjusted to compensate for the requested take at the required tier. The Applicant will promptly coordinate with USFWS and DLNR if Tier 2 rates of take are occurring in order to adjust mitigation efforts accordingly and, if five-year take limits are exceeded, to implement adaptive management measures. Sections 5.2.2.4, 5.2.3.4, 5.2.4.4, and 5.2.5.3 identify the rates of take that will be considered "Tier 2" for each species, as well as the amounts of time considered necessary to determine those rates. If Tier 2 mitigation is initiated, these mitigation measures will be completed, even if monitoring indicates that take has fallen back into Tier 1 levels.

Tier 3 and 4 Mitigation for the Hawaiian Hoary Bat and Nēnē

Tier 3 and 4 mitigation measures are identified in Sections 6.4.4 and 6.5.3 to compensate for the Tier 3 and 4 requested take for the Hawaiian hoary bat and nēnē. Mitigation measures for both species build upon the Tier 1 and Tier 2 mitigation measures identified above.

HCP Section 6.4.4 (*Mitigation for Tier 3 and Tier 4 Rate of Take - Nēnē*)

Mitigation for nēnē take at the Tier 3 and 4 levels will consist of expanding the existing pen on Moloka'i or implementing predator control at an already established pen or nesting site on Maui, Molokai, or Lana'i. Mitigation will be commensurate with the take of twenty-one additional nēnē above the Tier 2 take limit.

If predator control is chosen, funding will be provided for up to three years or until success criteria are met. Funding will be provided to employ personnel and/or provide equipment to implement predator control measures. Proposed predator removal measures may consist of deploying traps, leg holds, and/or snares or broadcasting rodenticide. These measures are expected to significantly improve adult and juvenile survival and increase productivity of nēnē pairs commensurate with the requested take and provide a net benefit to the species.

Any extra mitigation credit (from previous mitigation measures) already accrued in excess of that required for Tier 2 will be applied. Actual monitoring regardless of mitigation measures chosen will document the changes in the nēnē population and reproductive success at the mitigation site. The number of fledglings or adults accrued above the baseline productivity at the mitigation site will count toward the mitigation requirements of KWP II. Monitoring will follow the same structure as outlined in 6.4.2.1.

However, should circumstances regarding nēnē population status or health change and indications are such that other conservation or management practices are deemed more important or pressing in aiding the recovery of the species, the Applicant in consultation with USFWS and DLNR will direct the funds toward whatever management or management activity is deemed most appropriate at the time.

HCP Section 6.4.6 (*Measures of Success*)

Strictly speaking, mitigation will be deemed to be successful if the mitigation efforts result in one more fledgling or adult than that required to compensate for the requested take of the required tier. In practice however mitigation measures are likely to provide much greater net benefits.

This success may be measured by an increase in adult or juvenile survival or increased productivity (average number of fledglings per pair) at the mitigation site ~~release pens~~ over the baseline productivity level ~~expected at an overcrowded pen~~. A taken adult may be replaced through increased survival rates of adults in the area or adults may be replaced by fledglings.

If mitigation efforts ~~at the release pens~~ do not exceed the baseline productivity or adult survival rates for two years running (to take into account possible annual variations), then adaptive management measures will be implemented. The magnitude and scope of these measures will be determined with approval of USFWS and DLNR and will be based upon monitoring data recorded at the mitigation site and best available science at that point in time.

Net benefit will also have been provided to the species these mitigation measures will aid in establishing one or more self-sustaining populations on Maui, in accordance with the recovery plan for the nēnē (USFWS 2004a).

The goal of the habitat conservation program (minimization, mitigation, and monitoring) is to compensate for the incidental take of each species authorized at each tier (Take Scenario), plus to provide a net conservation benefit as measured in biological terms. Thus, for example, although the overall expenditure at the Tier 1 is not expected to exceed a total of $3.16 million, the budgeted amounts are estimates and are not necessarily fixed. KWP II will provide the required conservation measures in full, even if the actual costs are greater than anticipated. One way of accomplishing this is that past, current or future funds allocated to a specific Covered Species may be re-allocated where necessary to provide for the cost of implementing conservation measures for another Covered Species, and funding for any individual Covered Species is not limited to those amounts estimated in Appendix 6. KWP II also recognizes the cost of implementing habitat conservation measures in any one year may exceed that year's total budget allocation, even if the overall expenditure for the conservation program stays within the total amount budgeted over the life of the project. Accomplishing these measures may, therefore, require funds from future years to be expended or likewise unspent funds from previous years to be carried forward for later use. For practical and commercial reasons, such reallocation of funds among years may require up to 18 months lead time to meet revenue and budgeting forecast requirements. However, if reallocation between species or budget years is not sufficient to provide the necessary conservation, KWP II will nonetheless be responsible for ensuring that the necessary conservation is provided.

HCP Section 6.5.3 (*Mitigation for Tier 3 and Tier 4 Rate of Take – Hawaiian Hoary Bat)*

As of November 2014, the mitigation for the authorized take of 11 bats at KWPII has been funded and mitigation measures are being implemented. The following section describes the proposed mitigation for the remaining estimated take of 69 bats over the remainder of the permit term.

HCP Section 6.5.3.1 (*Management Measures to Enhance Native Bat Habitat*)

The proposed mitigation will contribute to protecting and restoring 1,600 acres of habitat at the Lāhainā District of Maui, on Makila Land Company and State land (Figure 6.7). This area encompasses at least eight small to large valleys that have wind protection and riparian habitat that bats favor to travel and forage. The area also ranges in altitude from 300 to 5,200 feet in elevation covering both lowland and upland bat habitat. Primary threats to the area are ungulates, invasive weeds and fire. Feral ungulate threats include pigs, goats, and Axis deer and priority invasive weeds include *Toona cilata, Macaranga tanarius, Cortaderia jubata, Psidium cattleianum, Tibouchina herbacea, Prosopis pallida, Sphaeropteris cooperi, Pithecellobium dulce* and others. Fire threats are present due to the *Prosopis* stands in the lowlands which add to the persistence of fires and also invasive plants.

Ungulate fencing, ungulate control, fire-fuel management, long-term maintenance and monitoring, native tree out-planting, native plant seed dispersal, invasive species control and bat monitoring are proposed on the 1,600 acres. Bat monitoring will include deployment of a minimum of ten bat detectors within the habitat from July through September in the first year as a baseline and from July through September at least every fifth year thereafter. Although it is unknown whether bat acoustic activity rates will change with improving habitat restoration, bat acoustic activity will be measured to determine if changes in activity rates can be detected.

These actions will protect and provide secure habitat for recovery of the Hawaiian hoary bat over a diverse landscape that includes lowland dry forest and shrub land, lowland wet forest and shrub land, dry and wet cliff, lowland and montane mesic forest and shrub land, as well as, dry grassland vegetation communities. In addition, at least ten miles of riparian corridor and flowing streams will be protected within this area and are likely good foraging bat habitat. These management measures will maintain native roost trees and ensure the continued recruitment of saplings of roost trees and prevent the degradation of the riparian habitat. Maintaining or restoring diverse native understory and canopy also can increase native insect abundance, particularly of Lepidoptera (butterflies and moths), thereby enhancing foraging opportunities for the Hawaiian hoary bat.

The proposed mitigation would occur through the end of the KWP II take permit (i.e., approximately 17 years) unless take is reduced by applying bat deterrents, for example, and Tier 3 is not exceeded. If Tier 3 is exceeded the total estimated cost is no more than $3.5M if the ESRC approves the cost/bat of $50,000 (See Appendix 6). A management plan will be completed with the approval of DOFAW and USFWS prior to implementation of any management measures. If the rate of take would be reduced by applying bat deterrents, for example, or some other means such that Tier 3 is not expected to be exceeded the project could: 1) be funded for less than 17 years, 2) have specific mitigation actions or research projects canceled if not begun or reduced in scope if already begun, or 3) some combination of 1 and 2 that would limit the restoration and research projects to $1.95MM (Tier 3 cost for 39 bats) whichever combination is deemed most appropriate by SunEdison, the USFWS and DOFAW.

It is anticipated that the measures outlined above, or others developed in the future, will be implemented in partnership with other conservation groups or entities and will complement other restoration, reforestation, or conservation goals occurring in that area and at the same time. The location and size of mitigation sites also may be changed with the approval of DOFAW and USFWS. Funds will be directed toward whatever management or research activity is deemed most appropriate by the agencies at the time. Acquisition of property for conservation may also be considered if feasible and if deemed appropriate by the agencies. If at any time new scientific information indicates

mitigation measures other than habitat restoration are more important or pressing for recovery of the Hawaiian hoary bat, KWPII may revise the mitigation plan with the approval of USFWS and DLNR.

Figure 6.7. Google Earth view of the project area. The 1600 acre area in green is proposed for fencing. Fire fuel management and breaks will be maintained in red and ungulate and weed control efforts will assess and control priorities throughout the area. The section (in green) to be built is estimated to be 3.5 miles. This fence will stretch across Makila Land Company Property from the north to State land at the southern end. Out-planting locations have not yet been determined.

HCP Section 6.5.3.2 (*Research*)

Research to aid in the recovery of the Hawaiian hoary bat is also proposed as a separate mitigation measure. The proposed research may be conducted at the mitigation site described in Section 6.5.3.1 above or at other locations in Hawaii. Other potential research can be conducted and could for example include an insect assessment near the bat detectors and additional bat detector deployment. The final allocation of research funds and the amount of mitigation credit accrued will be determined in agreement with USFWS and DOFAW. The total cost for restoration and research will not exceed the Tier 4 level of mitigation, i.e., $3.45MM.

HCP Section 6.5.4 (*Measures of Success*)

The success of the Tier 1 and 2 mitigation efforts will be determined as follows:

1. Both components of on-site research into Hawaiian hoary bat habitat utilization and bat interaction with wind facilities will be considered successful if KWPII joins the HBRC and the specified survey and monitoring is carried out, including proper deployment and

operation of bat detectors, data reduction and analysis, and reporting of findings to DLNR, USFWS and ESRC.

2. In the event that KWPII exceeds the Tier 1 rate of take measures to reduce bat fatalities will be considered successful if one or more causes can be identified and corrective measures are implemented that result in an estimated 50 percent or greater reduction in bat fatalities over previous levels when averaged over a five-year period.
3. Implementation of management measures will be considered successful if KWPII contributes funding sufficient to restore the acreage required to compensate for the Tier 1 requested take (for take at or below Tier 1) within 6-months of beginning project operations; and if a Tier 2 rate of take is identified, additional funding sufficient to restore the acreage required to compensate for the Tier 2 requested take (for Tier 2 take upon exceeding the 5-year or 20-year Tier 1 requested take) is provided within six months of the determination. Management measures will be considered successful if prior to the start of management measures:
    a. Ground and canopy cover at the mitigation site is measured,

    And after 6 years:
    b. The fencing is completed;
    c. The ungulates have been removed within the fenced area and the area is kept free of ungulates for the 20-year permit term.

    And after 20 years
    d. The cover of non-native species (excluding kikuyu grass) in the managed areas is less than 50%.
    e. The mitigation area should have a canopy cover composed of dominant native tree species (particularly koa and ohia) that are representative of that habitat after 15 years of growth. 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." Therefore, there should be at least a 25% increase in canopy cover over original conditions throughout the mitigation area, and closed canopy areas should attain at least 60% canopy cover.
    f. Restoration trials are implemented.

These criteria will be refined by DOFAW before management commences in the Kahikunui area.

The measures of success for Tier 3 and 4 habitat protection and restoration efforts are:

1) Complete the fence (finish enclosing the 1600 acre parcel) within two years of the project approval,

2) Remove all ungulates within four years of completion of the fence,

3) Monitor for ungulates and repair fence lines regularly (at least quarterly) and maintain the area to be ungulate free for the duration of the proposed project.

4) Remove invasive ground cover at least in 200m buffers (or yet to be determined more appropriate buffer width) near to existing native forests to allow natural regeneration and in areas where trees will be out-planted to ensure young trees can thrive.

5) Determine appropriate target areas (at least 200 acres) within 2 years of the ungulate removal for out planting within the 1,600 acres through experimental plots within the target areas.

6) Plant native trees (Koa, Ohia, etc.) in at least 200 acres (up to 200 plants per acre) within 1 year after the experimental plots have been assessed with a target increase in canopy cover after 15

years of 25% (except in 20-30 foot wide lanes where trees are not planted in order to create "forest edges").

7) Remove invasive trees within native forests in order to create additional "forest edges" (numbers and species of trees not yet determined).

8) Disperse native plant seeds in areas where invasive plants and trees have been removed (area covered and species of seeds is not yet determined).

9) Conduct regular fire fuel management along 24 miles of fire breaks.

10) Deploy a minimum of 10 bat detectors within the WMMWP project habitat for at least July through September in the first year as a baseline and for July through September at least every fifth year thereafter. Although it is unknown whether bat acoustic detection rates will change with improving habitat restoration bat detection will be conducted to determine if any change in detection rate can be revealed.

11) The measure of success for any additional research will be that the research is completed within 5 years of approval of this proposal and reports provided by specific contracted researchers.

These specific success criteria can be modified by biologists implementing the management measures to tailor the criteria to site conditions. Success criteria will be included in the management plan and approved by DLNR and USFWS.

If research is funded as part of mitigation, implementation of the research will commence within one year of the research proposal approval and completed within five years. The mitigation will be considered successful when the funded research is completed and reported.

The goal of the habitat conservation program (minimization, mitigation and monitoring) is to compensate for the incidental take of each species authorized at each tier (Take Scenario), plus provide a net conservation benefit, as measured in biological terms. Although the overall expenditure at the Tier 1 is not expected to exceed a total of $3.16 million, the budgeted amounts are estimates and are not necessarily fixed. KWP II will provide the required conservation measures in full, even if the actual costs are greater than anticipated. One way of accomplishing this is that past, current or future funds allocated to a specific Covered Species may be re-allocated where necessary to provide for the cost of implementing conservation measures for another Covered Species, and funding for any individual Covered Species is not limited to those amounts estimated in Appendix 6. KWP II also recognizes the cost of implementing habitat conservation measures in any one year may exceed that year's total budget allocation, even if the overall expenditure for the conservation program stays within the total amount budgeted over the life of the project. Accomplishing these measures may, therefore, require funds from future years to be expended; or, likewise, unspent funds from previous years to be carried forward for later use. For practical and commercial reasons, such reallocation of funds among years may require up to 18 months lead time to meet revenue and budgeting forecast requirements. However, if reallocation between species or budget years is not sufficient to provide the necessary conservation, KWP II will nonetheless be responsible for ensuring that the necessary conservation is provided

HCP Section 7.2.1.1 (*Long Term Monitoring*)

The long term monitoring protocol for KWPII from Years 4 through 20 of the permit term will consist of a reduced search effort from the current intensive monitoring protocol. It will consist of searching roads and graded pads that occur within 70m radius from each turbine. SEEF and CARE trials will be conducted at least quarterly. The long term monitoring protocol is detailed in Appendix 28.

HCP Section 7.3 (*Summary of Adaptive Management Program*)

According to USFWS policy (see 65 Fed. Reg. 35242 [June 1, 2000]), adaptive management is defined as a formal, structured approach to dealing with uncertainty in natural resources management, using the experience of management and the results of research as an on-going feedback loop for continuous improvement. Adaptive approaches to management recognize that the answers to all management questions are not known and that the information necessary to formulate answers is often unavailable. Adaptive management also includes, by definition, a commitment to change management practices when determined appropriate.

In the case of KWP II, some uncertainty exists in the proposed project, from estimated rates of take to the success of the proposed mitigation measures. ~~Fortunately, because of the adjacent KWP project and the monitoring surveys that have been conducted since its turbines were erected in 2006, the level of uncertainty in the estimated rates of take is believed to be quite low. Similarly~~ However, there is reasonable basis for expecting the proposed mitigation measures to be successful, including a track record for successfully improving breeding success of seabirds through predator control and social attraction at colonies in Hawai'i and elsewhere, and a long history of nēnē releases on Maui and other islands. Nonetheless, uncertainties regarding take of Covered Species remain and, as a result, adaptive management provisions have been incorporated into this HCP. As of January 2015, the following adaptive management measures have been/can be implemented to address take of Hawaiian hoary bats:

- As an avoidance and minimization measure, from July 2012 to July 2014, low wind speed curtailment was in effect from 1900-0600 from April through November (see Section 4.3.1). As of July 29, 2014, the low-wind speed curtailment regime was modified to extend from February 15 to Dec 15 (due to known fatalities occurring on February 24 and 26, 2014 at KWP I and II respectively and a fatality on December 14, 2013 at KWP I). The cut-in and cut-out speed was raised to 5.5 m/s.

- If bat deterrent devices become commercially available and are effective and feasible, these may be implemented during the course of the permit term, with the agreement of USFWS and DLNR. In that situation, it is expected that Tier 3 take levels likely would not be exceeded and therefore mitigation for Tier 4 would not be required.

The proposed tiered approach to mitigation was designed with adaptive management in mind as it is acknowledged that actual rates of take may not match those projected through the seabird modeling and results of mortality monitoring performed to date at the KWP facility. Mitigation efforts will increase if monitoring demonstrates that incidental take is, or may be, occurring above Tier 1 levels. Any changes in the mitigation effort would be made only with the approval of USFWS and DLNR. Regardless of recorded take levels, the avoidance and minimization measures described in Section 4.3 would be employed for the duration of the KWP II project.

Monitoring of seabird and nēnē mitigation efforts is intended to inform the Applicant, USFWS, and DLNR as to whether these efforts are adequately compensating for the total direct take and indirect take assessed to the KWP II facility. If monitoring reveals that a particular mitigation effort is not achieving the necessary level of success as dictated by the amount of take assessed to the KWP II facility, the Applicant will, as adaptive management and as approved by USFWS and DLNR, develop and implement a revised mitigation strategy intended to meet the project mitigation requirements.

If the take of any of the Covered Species exceeds that authorized by the ITP and ITL at the Tier 1 level, but remains within the range identified in Section 5.0 as the Tier 2 (or Tier 3 and 4 for nēnē and the Hawaiian hoary bat) rate for that species, the Applicant will increase the mitigation effort for that species as prescribed in Section 6.0. As an adaptive management process, the Applicant will also promptly discuss this situation with USFWS and DLNR to review the total take of that species recorded to date at the KWP II facility and the mitigation performed to date on behalf of that species, and to identify whether mitigation performed to date has compensated for the Tier 2 (or Tier 3 or 4) rate of take, or whether changes in mitigation are needed to compensate for the Tier 2 (or Tier 3 or 4) rate of take. The Applicant may also consider whether changes in operational practices are needed to reduce levels of take. Any changes to the mitigation efforts would be made only with the concurrence of the Applicant, USFWS and DLNR.

Should it become evident that the authorized take for any of the Covered Species is likely to be exceeded before the end of the permit and license terms, the Applicant will coordinate with USFWS and DOFAW and will prepare applications for permit amendments as necessary.

HCP SECTION 7.4 FUNDING

The HCP includes a habitat conservation program with measures that KWP II will undertake to monitor, minimize, and mitigate the incidental take of each covered species, plus provide a net conservation benefit, as measured in biological terms. An estimate of the costs of funding the proposed conservation program is presented in Appendix 6 of the HCP. KWP II will provide the required conservation (monitoring, minimization, and mitigation) measures in full, even if the actual costs are greater than anticipated. For example, although the overall expenditures at the Tier 1 tier is not expected to exceed a total of $3.16 million, the budgeted amounts are estimates and are not necessarily fixed. One way of accomplishing this is that past, current or future funds allocated to a specific Covered Species may be re-allocated where necessary to provide for the cost of implementing conservation measures for another Covered Species, and funding for any individual Covered Species is not limited to those amounts estimated in Appendix 6. KWP II also recognizes the cost of implementing habitat conservation measures in any one year may exceed that year's total budget allocation, even if the overall expenditure for the conservation program stays within the total amount budgeted over the life of the project. Accomplishing these measures may, therefore, require funds from future years to be expended or likewise unspent funds from previous years to be carried forward for later use. For practical and commercial reasons, such reallocation of funds among years may require up to 18 months lead time to meet revenue and budgeting forecast requirements. However, if reallocation between species or budget years is not sufficient to provide the necessary conservation, KWP II will nonetheless be responsible for ensuring that the necessary conservation is provided. Funding re-allocation for one species to another will not impede the implementation of mitigation measures for either species.

Funding for the implementation of the HCP will be provided by KWP II LLC as an annual operating expense paid *pari passu* with other operating expenditures (operation and maintenance costs, insurance, payroll, lease payments to the State of Hawai'i, audit costs, and agency fee costs) and, most importantly, ahead of both debt service to lenders and dividends to equity investors. A variety of measures assure that the project will operate as a viable commercial entity, fully capable of meeting all HCP obligations for the life of the permit term. These include:

1. A 20-year Power Purchase Agreement (PPA) with HECO, with a set price structure. As a result the project will not be subject to unforeseen swings in energy markets. As long as the project is operating it is assured to generate revenue within a predictable range.

2. Performance of the turbines (i.e., to generate revenue) is warranted by the manufacturer. Turbines must maintain a high level of availability (upwards of 97%) to comply with the warranty. The project's owners are thus protected from losses due to equipment non-performance, failure, etc.

3. The project's financing will require that it meet all obligations, including HCP-related monitoring and mitigation. These costs are built into the project's financial pro forma. Failure to fulfill permit obligations would constitute a material breach of financing terms, and would trigger remedial steps. Failure to remedy could lead to default and loss of ownership.

4. Revenue would be generated and the HCP activities would be funded regardless of who the owner/operator is. In the unlikely event that Kaheawa Wind Power II defaulted, the lender would assume ownership and presumably seek to sell the project to a new owner. In order to operate the project, the lender or any new owner would be required to continue to fulfill the obligations under the HCP in order to be in compliance with the project's Conservation District Use Permit from the Hawaii Department of Land and Natural Resources. Any new owner would not be able to operate the project unless they were in compliance with the CDUP, which in turns requires compliance with the HCP.

5. The Conservation District Use Permit (CDUP) for KWP II, issued by the Hawaii DLNR, requires an approved HCP for the project to operate. Failure to comply with the permit would lead to a shut-down, and if the project is not brought into compliance, could in the worst instance lead to decommissioning.

6. If for any reason the project is no longer operational (or is shut down) then an agreement with the DLNR (the landowner) requires decommissioning, including removal of all structures and remediating/re-vegetating the site within 12 months. The decommissioning obligation for KWP II is secured with a LC of $1.4 million.

Additional assurance that adequate funding will be available to support the proposed monitoring and mitigation measures will be provided by Kaheawa Wind Power II in the form of a bond, letter of credit (LC) or similar instrument naming the DLNR as beneficiary. The LC will be in the amount of $1 million, which will be available to fund mitigation in the unlikely event that there are unmet mitigation obligations due to a revenue shortfall, default, change of ownership, bankruptcy or any other cause. The amount of the LC is based on the estimated costs of mitigation obligations, as follows: Tier 1 mitigation for all Covered Species is expected be completed by Year 20, and it is unlikely that Tier 2 mitigation for any of the Covered Species will be triggered before Year 5. Therefore the amount of the LC covers the cost of Tier 1 mitigation, from Year 1-20, less the one-time costs that will be committed before commercial operations. After Year 5, the LC will cover the cost of Tier 2 mitigation in the unlikely event that all Covered Species are in Tier 2. The LC will be automatically renewed prior to expiration, unless it is determined to no longer be necessary by the USFWS and DLNR. As beneficiary, DLNR will have the ability to draw upon the LC to fund any outstanding mitigation obligations of the project.

KWPII funding assurance of $1,000,000 will be secured in a form approved by the USFWS and DLNR within 30 days of KWPII Permit issuance. If take of Newell's shearwater occurs, KWPII will secure funding assurance, in a form and in an amount approved by the USFWS and DLNR that is commensurate with the anticipated mitigation for this species. ~~KWPII Newell's shearwater take requested will be limited to the Tier 1 take level until KWPII LLC secures, in a form approved by the USFWS and DLNR, a total of $1,554,590, or less with approval of USFWS and DLNR, in funding assurance for the KWPII project, in addition to the seabird mitigation funding already in place pursuant to the KWPI HCP. The KWPII Newell's shearwater take level requested will increase to the Tier 2 level when the KWPII funding assurances are increased to $1,554,590, or with approval of USFWS and DLNR, an amount commensurate with the anticipated remaining mitigation need for this species. KWPII will secure the additional funding assurance within two years of KWPII Permit (License) issuance or within one month of a detected take of Newell's shearwater at KWPII, whichever is sooner.~~

Appendices

Appendix 6 *(Funding Matrix)*

Appendix 6 is modified as shown in the enclosed attachment.

Appendix 10 (Methods for Calculating Total Direct Take)

Appendix 10 is deleted in its entirety.

Appendix 27 *(Estimating Fatality Rates for the Hawaiian Hoary Bat and Nēnē at Kaheawa Wind Power II)*

Appendix 27 is added in its entirety. See enclosed attachment.

Appendix 28 *(KWPII - Recommended Long Term Monitoring Protocol*)

Appendix 28 is added in its entirety. See enclosed attachment.

HCP Section 9.0 (*References Cited*)

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EXECUTED to be effective as of the date the Service approves the ITP Amendment and DLNR/DOFAW approves the ITL Amendment.

Kaheawa Wind Power II, LLC
By:_____
Name:_____
Title:_____

U.S. Fish and Wildlife Service
By:_____
Name: _____
Title: _____

Department of Land and Natural Resources,
Division of Forestry and Wildlife
By:_____
Name: _____
Title: _____

Appendix 27

Estimating Fatality Rates for Nēnē and the Hawaiian Hoary Bat at Kaheawa Wind Power II

Nēnē Fatality Rates

Total expected fatality for nēnē for Kaheawa Wind Power II (KWPII) was estimated using the first three years of fatality monitoring data. Input parameters were provided by SunEdison (Table 1).

The expected total direct take of nēnē at KWPII for the entire permit term was calculated by assuming the rate of take observed over the first three years would be similar for the remainder of the permit term. The rate of observed fatality is projected for the remaining 17 years of the permit and adjusted for the long-term monitoring protocol proposed (see Appendix 28). The long term monitoring will be a reduced search effort from the current intensive monitoring protocol. It will consist of searching roads and graded pads that occur within 70m radius from each turbine (Figure 1a and 1b). The percent carcasses that will fall within the search area (also known as the density weighted area or DWA) is calculated based on the known fall distribution of medium and large birds at KWP I and KWP II (Figure 2), and the percent of area (roads and pads) that will be searched within each 10 m distance ring (Table 2). The fall distribution is assumed to be uniform around the turbine.

The DWA for each distance ring is calculated as follows

DWA for distance ring = percent fatalities found within distance ring X

percent area searched within the distance ring

It is estimated that this proposed search area is estimated to encompass the distribution (or DWA) of approximately 20% of all nēnē fatalities that could occur (Table 1).

This model assumes that the current SEEF and CARE values (including data through March 31, 2015) remain that same for the remainder of the permit term. (In reality, the SEEF values for nēnē on pads and roads should be higher than the overall SEEF observed during intensive monitoring.) Therefore the only reduction in the probability in finding a carcass comes from the reduced search plot size which will encompass 20% of the fall distribution of nēnē. The previous intensive search plot was assumed to cover 70% of the fall distribution, therefore the probability of finding a carcass will be 29% of the current probability (=20/70 x 100 %) with the new search regime.

Under the current search regime, an average of one nēnē is found per year (three nēnē in three years). A reduction to 29% probability of finding a carcass results in an expected observed take of approximately 0.29 nēnē/year or 5 observed takes for the remaining 17 years of the permit term (0.29 nēnē x 17 years =4.93) (Table 1). This provided a result that at the 80% credibility level, a maximum of 46 nēnē would have been directly taken after 20 years (the permit term of KWPII, Table 3) at an average annual rate of 2.3 nēnē/year.

Table 1. Input Parameters For Nēnē At KWPII.

		Probability of Observing a Carcass (g)				Data Used	
Observed Fatalities	Year	mean	lwr (95% CI)	upr (95% CI)	Weighting *	SEEF	CARE
1	2013	0.63	0.58	0.657	1	2013	2013
2	2014-2015	0.663	0.644	0.673	2	2014-2015	2014-2015
5	2016-2032	0.18	0.15	0.23	17	Average of 2013-2015 site values	Average of 2013-2015 site values

*weighting is based on the time span of the data set available/expected. For example a weighting of 1 is used when one year of data is available/expected.

** the average g value for 2013 to 2015 is 0.652. The reduction in search plot is expected to reduce the g value to 29% of present value, resulting in a g value of 0.18 (=0.652 x 0.29). See text for a detailed explanation.

Table 2. Proportion of Nēnē Expected to Fall Within The Search Area

Distance Ring	Search Area Within Distance Ring (ac)	Area Of Distance Ring (ac)	Proportion Of Distance Ring Searched (A)	Percent Birds Found Within Distance Ring (B)	DWA of Distance Ring (A x B)
20	3.30	4.33	0.76	0.10	0.07
30	1.92	5.41	0.35	0.12	0.04
40	1.44	7.59	0.19	0.18	0.03
50	1.16	9.77	0.12	0.16	0.02
60	1.38	11.94	0.12	0.12	0.01
70	1.13	14.11	0.08	0.20	0.02
				Total DWA	**0.20**

Table 3. Estimated Fatality Results For Nēnē From The Inputs To The Evidence Of Absence model At 80% credibility level.

Posterior distribution for total fatality for 20 years.

g = P(observe|arrive):	0.2508	95% CI:	0.186248	0.321386
80% credible maximum for 20 years:	46			

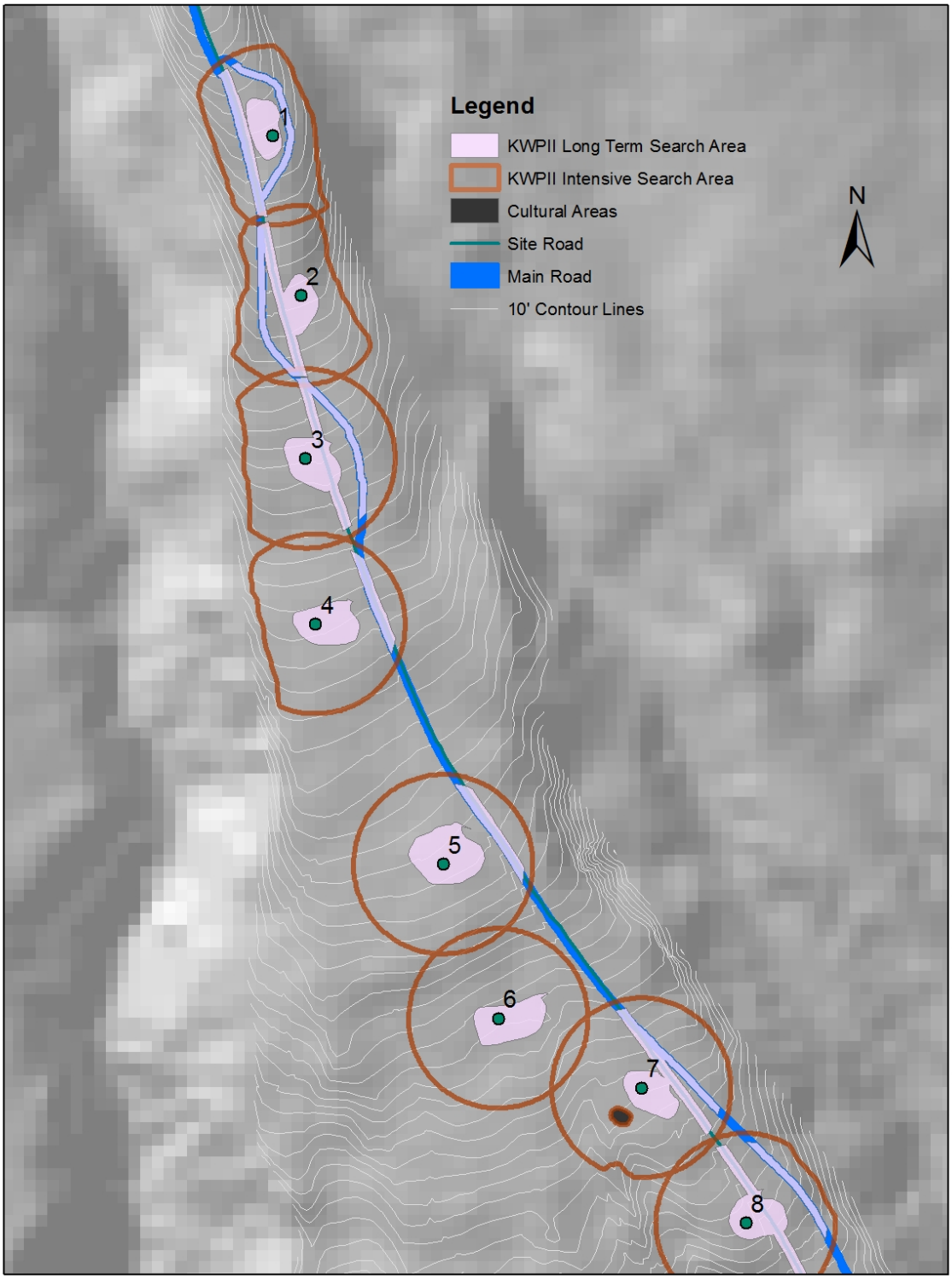

Figure 1a Proposed Long Term Monitoring Search Area for KWPII (Turbines 1-7) With Roads and Pads Out To 70m.

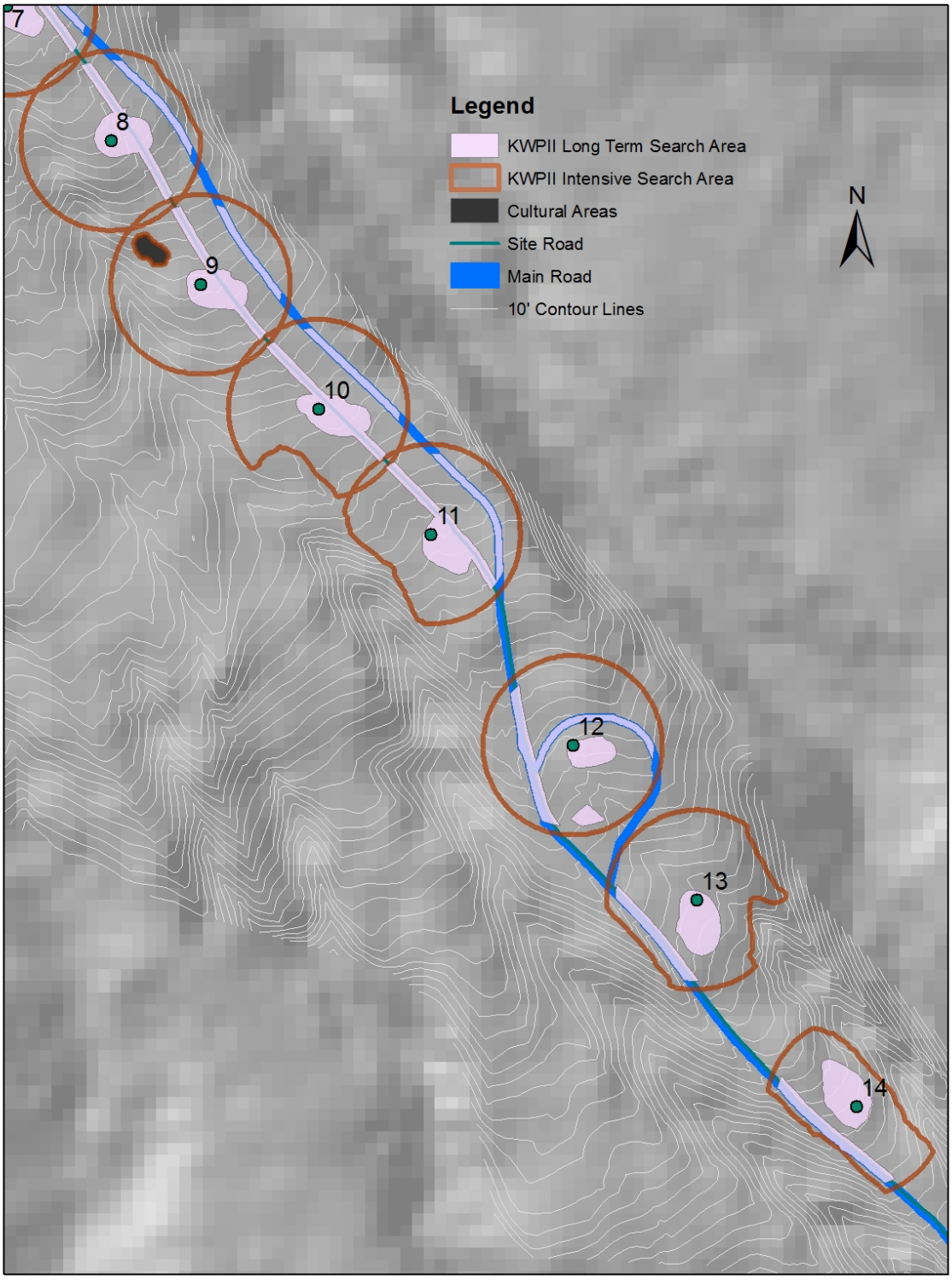

Figure 1b Proposed Long Term Monitoring Search Area for KWPII (Turbines 8-14) With Roads and Pads Out To 70m.

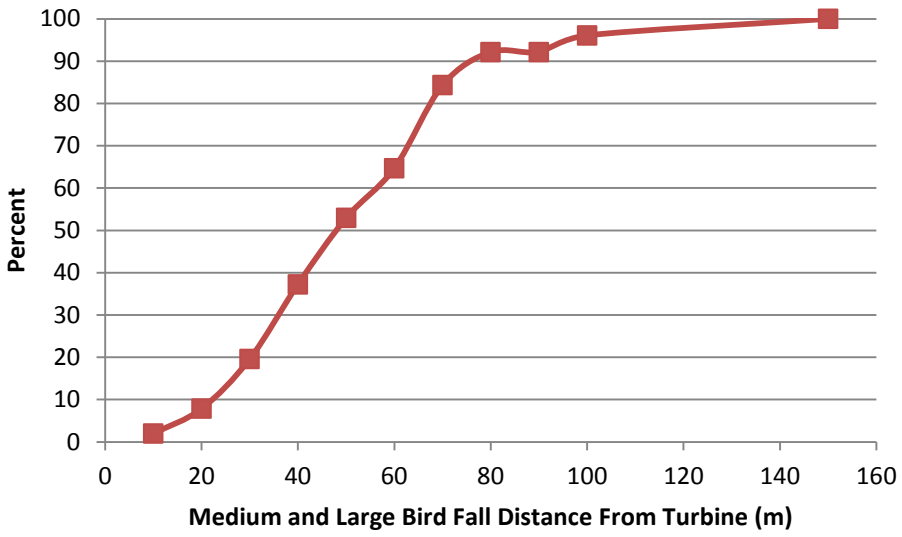

Figure 2. Cumulative Percent of Medium and Large Birds Found With Distance from Turbine at KWPI and KWPII (n=51)

Hawaiian Hoary Bat Fatality Rates

Total expected fatality for the Hawaiian hoary bat for Kaheawa Wind Power II (KWPII) was estimated using the first three years of fatality monitoring data. Input parameters were provided by SunEdison (Table 4). These three years of data were used in the the Evidence of Absence model (Huso et al. in press) to calculate the total anticipated take for the 20 year permit term of KWPII.

The expected total direct take of the Hawaiian hoary bat at KWPII for the entire permit term was calculated by assuming the rate of take observed over the first three years would be similar for the remainder of the permit term. The rate of observed fatality is projected for the remaining 17 years of the permit and adjusted for the long-term monitoring protocol proposed (see Appendix 28). The percent carcasses that will fall within the search area (also known as the density weighted area or DWA) is calculated based on the known fall distribution of bats at KWP I and KWP II (Figure 3), and the percent of area (roads and pads) that will be searched within each 10 m distance ring (Table 5). The fall distribution is assumed to be uniform around the turbine.

It is estimated that this proposed search area is estimated to encompass the distribution (or DWA) of approximately 40% (rounded up from 37%) of all bat fatalities that could occur (Table 5).

This model assumes that the current SEEF and CARE values remain that same for the remainder of the permit term. (In reality, the SEEF values for bats on pads and roads should be higher than the overall SEEF observed during intensive monitoring.) Therefore the only reduction in the probability in finding a carcass comes from the reduced search plot size which will encompass 40% of the fall distribution of bats. The previous intensive search plot was assumed to cover 95% of the fall distribution, therefore the probability of finding a carcass will be 42% of the current probability (=40/95 x 100 %) with the new search regime (see Table 4).

Under the current search regime, an average of one bat is found per year (three bats in three years). A reduction to 42% probability of finding a carcass results is an expected observed take of approximately 0.42 bats/year or 7 observed takes for the remaining 17 years of the permit term (0.42 bats x 17 years =7.14 bats) (Table 1). This provided a result that at the 80% credibility level, a maximum of 87 bats would have been directly taken after 20 years (the permit term of KWPII, Table 2) at an average annual rate of 4.35 bats/year.

Table 4. Input Parameters For The Hawaiian Hoary Bat At KWPII.

		Probability of Observing a Carcass (g)				Data Used	
Observed Fatalities	Year	mean	lwr (95% CI)	upr (95% CI)	Weighting *	SEEF	CARE
1	2013	0.372	0.211	0.553	1	2013	2013
2	2014	0.314	0.214	0.43	1	2014	2014
0	2015	0.271	0.155	0.423	1	2015	2015
7	2016-2032	0.13**	0.1	0.16	17	Average of 2013-2015 site values	Average of 2013-2015 site values

*weighting is based on the time span of the data set available/expected. For example a weighting of 1 is used when one year of data is available/expected.

** the average g value for 2013 to 2015 is 0.319. The reduction in search plot is expected to reduce the g value to 42% of present value, resulting in a g value of 0.13 (=0.319 x 0.42). See text for a detailed explanation.

Table 5. Proportion of Hawaiian Hoary Bats Expected to Fall Within The Search Area

Distance Ring	Search Area Within Distance Ring (ac)	Area Of Distance Ring (ac)	Proportion Of Distance Ring Searched (A)	Percent Bats Found Within Distance Ring (B)	DWA of Distance Ring (A x B)
20	3.30	4.33	0.76	0.27	0.21
30	1.92	5.41	0.35	0.18	0.06
40	1.44	7.59	0.19	0.45	0.09
50	1.16	9.77	0.12	0.09	0.01
60	1.38	11.94	0.12	0.00	0.00
70	1.13	14.11	0.08	0.00	0.00
				Total DWA	**0.37**

Table 6. Estimated Fatality Results For The Hawaiian Hoary Bat From The Inputs To The Evidence Of Absence model At 80% credibility level.

Posterior distribution for total fatality for 20 years.

g = P(observe|arrive):	0.15835	95% CI:	0.12641	0.193114
80% credible maximum for 20 years:	87			

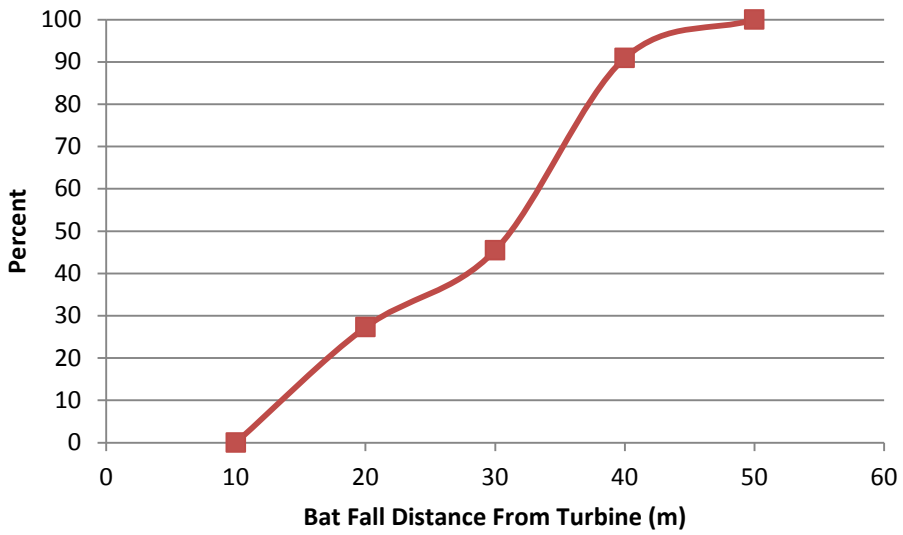

Figure 3. Cumulative Percent of Bats Found With Distance from Turbine at KWPI and KWPII (n=11)

References:

Manuela M. P. Huso, Daniel H. Dalthorp, David A. Dail, and Lisa J. Madsen. 2015. Estimating wind-turbine caused bird and bat fatality when zero carcasses are observed. Ecological Applications. http://dx.doi.org/10.1890/14-0764.1

Appendix 28

KWPII - Long Term Monitoring Protocol

Summary of Intensive Monitoring Results to Date

KWPII has challenging search conditions due to rugged terrain and vegetation cover, and the use of canine assistance has until recently been restricted due to nēnē concerns.

For KWPII the average observed annual take of nēnē at KWPII is approximately 0.75 birds/year. The average annual observed bat take is nearly one bat/year (Tables 1 and 2). No take of Hawaiian petrels (HAPE) or Newell's shearwaters (NESH) have been documented.

Searcher Efficiency (SEEF) has averaged approximately 44% for bats at KWPII. SEEF has averaged nearly 78% for nēnē and about 66% for HAPE at KWPII (Table 1, Table 2).

Carcass Retention (CARE) is measured in 14-day trials[1] and has averaged approximately six days for bats at KWPII. HAPE at KWPII averaged 12 days, while nēnē averaged 14 days (Table 1, Table 2). SEEF and CARE values reported include all data collected through March 31, 2015. Search interval has been approximately seven days at KWPII.

Table 1. Observed take, SEEF, and for Nene.

Fiscal Year	Observed Take	Mean SEEF	Mean CARE (days)
2013	1	0.67	27
2014	0	0.50	28
2015	2	0.85	30

Table 2. Observed take, SEEF, and for the Hawaiian Hoary Bat

Fiscal Year	Observed Take	Mean SEEF	Mean CARE (days)
2013	1	0.42	10
2014	2	0.52	5
2015	0	0.38	8

[1] Trial lengths at all sites have been 28 days in fiscal years 2013-2015 and earlier at KWP I.

KWPII assumes that the observed take, fatality estimation and the variability in the environmental, ecological, and searching conditions that had been recorded during the three year intensive monitoring period appropriately represents expected variation in the future.

Proposed Long Term Search Protocol

Search Area

KWPII proposes a long term monitoring protocol for the remaining years of the permit term. The searched area will consist of roads and graded pads that occur within 70 m radius of the WTG's (Figure 1). Searches will be conducted once a week. Vegetation on pads and along roads will be managed to maximize searcher efficiency. Exact GIS maps of the searched areas and the proportion of each 10m ring out to 70 m (7 rings) that the searched areas represent will be determined and provided.

CARE Trials

CARE trials will be conducted once every quarter and will include 1 medium and 1 large bird and at least 5 rats for each CARE trial with a minimum of 8 birds and 20 rats per year. Predator trapping may be conducted if carcass retention rates average less than 7 days which is possible for rats but very unlikely for birds.

SEEF Trials

SEEF trials will be conducted year round and will include a minimum of 40 rats (an average 10/quarter) and 10 medium and 10 large birds each year (between 2-3 birds of each size class each quarter).

References:

Manuela M. P. Huso, Daniel H. Dalthorp, David A. Dail, and Lisa J. Madsen. 2015. Estimating wind-turbine caused bird and bat fatality when zero carcasses are observed. Ecological Applications. http://dx.doi.org/10.1890/14-0764.1

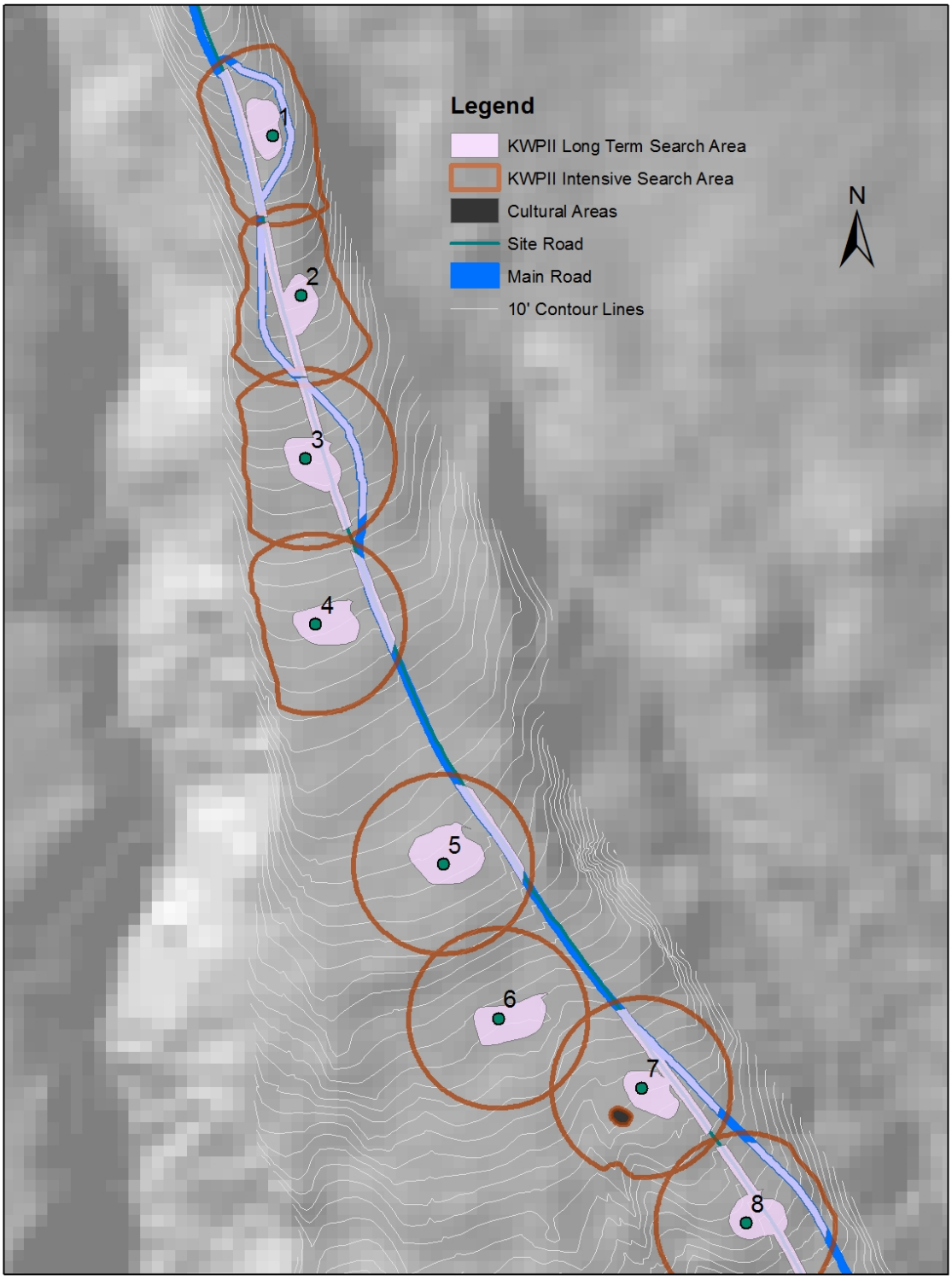

Figure 2a. Proposed Long Term Monitoring Search Area for KWPII (Turbines 1-7) With Roads and Pads Out To 70m.

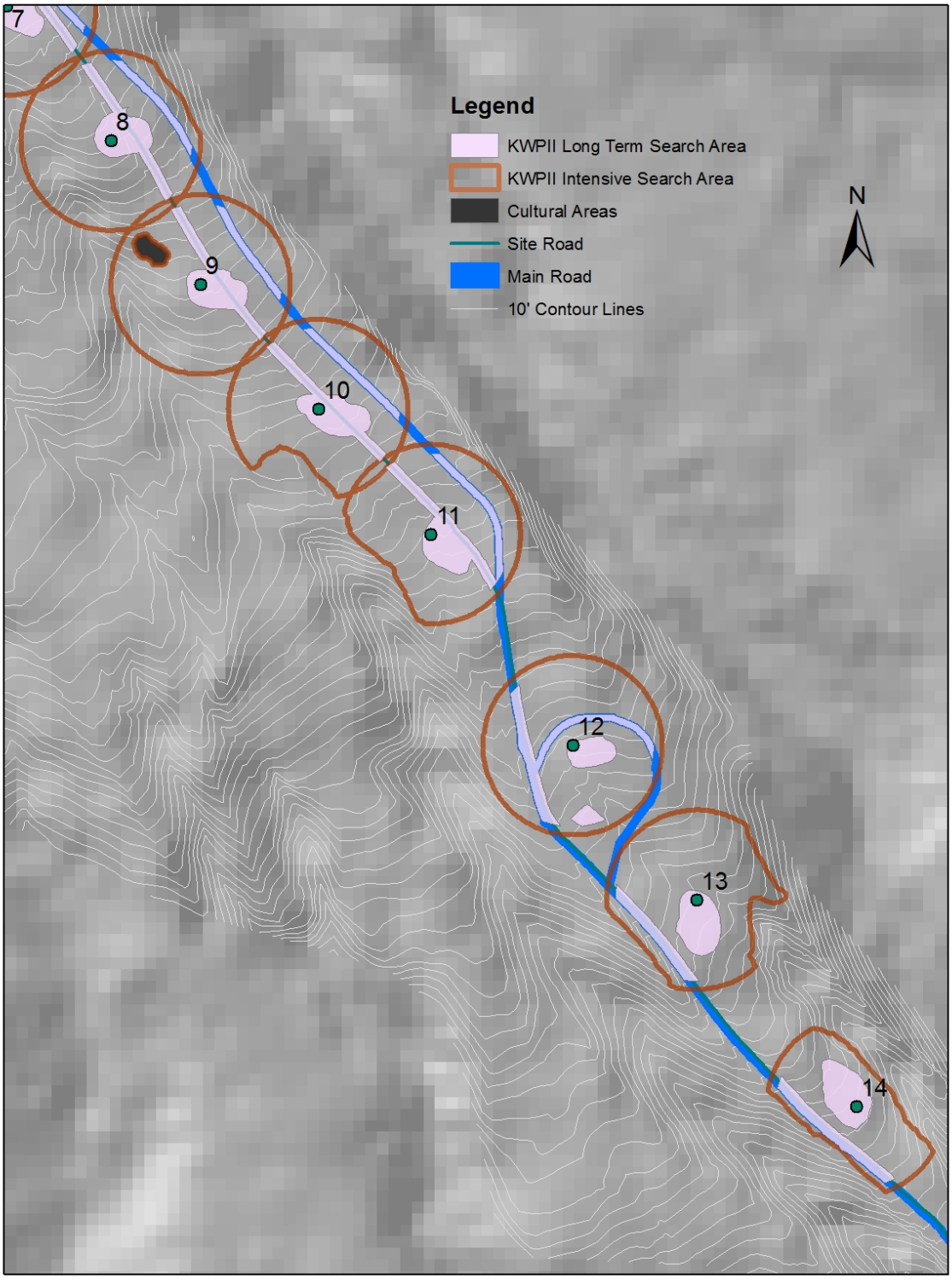

Figure 2b. Proposed Long Term Monitoring Search Area for KWPII (Turbines 8-14) With Roads and Pads Out To 70m.

Funding Matrix
Kaheawa Wind Power II Habitat Conservation Plan

	Item / Activity	One-Time Cost	Annual Cost	Years 1-5	Remaining 15 Years	20-Year Permit Duration
General Measures	Preconstruction surveys for nene and nests	$5,000				$5,000
	Daily search and documentation of nene and nests during construction	$25,000				$25,000
	Invasive species avoidance and minimization	$30,000	$5,000	$50,000	$15,000	$95,000
	Wildlife Education and Observation Program (WEOP)		$1,500	$7,500	$25,000	$32,500
	Hawaiian short-eared owl mitigation	$25,000				$25,000
	Sub-Total	**$85,000**	**$6,500**	**$57,500**	**$40,000**	**$182,500**
Minimization Tier 2 Rates of Take)	Radar studies to characterize seabird interactions at facility				$50,000	$50,000
	Increased site-specific bat studies using enhanced audio-visual technologies to characterize activity levels and document bat interactions at facility		$10,000	$50,000	$50,000	$100,000
	Sub-Total		**$10,000**	**$50,000**	**$100,000**	**$150,000**
Seabird mitigation (Tier 1)	Alt. 1 - Makamakaole fencing and social attraction option	$121,000	$15,000	$75,000	$225,000	$421,000
	Exploring Maui mitigation alternatives KWPII portion			$88,800		$88,800
	Subtotal	**$121,000**	**$15,000**	**$163,800**	**$225,000**	**$509,800**
Additional Measures for Tier 2 rates of take (NESH), or insufficient credit accrual at Alt 1.	Alt 2a Increase seabird colony size and productivity within fenced area, habitat enhancement and social attraction	$50,000	$10,000	$50,000	$150,000	$250,000
	Alt 2b Project at scale similar to Alt 1 at alternative location on Maui	$157,300	$19,500	$97,500	$292,500	$547,300
	Alt 2c: In situ predator proof fence in West Maui *	$220,760	$36,642	$36,642	$549,623	$807,024
	Maximum sub-total	**$220,760**	**$36,642**	**$36,642**	**$549,623**	**$807,024**

Additional Measures for Tier 2 rates of take (HAPE)	Increased mitigation efforts at the same site or mitgation at another seabird site		$30,000	$150,000	$100,000	$250,000
	Sub-Total		**$30,000**	**$150,000**	**$100,000**	**$250,000**
Lower rates of Take	Same as Baseline					
Nene Mitigation (Tier 1)						
Tier 1 (Preferred) Alternative 1	Construction of release pen and staffing for monitoring and predator trapping at pen	$158,290	$30,000		$240,000	$398,290
	Sub-Total	**$158,290**	**$30,000**		**$240,000**	**$398,290**
Additional Measures for Tier 1	Systematic observations of nene at the KWP II site		$2,000	$10,000	$30,000	$40,000
	Sub-Total	**$0**	**$2,000**	**$10,000**	**$30,000**	**$40,000**
Tier 2 Take Alternative 1	Staffing for monitoring and predator trapping at pen		$30,000		$150,000	$150,000
	Sub-Total		**$30,000**		**$150,000**	**$150,000**
Tier 3 and 4 Take	Staffing for monitoring and predator trapping at identifed location		$30,000		$300,000	$300,000
	Sub-Total		**$30,000**		**$300,000**	**$300,000**
Lower rates of take	Same as Tier 1					
Additional Measures if Hanaula population declines or reintroduction efforts fail	New release pen if required	$150,000				$150,000
	Partial purchase of truck	$10,000				$10,000
	Staffing for on-site monitoring		$20,000	$80,000		$80,000
	Helicopter transport of nene to release site		$2,000	$6,000		$6,000
	Sub-Total	**$160,000**	**$22,000**	**$86,000**		**$246,000**

Bat mitigation (Tier 1)	Funding for management		variable	$126,260	$123,740	$250,000
	Bat monitoring at KWP II and vicinity for 5 years		$12,500	$25,000	$37,500	$62,500
	Sub-Total		**$12,500**	**$151,260**	**$161,240**	**$312,500**
Measures for Tier 2 rates of take	Funding for increased management		variable		$125,000	$125,000
	Increased site-specific bat studies using enhanced audio-visual technologies to characterize activity levels and document bat interactions at facility	$50,000	$10,000		$50,000	$100,000
	Sub-Total	**$50,000**	**$10,000**		**$175,000**	**$225,000**
Measures for Tier 3 and 4 rates of take	Funding for increased management including bat monitoring	$689,500	variable	$100,000	$2,350,000	$2,450,000
	Funding for additional research			$1,000,000		$1,000,000
	Sub-Total	**$689,500**		**$1,100,000**	**$2,350,000**	**$3,450,000**
Measures for Lower Rates of Take	Same as Baseline					
Downed Wildlife Monitoring	Downed wildlife searches by 2 FTE trained technicians and partial cost of Senior Biologist, includes Scavenger Removal Trials by staff and preparation of quarterly and annual reports..		$130,000.0	$520,000.0	$780,000	$1,300,000
	3rd party Proctoring of Searcher Efficiency Trials and QA/QC of take calculations and reporting.		$30,000	$60,000	$60,000	$120,000.0
	Sub-Total		**$160,000**	**$580,000**	**$840,000**	**$1,420,000**
State Compliance Monitoring	**Sub-Total**		**$25,000**	**$75,000**	**$225,000**	**$300,000**
3rd Party Monitoring Contingency	**Sub-Total**		**$130,000**	**$520,000**	**~~$780,000~~ $0**	**~~$1,300,000~~ $520,000**

Estimated Project Sub-Totals					
Tier 1		One time Cost	Years 1-5	Remaining 15 Years	20-Year Permit Duration
	Minimization and General Measures	$85,000	$57,500	$40,000	$182,500
	Seabird Mitigation (Maximum)	$341,760	$200,442	$774,623	$1,316,824
	Nene Mitigation	$158,290	$10,000	$270,000	$438,290
	Hawaiian Hoary Bat	$0	$151,260	$161,240	$312,500
	Sub-Total	$585,050	$419,202	$1,245,863	$2,250,114
Tier 2					
	Minimization	$0	$50,000	$100,000	$150,000
	Seabird Mitigation	$0	$150,000	$100,000	$250,000
	Nene Mitigation	$0	$0	$150,000	$150,000
	Hawaiian Hoary Bat	$50,000	$0	$175,000	$225,000
	Sub-Total	$50,000	$200,000	$525,000	$775,000
Tier 3 and 4					
	Nene Mitigation	$0	$0	$300,000	$300,000
	Hawaiian Hoary Bat	$689,500	$1,100,000	$2,350,000	$3,450,000
	Sub-Total	$689,500	$1,100,000	$2,650,000	$3,750,000
Contingency Measures					
	Contingency Measures if Hanaula Nene Population exhibits failure	$160,000	$86,000		$246,000
	3rd Party Monitoring Contingency	$0	$520,000	~~$780,000~~ $0	~~$1,300,000~~ $520,000
	Sub-Total	$160,000	$606,000	~~$780,000~~ $0	~~$1,546,000~~ $766,000
Other					
	Downed Wildlife Monitoring	$0	$580,000	$840,000	$1,420,000
	State Compliance Monitoring	$0	$75,000	$225,000	$300,000
	Sub-Total	$0	$655,000	$1,065,000	$1,720,000

Grand Total Including Expected Cost for Tier 1 Mitigation**	$3,163,090	
Grand Total Including Maximum Cost for Tier 1 Mitigation	$3,970,114	
Grand Total Tier 1 + Contingency Measures	$5,690,114	~~$5,516,114~~
Grand Total for Tier 1 + Tier 2 Take Level of Mitigation + Contingency Measures	$7,410,114	~~$6,291,114~~
Grand Total for Tier 1 + Tier 2 + Tier 3 Take Level of Mitigation + Contingency Measures	$11,160,114	

* Note: The total estimated cost of a 115 ac in-situ colony protection and management program for 16 years is on the order of $3.2M. Due to the substantial scope and logistical challenges of this alternative, for budgeting purposes it is assumed that there will be several partners, and that KWP II would contribute approximately

** consists of cost for 20 year Minimization and General Measures, Tier 1 Preferred Mitigation, 20 year Downed Wildlife Monitoring and State Compliance Monitoring

FIRST AMENDMENT TO
IMPLEMENTING AGREEMENT
KAHEAWA WIND POWER II WIND ENERGY GENERATION FACILITY
December 28, 2011
As Amended XXXXXXXXXX

THIS FIRST AMENDMENT TO IMPLEMENTING AGREEMENT (this "Amendment") is made to be effective as of the XXXXX day of XXXX, 2015, by and between KAHEAWA WIND POWER II, LLC, ("Permittee"), the U.S. FISH AND WILDLIFE SERVICE ("Service") and the HAWAI`I DEPARTMENT OF LAND AND NATURAL RESOURCES ("DLNR") through its Division of Forestry and Wildlife ("DOFAW"). Permittee, the Service, and DLNR are sometimes collectively referred to herein as the "Parties."

1.0 RECITALS

WHEREAS, the Parties executed that certain Implementing Agreement (the "Agreement") on December 28, 2011, in conjunction with the issuance of Incidental Take Permit TE-27260A-0 and Incidental Take License ITL-15 (collectively "Permits") to Permittee.

WHEREAS, on XXXXX 2015, the Service and DLNR approved an amendment to the Permits, increasing the amount of authorized incidental take for the Hawaiian Hoary Bat and the Nene ("Permit Amendments"). To conform to the Permit Amendments, the HCP has been amended to increase the authorized incidental take for Hawaiian Hoary Bat and nēnē, provide for mitigation for the increased take and add a long-term monitoring program for Covered Species ("HCP Amendment").

WHEREAS, the purpose of the Agreement is to ensure the implementation of each of the terms of the HCP.

WHEREAS, certain Agreement provisions require revisions to conform to the Permit Amendments and HCP Amendment.

WHEREAS, the Parties wish to amend the Agreement to reflect the Permit Amendments, the HCP Amendment, and the updated language as set forth below.

2.0 AMENDMENT

The Agreement will be revised as set forth below.

1. Subsection 3.7 of the Agreement will be amended to read as follows: "`HCP' means the Habitat Conservation Plan prepared by Permittee for the Project as amended on XXXXX."

2. Subsection 4.1.1 (e) of the Agreement will be deleted and replaced with the following:

(d) If take of Newell's shearwater occurs, KWPII will secure funding assurance, in a form and in an amount approved by the USFWS and DLNR, that is commensurate with the anticipated mitigation for this species.

.

3. Subsection 4.2.1 will be amended to read as follows: "**Permits coverage.** The Permits will identify all Covered species. The Permits will take effect for Covered Species at the time the Permits are issued, respectively, except that incidental take coverage for Newell's shearwater will not take effect unless and until the Service and DLNR approve the requested reduction in Newell's shearwater incidental take permitted at KWP I to a total take of 8 Newell's shearwater."

IN WITNESS WHEREOF, THE PARTIES HERETO have executed this Amendment to be effective as of the date first written above, which shall be the date of the last execution below.

By: _____ Date: _____
Deputy Regional Director
United States Fish and Wildlife Service
Portland, Oregon

By: _____ Date: _____
Chairman of the Board
Department of Land and Natural Resources
State of Hawai`i

By: _____ Date: _____
XXXXX, Assistant Secretary of
Hawaii Holdings, LLC, the member of
Kaheawa Wind Power II, LLC

July 20, 2015

Acting Wildlife Program Manager
Hawaii Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

Acting Field Supervisor
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

Aloha,

Attached is a proposal for additional Hawaiian hoary bat mitigation for Kaheawa Wind Power Phase II (KWP II) that supersedes previous versions. If accepted, implementing this proposal would fulfill the mitigation obligations for the remaining take of Hawaiian hoary bats projected through the end the project's 20-year permit term.

KWP II proposes to amend its permitted take of Hawaiian hoary bats currently authorized by its federal Incidental Take Permit (TE27260A-0) and state Incidental Take License (ITL -15). Currently authorized take is 11 bats, as modified by letter dated May 20, 2014. Mitigation for the take of the first 11 bats was fulfilled in 2014 (KWPII 2014). This mitigation proposal is being presented in support of permit and license amendment applications to the Service and DLNR seeking authorization for the incidental take of an additional **69 bats** over the life of the Project.

Using the Huso *et al* (2015) evidence of absence estimator, the estimated take to date for three observed fatalities over three years at an 80% credibility is 16 (Table 1). The KWP II estimated direct take for the entire 20 year permit duration including observed take to date is 87 at the 80% credibility level (Table 2) assuming: 1) past fatality rates on average continue, 2) low wind speed curtailment (LWSC) would have remained at 5 m/s and 3) SunEdison conducts low level monitoring over the remaining 17 years of the project life.

KWP II began implementing LWSC to further reduce risk to bats in July 2012 at 5 m/s and continued through December 1, 2012. In 2013 and 2014, KWP II began LWSC on March 14 and February 27, respectively and continued through December 4 and 16, respectively. In 2015, KWP II began LWSC on February 15. LWSC was increased from 5.0 m/s to 5.5 m/s on July 28, 2014, and will continue at 5.5 m/s between February 15 and December 15 for the duration of the 20 year permit. LWSC is expected to reduce overall potential direct take based on the results of numerous studies. Arnett et al. (2013) summarize recent studies of the effects of

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LWSC on bat mortality in North America. Research consistently indicates that most bat collisions occur at relatively low wind speeds, and consequently the risk of fatalities may be significantly reduced by curtailing operation on nights when winds are light. Arnett et al. (2011) showed that bat fatalities were reduced by an average of 82 percent (95 percent CI: 52 – 93 percent) in 2008 and by 72 percent (95 percent CI: 44 – 86 percent) in 2009 when cut-in speed was increased to 5 m/s and WTG blades were feathered at lower wind speeds.

Subsequent studies have also shown significant reductions in fatalities: at Fowler Ridge (Good et al. 2011) feathering below normal cut-in speed of 3.5 m/s reduced fatalities by 36 percent, below 4.5 m/s by 57 percent and below 5.5 m/s by 73 percent (16 percent increase from 4.5 to 5.5 m/s). An anonymous study in USFWS Region 3 showed fatality reductions of 47 percent and 72 percent for cut-in speeds of 4.5 and 5.5 m/s (25 percent increase from 4.5 to 5.5 m/s). Similar results have been documented in Germany, where LWSC is widely prescribed to reduce bat fatalities. The hoary bat (*Lasiurus cinereus*), of which the Hawaiian hoary bat is a subspecies, is one of the most frequently documented casualties at wind farms throughout their worldwide range, and is one of the species most benefitted by curtailment. Based on the above, it is reasonable to expect that the current curtailment regime at 5.5 m/s is, on average, providing similar reductions (>70%) of take of Hawaiian hoary bats at KWP II.

SunEdison proposes that by increasing LWSC from 5.0 to 5.5 m/s, the subsequent estimated future direct take should be reduced by at least 15% less than what would be expected if LWSC remained at 5.0 m/s. The estimated direct take for the 20-year period at LWSC of 5.0 m/s is 87 (Table 2). Estimated direct take to date from 3 observed bat fatalities is 16 bats. The 3 observed fatalities occurred before LWSC was increased from 5.0 to 5.5 m/s. Estimated future direct take assuming no increase in LWSC is 87 – 16 = 71. After increasing LWSC from 5.0 to 5.5 m/s and reducing the estimated future direct take by 15%, the estimated future direct take is 60.4 (71 - (71*0.15) = 60.4).

The total indirect take converted to adult take for 76.4 estimated direct take (16 already taken during 5.0 m/s LWSC and 60.4 estimated future take after LWSC is increased to 5.5 m/s) is 3.5 ((76.4 – 3 observed take) * 0.1)/2.1= 3.5). Lost productivity has not accrued from observed direct take. Total estimated take for the 20 year life of the project therefore is 80 (76.4 direct take +3.5 indirect take = 79.9 (80 rounded up)). Mitigation already has been provided for 11 bats, leaving 69 bat takes to be mitigated for (80 – 11 = 69).

This proposal is intended to satisfy all mitigation obligations for the additional projected take of **69 bats**. The KWP II permit amendment application includes 2 additional take Tiers (3 and 4). The total take expected for the 20-year permit is 80 adults. Tier 3 limit is 50 bats (39 more than the Tier 2 limit). The Tier 4 limit of 80 includes an additional 30 bats. The proposed mitigation for Tier 3 and Tier 4 will protect and restore habitat in the West Maui Mountains in the Lahaina District and will also include bat population and ecology research. Funding will be applied now commensurate with fulfilling the mitigation obligation for 39 bats (Tier 3 total take is 50 bats and the Tier 1 and 2 mitigation for 11 bats has already been funded completely, 50-

11=39). If Tier 3 is exceeded or the rate of take continues as expected over the next 2-3 years additional funding commensurate with an additional 30 bats will be applied to this project and for additional research, whichever is deemed most appropriate.

The West Maui Mountains Watershed Partnership (WMMWP) through Malama Kahalwai, Inc. proposes ungulate fencing, ungulate control, fire fuel management, native plant seed dispersal and native tree out-planting, invasive plant control and long-term maintenance and monitoring within 1,600 acres (Appendix 1 is an earlier version of the proposal, the updated version is not yet complete). The area the fencing will enclose includes at least eight small to large valleys that have wind protection and riparian habitat that bats may favor for travel and to forage. The fenced area also ranges in altitude from 300 to 5,200 feet in elevation. These actions will protect and provide secure habitat for recovery of the Hawaiian hoary bat in a West Maui location.

The proposed mitigation for Tier 3 and 4 would occur through the end of the KWP II take permit (i.e., approximately 17 years). If the rate of take would be reduced by applying bat deterrents, for example, or some other means such that Tier 3 is not expected to be exceeded the project could: 1) be funded for less than 17 years, 2) have specific mitigation actions or research projects canceled if not begun or reduced in scope if already begun, or 3) some combination of 1 and 2 that would limit the restoration and research projects to $1.95MM (Tier 3 cost for 39 bats) whichever combination is deemed most appropriate by SunEdison, the USFWS and DOFAW.

Assuming no reduction in take rate occurs for the remaining years of the permit, the measures of success of the proposed mitigation as habitat restoration will be:

1) Complete the fence (finish enclosing the 1600 acre parcel) within two years of the project approval,
2) Remove all ungulates within four years of completion of the fence,
3) Monitor for ungulates and repair fence lines regularly (at least quarterly) and maintain the area to be ungulate free for the duration of the proposed project.
4) Remove invasive ground cover at least in 200m buffers (or yet to be determined more appropriate buffer width) near to existing native forests to allow natural regeneration and in areas where trees will be out-planted to ensure young trees can thrive.
5) Determine appropriate target areas (at least 200 acres) within 2 years of the ungulate removal for out planting within the 1,600 acres through experimental plots within the target areas.
6) Plant native trees (Koa, Ohia, etc.) in at least 200 acres (up to 200 plants per acre) within 1 year after the experimental plots have been assessed with a target increase in canopy cover after 15 years of 25% (except in 20-30 foot wide lanes where trees are not planted in order to create “forest edges”).
7) Remove invasive trees within native forests in order to create additional “forest edges” (numbers and species of trees not yet determined).

8) Disperse native plant seeds in areas where invasive plants and trees have been removed (area covered and species of seeds is not yet determined).

9) Conduct regular fire fuel management along 24 miles of fire breaks.

10) Deploy a minimum of 10 bat detectors within the WMMWP project habitat for at least July through September in the first year as a baseline and for July through September at least every fifth year thereafter. Although it is unknown whether bat acoustic detection rates will change with improving habitat restoration bat detection will be conducted to determine if any change in detection rate can be revealed.

11) The measure of success for any additional research projects will be that the research is completed within 5 years of approval of this proposal and reports provided by specific contracted researchers.

The total cost of any proposed mitigation for the estimated 69 bat takes not mitigated for is no more than $3,450,000 assuming the cost/bat is $50,000 (Tier 3 cost would be capped at $1,950,000 and Tier 4 cost would include an additional $1,500,000). The rate of $50,000/bat has been recommended by the state and federal agencies but has not yet been approved by the Endangered Species Recovery Committee (ESRC). All elements of the habitat restoration plan costs and any additional research proposed are still being determined. Additional research would occur within the 1,600 acre parcel or elsewhere in Hawaii or both.

Sincerely,

Mitchell Craig

Mitchell Craig
Hawaii HCP Manager

Citations

Arnett, E. B., M. M. P. Huso, M. R. Schirmacher, and J. P. Hayes. 2011. Changing wind turbine cut-in speed reduces bat fatalities at wind facilities. Frontiers in Ecology and the Environment 9(4): 209–214; doi:10.1890/100103 (published online 1 November 2010).

Good, R.E., W. Erickson, A. Merrill, S. Simon, K. Murray, K. Bay, and C. Fritchman. 2011. Bat monitoring studies at the Fowler Ridge Wind Energy Facility, Benton County, Indiana. Prepared for Fowler Ridge Wind Farm by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Kaheawa Wind Power, LLC (KWP). 2007. Kaheawa Pastures Wind Energy Generation Facility, Habitat Conservation Plan: Year 1 Annual Report. UPC Wind Management, LLC, Environmental Affairs Division, Newton, MA. 25 pp + app.

Kaheawa Wind Power I and II, LLC 2014. Habitat Conservation Plan: Fiscal Year 2014 Quarter 3 Report. First Wind Energy, LLC, 3000 Honoapiilani Hwy, Wailuku, HI. 23 pp + app.

Kaheawa Wind Power I and II, LLC 2014. Habitat Conservation Plan: Fiscal Year 2014 Annual Report. First Wind Energy, LLC, 3000 Honoapiilani Hwy, Wailuku, HI. 33 pp + app.

Manuela M. P. Huso, Daniel H. Dalthorp, David A. Dail, and Lisa J. Madsen. 2015. Estimating wind-turbine caused bird and bat fatality when zero carcasses are observed. Ecological Applications. http://dx.doi.org/10.1890/14-0764.1

U.S. Fish and Wildlife Service. 2012. Land-based wind energy guidelines. http://www.fws.gov/windenergy/docs/WEG_final.pdf. U.S. Fish and Wildlife Service, Arlington, VA, USA.

Table 1. Estimated bat take for 3 years at KWPII.

Credibility level (1 - ?)					Posterior distribution for total fatality for 3 years.					
	0.8					g = P(observe|arrive):	0.319	95% CI:	0.228	0.417
Yr	Observed fatality	g	min(g)	max(g)	Years	80% credible maximum:	16			
1	1	0.372	0.211	0.553	1	m	P(total = m)	P(total > m)		
2	2	0.314	0.214	0.43	1	0	0	1		
3	0	0.271	0.155	0.423	1	1	0	1		
						10	0.079	0.537		
						11	0.074	0.463		
						15	0.046	0.236		
						16	0.040	0.197		

Table 2. Estimated bat take for 20 years at KWPII.

Credibility level (1 - ?)						Posterior distribution for total fatality for 20 years.				
0.8						g = P(observe|arrive):	0.158	95% CI:	0.126	0.193
Yr	Obs fatal.	g	min(g)	max(g)	years	80% credible maximum:	87			
1	1	0.372	0.211	0.553	1	m	P(total = m)	P(total > m)		
2	2	0.314	0.214	0.43	1	0	0	1		
3	0	0.271	0.155	0.423	1	1	0	1		
4-20	7	0.13	0.1	0.16	17	67	0.020	0.500		
						68	0.019	0.481		
						86	0.011	0.202		
						87	0.011	0.190		
						108	0.004	0.050		
						109	0.003	0.047		

Appendix 1.

Initial Proposal to

Ling Ong, SWCA Environmental Consultants

Regarding Bat Mitigation Projects in West Maui

Requested by:

Malama Kahalwai, Inc.

Dedicated 501(c)(3) of WMMWP

On behalf of:

West Maui Mountains Watershed Partnership

Kahoma Land Holdings, Inc.

Ka'anapali Land Company, LLC

Kahoma Land, LLC

Kamehameha Schools

Makila Land Company, LLC

Maui Land & Pineapple Company, Inc.

Maui County Department of Water Supply

State Division of Forestry and Wildlife

The Nature Conservancy

Wailuku Water Company, LLC

Prepared by:

Chris Brosius - Watershed Program Manager

West Maui Mts. Watershed Partnership

P.O. Box 13240, Lahaina, Hawaii. 96761

(808) 661-6600

brosius@westmauiwatershed.org

January 26, 2015

Lahaina Boundary Fence and Watershed Management:

Introduction:

WMMWP proposes habitat protection efforts in West Maui to preserve and enhance lands for the endangered Hawaiian Hoary Bat**,** *Lasiurus cinereus semotus*, or ʻopeʻapeʻa and other rare and endangered species within the region. This would include comprehensive management efforts in fencing, ungulate control, priority weed control, native tree out-planting, invasive tree removal, fire fuel management and vegetation restoration. The habitat found within the upper reaches of each valley and summit are some of the most diverse and species rich regions of west Maui. The elevation range of the area spans from 5,200 feet to 300 feet above sea level. The proposed actions will reduce the key threats to the lowlands, as well as, further secure the extensive upward reaching peaks and within each valley of the region.

Location:

The project is found in the Lahaina District of Maui and spans lands owned by the State of Hawaii - including the Panaewa and Lihau Sections of the West Maui Natural Area Reserve and two parcels of the West Maui State Forest Reserve. Makila Land Company and Kamehameha Schools are also landowners within the project footprint, however the southern portion involved in fencing would only need to involve Makila and the State (See map, p 6). The TMK's involved include 480010020000 , 470010240000 , 470010040000, 460250010000, 460250020000 460180030000, 460220010000 , 460220010000 , 470060030000, and 470010020000

Protected Resources:

These fences protect lowland dry forest and shrub land, lowland wet forest and shrub land, dry and wet cliff, lowland and montane mesic forest and shrub land, as well as, dry grassland vegetation communities. Three primary stream and riparian systems in Kauaula, Launiupoko and Olowalu will be protected within the Conservation District. At least 10 miles of riparian corridor and flowing streams falls within this area. A preliminary tally of at least 15 endangered, 2 candidate and 14 species of concern will be further protected in this region (See species list, p. 5.) Our work will aid the Lihau and Panaewa Sections of Natural Area Reserve and equally important portions of private land. Completing this fence will also protect a principle water recharge for regional residents, farmers and businesses. Any encounter of rare taxa or resources of concern will be geo referenced, reported and kept from potential project impacts.

Fencing:

We propose to complete a boundary fence across the foothills of the West Maui Mountains from Lahaina to Olowalu. The entire project is over 6 miles and partial funding has been acquired through the State of Hawaii. The fencing this proposal will fund is approximately 3.5 miles at the southern end of the project that remains to be funded. Permits and archeological work have been completed. In its entirety, the 6 mile fence will protect the boundary of 7,800 acres of watershed including the major drainages of Kauaula, Launiupoko and Olowalu. This boundary fence will be the primary line of defense against ungulates while also serving as a conservation district boundary marker to encroaching development and human uses such as dirt biking. Between this boundary line and our strategic fence

system, which is comprised of short fence segments built across the major ridge tops and segments placed in the narrows of valley floors, lays an entirely unprotected 3,000 acre area within the foothills. The portion of land mauka of the proposed 3.5 miles of fence would be approximately 1,600 acres. Fence installation will be performed by a contractor under WMMWP supervision or by WMMWP crews and will include all aspects of building including brushing, decontamination of materials, transport of fencing materials and supplies via truck and helicopter, as well as construction. The fence will be a 7.5 foot high fence made from bezenol wire, welded hog panel or equivalent. On extremely steep terrain, a 4 foot high galvanized hog wire may be used with 4 foot high plastic deer mesh above it, creating an equally high fence. This method is safer and effective in steep conditions. An apron of 32 inch hog wire will be installed to prevent digging under the fence. Cross over steps will allow for traditional human access past fences along known trails. Fences will also utilize plunge pools in streams as natural barriers and where necessary, stream curtains, grates or similar devices will be designed to impede the mauka advance of feral ungulates without restricting stream flow. Post installation inspections will ensure completion and maintenance for their expected duration.

Ungulate Control:

This fencing is intended to protect the region against feral pigs, goats and deer. All these animals are in low numbers at present, but are increasing within the project area until fenced. This fencing will prevent large scale establishment and make it possible to implement zero tolerance management through a combination of trapping, hunting and aerial shooting. At present approximately a dozen of each species is in the project area and are considered incipient at this time.

Once ungulates are removed, vigilance will be needed to monitor the area for breaches and run monitoring transects to prevent ungulates from reestablishing. This would entail scouting and threat monitoring on a quarterly basis to make sure the fenced region is free of priority threats or monitor changes in threat ranges. This would also include operating of threat monitoring transects for ungulates on an annual basis. These are belt transects with stations 5X50 meters long from mauka to makai along the major ridges and stream corridors. This regional network of 6 to 8 transects gives a quick annual assessment of health. The percentage of ground disturbance is measured on each station and compared from year to year for ungulates. Invasive weed presence and absence is also recorded along the same stations every three years. This type of coarse monitoring shows rough trends of these major threats and their distribution in the project area while maintaining a degree of vigilance to allow us to respond to new and ongoing threats appropriately.

Weed Control:

Priority weed control in the region is guided by our weed management plan. Monitoring of invasive weeds is being conducted along 5 transects along ridges and valleys to create species lists and monitor changes in species range. Priority weed targets in the region include *Toona cilata, Macaranga tanarius, Cortaderia jubata, Psidium cattleianum, Tibouchina herbacea. Prosopis pallida, Sphaeropteris cooperi, Pithecellobium dulce* and others. The approach would be to protect the most pristine native forest areas and control the outliers of each species first to arrest the potential spread. Aerial helicopter surveys,

ground surveys, and use of herbicides via aerial and ground methods will be warranted along with potential biological controls.

Fire Fuel Management:

To mitigate for the threat of fire, which has occurred in the past, fuel management is needed. *Prosopis* or Kiawe stands in the lowlands which modify habitat also add to the persistence of fires and should be removed and kept from spreading. Fuel mitigation through herbicide applications is also needed along the sides of established access roads to the boundary area. Road maintenance should also be performed to maintain fire suppression access of DLNR and Maui Fire Department Wildland Fire suppression equipment and crews. Dozer work will repair erosional gullies and keep the surface free from fuels on a periodic basis.

Habitat Restoration:

The completed fence and ungulate and weed removal will create the opportunity to restore some of the composition of the native forest within the region. Passive restoration will occur with the removal of invasive species and active restoration opportunities can be enhanced in newly created safe zones through out-planting. This opportunity can be provided to critically rare species via the Plant Extinction Prevention Program whom are already having success in the most remote portions of the region. Common pioneering species could be applied in burned zones at lower elevations via seed scatter techniques. The whole scope of the project will make it possible for PEPP and NARS to also reintroduce species to newly fenced areas in the future. This additional reintroduction will be funded by their means.

This effort could involve volunteer assistance through seed collection to foster the public's connections to rare species habitat, watershed restoration and the Hawaiian hoary bat. WMMWP would be conducting the recruiting of volunteers through our approved volunteer program. We, the WMMWP staff are employees of the Pacific Cooperative Studies Unit at UH and the Research Corporation of UH. We might also be coordinating with any DLNR's volunteer efforts if we were to work on their land.

Large scale seed propagation for seed-dispersal would be outsourced to the Molokai Plant Material Center or equivalent. Pioneering species such as Pili grass (*Heteropogon contortus)*, Uhaloa (*Waltheria indica)*, and a'ali'i (*Dodonaea viscosa)* are likely species to be used for restoration purposes in the lowlands and near existing forests yet other species may add diversity to restored habitats. Within the project area, we have about 100 acres of land needing erosion control and 100 acres needing grass reduction and restoration. Treatments would be performed on a trial basis first to prove concepts and then up-scaled a few years later to cover larger areas. The quantity and distribution of seeds dispersed and the number of plants out-planted will be determined after initial trials prove the best methods. These activities would be supported by mitigation funding and performed by WMMWP. NARS personnel would also participate and advise in the process. The other treatment methods of habitat restoration might be to use an appropriate grass specific herbicide to assist habitat recovery in fire

impacted areas where grass is the main non-native competitor to native cover types. This will also help to limit the recurrence of fire by reducing flashy grass fuels.

Other areas that may include out-planting of native tree species will be identified such as replacing guava trees and increasing native tree cover in gulches. Experimental planting of small numbers of trees will occur first in prospective areas to demonstrate the potential for success. If plants can thrive then expanding out-planting will occur. Any intensive planting will be limited to areas where water resources are readily available. At least 200 acres will be attempted to be reforested with approximately 200 trees per acre initially. At least two open lanes 20-30 ft wide and as long as possible in each 100 acres and perpendicular to the trade winds will not be planted with trees in these "new" forests. These lanes would be planted with low stature natives. In existing forests invasive trees may be removed and the vacated area kept open through planting short stature natives.

Project Timeline and Proposed Budget provided by WMMWP:

Lahaina Area Management Budget		**Timeline**	**Annual Cost**	**Estimated Cost**
Fencing	All Aspects	Years 1 & 2		$ 689,500
Ungulate Control	All Aspects	Years 2-4	TBD	TBD
Weed Control	Priority weed Containment	Years 2-10	TBD	TBD
Fire Fuel Management	24 miles of fuel break, kiawe removal, dozer work	Annually, 17 yrs	$ 3,200	$ 54,400
Habitat Restoration	Seed scattering and/or out-planting	Years 4-10	TBD	TBD
Sustained Management	Threat Monitoring & Maintenance	Annually, 17 yrs	TBD	TBD
Sub total			TBD	TBD
PCSU Direct	On salary at 5%		TBD	TBD
UH Indirect	10%		TBD	TBD
Total			Not to exceed	**$3,450,000**

Species List: The completion of this project will significantly reduce threats to the following Taxa or improve their designated critical habitat. This record is incomplete:

#	Type	Family Name	Scientific Name	Status
1	Invert	Achatinellidae	*Partulina terebra*	SOC
2	Plant	Sapindaceae	Alectryon macrococcus var. macrococcus	E
3	Plant	Amaranthaceae	*Achyranthes splendens var. splendens*	SOC
4	Plant	Asteraceae	*Bidens campylotheca* subsp. *pentamera*	C
5	Plant	Rubiaceae	*Bobea sandwicensis*	SOC
6	Plant	Campanulaceae	*Clermontia arborescens* subsp. *arborescens*	SOC
7	Plant	Dryopteridaceae	*Ctenitis squamigera*	E
8	Plant	Campanulaceae	*Cyanea glabra*	E
9	Plant	Gesneriaceae	*Cyrtandra filipes*	C
10	Plant	Gesneriaceae	*Cyrtandra lydgatei*	SOC
11	Plant	Aspleniaceae	*Diellia erecta* f. *erecta*	E
12	Plant	Theaceae	*Eurya sandwicensis*	SOC
13	Plant	Santalaceae	*Exocarpos gaudichaudii*	SOC
14	Plant	Rhamnaceae	*Gouania hillebrandii*	E
15	Plant	Rhamnaceae	*Gouania vitifolia*	E
16	Plant	Begoniaceae	*Hillebrandia sandwicensis*	SOC
17	Plant	Rubiaceae	*Kadua formosa*	SOC

18	Plant	Rubiaceae	*Kadua laxiflora*	E
19	Plant	Orchidaceae	*Liparis hawaiensis*	SOC
20	Plant	Primulaceae	*Lysimachia lydgatei*	E
21	Plant	Plantaginaceae	*Plantago princeps var. laxifolia*	E
22	Plant	Pteridaceae	*Pteris lydgatei*	E
23	Plant	Urticaceae	*Neraudia sericea*	E
24	Plant	Araliaceae	Reynoldsia sandwicensis	SOC
25	Plant	Asteraceae	*Remya mauiensis*	E
26	Plant	Caryophyllaceae	*Schiedea menziesii*	SOC
27	Plant	Apiaceae	*Spermolepis hawaiiensis*	E
28	Plant	Lamiaceae	*Stenogyne kauaulaensis*	SOC
29	Plant	Cucurbitaceae	*Sicyos cucumerinus*	SOC
30	Plant	Asteraceae	*Tetramolopium capillare*	E
31	Plant	Violaceae	*Viola lanaiense*	E

Map1: Google Earth view of the project area with 7800 acres benefitting from proposed actions. The 1600 acre area in green is proposed for fencing to add regional benefits. Fire fuel management and breaks will be maintained in red and ungulate and weed control efforts will assess and control priorities throughout the area. With funding from the state of Hawaii we will be able to build 1.9 miles of this Lahaina Boundary Project (blue line). The remaining section (in green) to be built is estimated to be 3.5 miles. This fence will stretch across Makila Land Company Property from the north to State land at the southern end.