BIOLOGICAL OPINION

OF THE

U.S. FISH AND WILDLIFE SERVICE

FOR

Kaheawa Wind Power II Habitat Conservation Plan and Incidental Take Permit

ISLAND of MAUI

DECEMBER 27, 2011

(1-2-2011-F-136)

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United States Department of the Interior

FISH AND WILDLIFE SERVICE

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Honolulu, Hawaii 96850

In Reply Refer To:
1-2-2011-F-0136

Memorandum

To: Chief, Division of Consultation and Conservation Planning
Pacific Regional Office
Portland, Oregon

From: Field Supervisor, Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

Subject: Kaheawa Wind Power II Wind Energy Generation Facility Habitat Conservation Plan and Incidental Take Permit, TE27260A-0

This document represents the Fish and Wildlife Service's (Service) biological opinion (Opinion) regarding the Service's proposed issuance of an Endangered Species Act (ESA) section 10(a)(1)(B) incidental take permit (Permit) for the Kaheawa Wind Power II (KWPII), a wind power generating facility in Maalaea, Maui, Hawaii. Kaheawa Wind Power II, LLC (KWPII LLC) (the Applicant or KWPII), a subsidiary of First Wind Holdings, LLC (formerly UPC Wind Partners, LLC), a Boston-based wind energy company, applied for a permit to develop and operate a 14-turbine wind energy generation facility (wind farm) and implement the KWPII Habitat Conservation Plan (HCP) pursuant to the requested Permit. This Opinion addresses the impacts of Permit issuance and project implementation to the endangered Hawaiian petrel *(Pterodroma sandwichensis)*, threatened Newell's (Townsend's) shearwater *(Puffinus auricularis newelli)*, endangered Hawaiian goose, nene (*Branta sandvicensis*), and the endangered Hawaiian hoary bat, opeapea (*Lasiurus cinereus semotus*). The above species are hereafter referred to as the "covered species." Impacts of mitigation actions to listed plants and critical habitat are addressed in our December 23, 2011, memorandum to the record. This Opinion was prepared in response to your November 2, 2010, request for initiation of formal consultation in accordance with section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.). On March 17, 2011, you agreed to an extension of the formal consultation period to provide additional time for the Applicant to refine their proposed project plans.

This Opinion is based upon information in the following documents: (1) the Kaheawa Wind Power II Wind Energy Generation Facility Habitat Conservation Plan (KWPII HCP) (SWCA 2011a), which is herein incorporated by reference; (2) the Kaheawa Wind Power II Wind Energy

Generation Facility Final Environmental Assessment (Service 2011a); (3) the Draft Revised Recovery Plan for the nene or Hawaiian goose (*Branta sandvicensis*) (Service 2004); (4) the Hawaiian Dark-rumped Petrel and Newell's Manx Shearwater Recovery Plan (Service 1983); (5) the Recovery Plan for the Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) (Service 1998); (6) other biological literature cited herein (*see* Literature Cited); and (7) other information in our files. A complete administrative record of this consultation is on file at the Service's Pacific Islands Fish and Wildlife Office in Honolulu, Hawaii.

Consultation History

On November 2, 2010, the Service's Pacific Regional Office submitted a formal request for consultation on the proposed Permit action to the Pacific Islands Fish and Wildlife Office.

On March 17, 2011, the Pacific Regional Office and the Pacific Islands Fish and Wildlife Office agreed to extend the formal consultation period to provide the Applicant with additional time to refine their proposed action.

BIOLOGICAL OPINION

1.0 DESCRIPTION OF THE PROPOSED ACTION

Activities Covered Under the Proposed Permit and HCP

Project Overview

The Service proposes to issue a Permit to the Applicant for the incidental take of the HCP-covered species by HCP-covered activities associated with the construction and operation of KWPII, a new 14-turbine, 21-megawatt (MW) wind energy generation facility, and to approve the proposed KWPII HCP addressing, in part, measures the Applicant will take to minimize and mitigate the impacts of incidental take of the covered species.

The proposed action is detailed in the KWPII HCP (SWCA 2011a) and the Final EA for the proposed permit action (Service 2011), which are incorporated herein by reference. Table 1 summarizes the Applicant's requested levels of incidental take for each of the Covered Species. Table 2 outlines the Applicant's proposed measures to mitigate the impacts of incidental take for each of the Covered Species. Tier 1 is the level of take the analysis indicates is likely to occur, while Tier 2 take levels were set based on the level of take which is unlikely to be exceeded. In addition, KWPII set five-year limits to serve, in addition to calculations of 20-year take levels, as trigger points for mitigation implementation. Tier 2 mitigation will be implemented if the 5-year take limits for Tier 1 are exceeded within a five year period (ie., in year 1-5, 6-10, 11-15, or 16-20), or if calculations indicate the 20-year Tier 1 take level will be exceeded.

Table 1. Amount of Authorized Take Requested at Tier 1 and Tier 2 levels.

Covered Species	Tier	Requested ITP Authorization	
		5-Year Limit	20-Year Limit
Hawaiian Petrel	Tier 1	8 adults/ immatures and 4 chicks/eggs	19 adults/ immatures and 9 chicks/eggs
	Tier 2	up to 16 adults/ immatures and 8 chicks/eggs	up to 29 adults/ immatures and 14 chicks/eggs
Newell's Shearwater	Tier 1	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
Hawaiian Goose	Tier 1	8 adults/ immatures and 1 fledgling	18 adults/ immatures and 2-3 fledglings
	Tier 2	up to 12 adults/ immatures and 3 fledgling	up to 27 adults/ immatures and 3 fledglings
Hawaiian Hoary Bat	Tier 1	6 adults/ immatures and 3 juveniles	6 adults/ immatures and 3 juveniles
	Tier 2	up to 9 adults/ immatures and 5 juveniles	up to 9 adults/ immatures and 5 juveniles

Table 2. Proposed mitigation for the take of covered species under the KWPII HCP.

Tier 1 Mitigation	Tier 2 Mitigation
Hawaiian Petrel: 1. KWPII shall implement a comprehensive plan for Hawaiian petrel management at Makamakaole, located on west Maui near the lower Kahakuloa Valley. Management actions shall include installation of predator-proof fencing around a five-to 10 acre enclosure within known breeding habitat, eradication of known predators within the enclosure, and use of social attraction and artificial burrows to enhance the abundance of petrels nesting within the enclosures. The success of the social attraction project in establishing a larger breeding colony within the enclosures shall be determined after 5 years. If unsuccessful, additional measures shall be implemented until these mitigation measures are determined to have offset the impacts of take of the petrel by covered activities. If additional mitigation is necessary to offset the impacts of Tier 1 take of the petrel, KWPII shall: 2. Implement predator control to protect a Hawaiian petrel colony at the Haleakala Crater Rim within an approximately 220-acre (ac) (89 hectare (ha) area with approximately 100 burrows. This effort shall include contracting for labor and equipment (e.g., traps and bait) required to conduct predator trapping in this area (or a section thereof, depending on the mitigation requirement), and for monitoring to document success of this effort. If additional mitigation is necessary to offset the impacts of Tier 1 take of the petrel, KWPII shall: 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, the area managed at the Haleakala Crater Rim site will be expanded eastward to an area known to be occupied by unprotected Hawaiian petrels.

Tier 1 Mitigation	Tier 2 Mitigation
Newell's Shearwater: 1. KWPII shall fund implementation of a comprehensive plan for Newell's shearwater colony management at Makamakaole, located on west Maui near lower Kahakuloa Valley. Management actions shall include predator-proof fencing of a five-to 10-acre enclosure, predator eradication within the enclosure, and use of social attraction and artificial burrows to enhance the abundance of shearwaters nesting within the enclosures. The success of the social attraction project in establishing additional breeding pairs of shearwaters within the enclosures will be determined after 5 years. If unsuccessful, additional measures shall be implemented until these mitigation measures are determined to have offset the impacts of take of the shearwater by covered activities. If additional mitigation is necessary to offset the impacts of Tier 1 take of the shearwater, KWPII shall: 2. Fund the construction of predator exclosures at an in-situ site at upper Kahakuloa or an alternative site in west Maui, if deemed feasible by the Applicant, with the approval of the Service. If additional mitigation is necessary to offset the impacts of Tier 1 take of the shearwater, KWPII shall: 3. Fund the construction of predator exclosures at an in-situ site in east Maui, if deemed feasible by the Applicant with the approval of the Service. If additional mitigation is necessary to offset the impacts of Tier 1 take of the shearwater, KWPII shall: 4. Fund the construction of predator exclosures and implement a social attraction project in east Maui. If additional mitigation is necessary to offset the impacts of Tier 1 take of the shearwater, KWPII shall: 5. Fund the construction and management of predator exclosures at an in-situ site in west Maui or east Maui, if deemed feasible based on DOFAW and Service feasibility criteria. And, if additional mitigation is necessary to offset the impacts of Tier 1 take of the shearwater, KWPII shall: 6. Provide funding support for colony-based protection and productivity enhancement, at an in-situ or social attraction nesting area 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 impacts.

Hawaiian Goose: 1. KWPII shall fund construction of a new release pen to accommodate spillover of Hawaiian geese from existing pens or KWPII shall participate in the translocation of eggs, adults or family groups from Kauai. The mitigation program includes funding for logistics, DOFAW staffing, predator control and vegetation management activities at the new Hawaiian goose release pen for the first five years of the Permit term. Monitoring and modeling of the results of predator control shall also be done to confirm the above mitigation efforts offset the impacts of Tier 1 take of the goose.	1. Extend management activities at the new release pen constructed for Tier 1, including funding support for logistics, DOFAW staffing, predator control, and vegetation management. Monitor and model the results of Tier 2 actions to confirm mitigation offsets Tier 2 take impacts.
Hawaiian Hoary Bat: 1a. KWPII shall fund surveys to document bat occupancy within different habitat types (e.g., ridges vs. gulches) and elevation ranges at the KWPII project site and in the project vicinity to support Maui bat research. 1b. KWPII shall fund removal of ungulates, restoration of native forest habitat, and management of vegetation on State land at Kahikinui to provide bat habitat at a ratio of 84 ac per male bat taken.	1a. Continue bat surveys to document bat occupancy within different habitat types (e.g., ridges vs. gulches) and elevational ranges at the KWPII project site and vicinity to support Maui bat research. 1b. Restoration of additional bat habitat at an acreage commensurate with the requested take at Tier 2.

Action Area

KWPII will be located in the Kaheawa Pastures area of the Ukumehame Ahupuaa, above Maalaea, west Maui, Hawaii. KWPII will supply wind-generated electricity to Maui Electric Company Ltd. (MECO) under the terms of a State of Hawaii Public Utilities Commission (PUC) approved power purchase agreement (PPA). Power generated by the facility will be delivered from the proposed substation to the existing MECO 69 kilovolt (kV) transmission line that passes directly through the southern end of the project area.

KWPII will be located on approximately 143 ac (58 ha) of State Conservation Land, approximately 2,000 feet (ft) southeast of the southern end of the existing 20-turbine KWPI wind farm (Figure 1). The subject property is located along an existing access road on portions of Tax Map Key Nos. 4-8-001: 001 (8 ac, 3 ha) and 3-6-001:014 (135 ac, 55 ha). Construction of the proposed facilities will disturb approximately 43 ac (17.4 ha). Approximately 39.2 ac (15.9 ha) will be developed (i.e. made to contain structures or hardened surfaces).

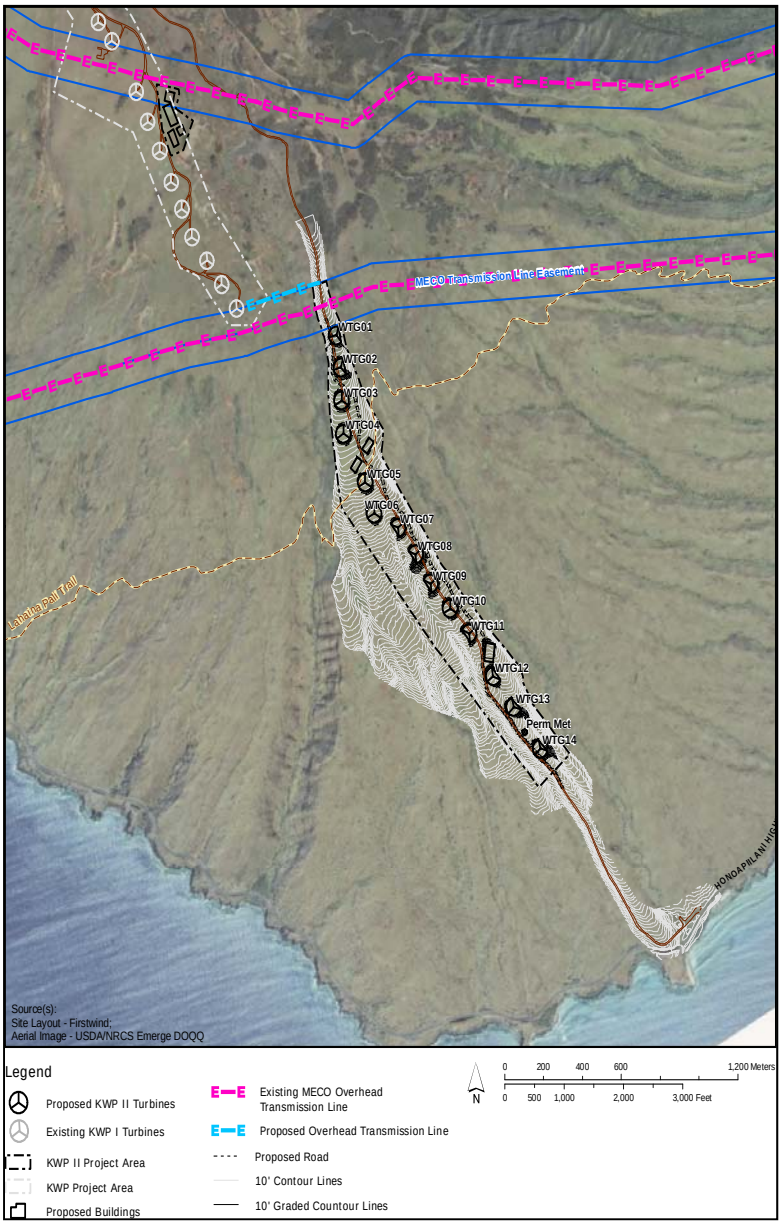

Figure 1. KWPII wind farm project site and lower turbines of the existing KWPI wind farm.

The action area consists of all areas to be affected directly or indirectly by the Federal action including access roadways, wind turbine foot prints, associated facilities, overhead collection lines, and meteorological towers. The action area also includes mitigation sites, where actions will be implemented to benefit the covered species. Potential adverse impacts of mitigation site fence installation and vegetation management to critical habitat and listed plants were determined to be not likely to adversely affect listed species and critical habitat (see Consultation History section above).

Project Description Summary

The proposed Permit action and HCP entail the Applicant's completion of the following actions:

- Obtaining a lease for or easement right from the State Department of Lands and Natural Resources (DLNR) for approximately 135 ac of land within parcel (2) 3-6-001:014 and roughly 8 ac of land within parcel (2) 4-8-001:001.
- Obtaining easement rights for access to and use of the existing entrance and main access road (within parcels (2) 3-6-001:014 and (2) 4-8-001:001) from DLNR.
- Executing an agreement with KWPI to use the existing road and to construct proposed KWPII facilities within the KWPI lease area.
- Realigning portions of the existing access road and constructing short service roads that connect KWPII to the main access road. The cleared and graded area for the proposed new internal access roads will be approximately 36 ft (11 m) wide, of which 16-20 ft (5-6 m) will be graveled.
- Installing 14 General Electric (GE) 1.5 MW wind turbine generators (WTGs) and supporting equipment. Each WTG will be set in a concrete foundation approximately 46 ft^2 in area. An additional 20-ft wide cleared gravel perimeter will be provided around each foundation to facilitate access and maintenance. Table 3 lists other pertinent characteristics of the WTGs.
- Renovate the existing KWP Operations & Maintenance (O&M) building for shared KWPI and KWPII use, adding a bathroom, expanding the office area, and reducing the shop area.
- Constructing a 5,000 ft^2 maintenance building adjacent to the existing KWPI O&M building to be shared by both projects. Outdoor parking will be provided for three to five vehicles.
- Constructing a new electrical substation near the existing KWPI WTG #12 and connecting the new substation to the existing MECO power transmission lines that pass over the substation site using a short overhead cable.
- Constructing a Battery Energy Storage System (BESS) and housing it in an enclosure adjacent to the proposed substation to provide dispatchable energy under various operating conditions. This stored energy will be used to improve the ability of the MECO system to absorb additional as-available wind-generated resources. Outdoor parking will be provided for three to five vehicles.
- Constructing one permanent un-guyed meteorological tower and one temporary guyed 65-meter test tower prior to construction of the WTGs. The temporary test tower shall be removed within three months of completing construction.
- Installing an underground fiber optic network and electrical collection system connecting the KWPII WTGs, substation, BESS, meteorological tower, KWPI communications tower, and O&M building. The electrical collection system will include an overhead collection line approximately 1,225 ft in length mounted on poles approximately 60 - 90 ft high that will cross Manawainui Gulch, adjacent and parallel to an existing MECO line. The underground collection cables will be buried in trenches approximately two ft wide and four ft deep. Trenches will be backfilled and returned to pre-construction elevations and disturbed areas will be revegetated.
- Installing a 60,000-gallon tank adjacent to the existing KWPI O&M building which will be filled with non-potable water periodically trucked into the site. This water will be used for nonpotable plumbing, dust control, landscape irrigation, emergency fire-fighting, and other

similar purposes. If a new tank does not prove feasible due to permitting or cost considerations, KWPII will continue to use bottled water and portable pumped toilets.

Table 3. Characteristics of 1.5-MW wind turbine generators.

Power generation	1.5 MW each
Tower structure and height	Tubular; 213 ft tall
Rotor diameter	231 ft
Total height (tower + ½ rotor)	328 ft
Rotor swept area	50,130 ft^2
Rotor speed	10-21 rpm (variable)
Wind speed at which generator starts	8 mph
Wind speed at which generator cuts out	56 mph
Rated wind speed (unit reaches maximum output)	27 mph

Table 4 summarizes the area that will be occupied by each of the major components of the proposed project. The total developed area of the site is anticipated to be roughly 39.2 ac. This includes the 14 turbine foundations, one permanent meteorological tower foundation, maintenance building, O&M building, electrical substation, and BESS.

Table 4. Approximate area disturbed by construction of proposed facilities.

Project Component	**Approximate Area Disturbed (ac)**
14 WTG foundations and pads	21
Trenching for underground electrical cables	2
Permanent meteorological tower	0.2
Maintenance building, substation, BESS	2
Access roads	16
Temporary lay-down area	2
Total	43

Wind Turbine Generators

Each of the proposed GE 1.5 MW WTGs has four principal elements: (1) a three-bladed rotor which converts the wind's energy into rotational shaft energy; (2) a nacelle that houses a gearbox and a generator; (3) a tower that holds the rotor and drive train above the ground; and (4) electronic equipment at the base of the turbine such as controls, electrical cables, and a transformer. Table 3 lists the characteristics of the WTGs. The three-bladed rotor on each WTG has a diameter of approximately 230 feet. When the blade tip is at the top of its arc it extends about 327 ft above the ground. The rotors turn at a rate of between ten and twenty-one revolutions per minute, depending on wind speed. The nacelle atop each tower contains the gear box, low and high speed shafts, generator, controller, and brake; it is approximately 12 ft high by 12 ft wide by 27 ft long. The nacelles are mounted on the towers in a manner that enables them to

rotate 360 degrees about a vertical axis so that they can always be oriented into the wind. When the wind speed picks up to within operating range, the sensors cue the WTG to orient itself to face the wind, to switch its rotor from a dormant position (i.e. feathered) to an active position, and to commence generating power. The conical tubular steel towers supporting each unit will be 212 feet high; they will taper from a diameter of approximately 15 feet at the base to approximately 10 feet at the top. The reinforced concrete foundation supporting each tower is approximately 46 square feet. An electronics cabinet inside the base of each tower houses the electric switchgear and related controls. Additionally, a small (approximately 8 ft^3) pad-mounted transformer is located adjacent to the base of each tower to increase the electrical voltage of the energy produced by the generator to 34.5 kV.

A work area will be cleared and graded around the base of each WTG to provide room for delivery and laydown of turbine components, crane access, and foundation and turbine construction. This will be done using bulldozers, excavators, compactors, graders, front-end loaders, a trencher and a drill rig for possible probe and grout activity, and potentially drill and shoot explosives and a rock crusher/screener at specified sites. Water trucks will be utilized to provide moisture for compaction as well as dust control activities. Ready-mix concrete trucks will deliver concrete for the turbine foundations. Based on experience gained at KWPI the size and shape of each work area will vary depending on terrain and construction requirements. However, it will generally be on the order of 100 ft – 135 ft radius of usable area. Additional area will be disturbed outside this finished pad surface to provide a safe layback of cut/fill. A gravel perimeter will be installed around each foundation at the completion of construction to facilitate access and maintenance. Geotextile weed barrier material will be used beneath the gravel as dictated by the geotechnical engineer where required for road stability. Disturbed areas outside the gravel perimeter will be scarified and seeded to stabilize the soil. The WTG components will be stored at an interim storage site on Maui. The equipment will be transported to the site via the existing KWPI access road. Once at the site, the turbines will be erected utilizing several cranes, including the 300-ton capacity crane that is housed at the KWPI facility.

Turbine Construction

The turbine components (tower segments, rotors, nacelles) will be shipped to Maui via containers that will be unloaded at Kahului Harbor. These materials will be transported to the staging area (just above the Honoapiilani Highway entrance) in the evening, to minimize any disruption of vehicular traffic. Otherwise, no construction work is expected to occur at night.

During daylight hours, the turbine components will be slowly transported on the access roadway to the project site using a combination of vehicles to carry, push and pull each load, including multi-axle lowboy trailers and specialized tractors. Once at the site, turbine components will be staged at the site and the turbines subsequently will be erected by a 300-ton crane, which itself must be transported unassembled to the site and assembled prior to its use. It is anticipated that erection of each turbine will require one to three days and therefore total assembly time for fourteen turbines may span fourteen to forty-two days.

Turbine Operations

Personnel will generally be present at the facility on a daily basis throughout project operation. They will maintain the road and other facilities. Maintenance will include vegetation control (manual and chemical) on the turbine pads to prevent new growth that may otherwise attract the Hawaiian goose, as well as revegetation in other disturbed areas using species commonly found in the general project area. Downed wildlife search areas may be kept mowed to increase searcher efficiency. Additional maintenance and site work may be conducted for fire prevention purposes at the direction of DLNR forestry officials with the review and approval of Service and DLNR wildlife officials.

Operations and Maintenance Buildings

To minimize the footprint of the proposed project, the Applicant will renovate the existing KWPI O&M building for shared operations use between the KWPI and KWPII projects. The renovations will include the addition of two bathrooms, expansion of the office area, and reduction of the maintenance area. KWPII will construct a new maintenance building adjacent to the existing KWPI O&M building in the KWPI lease area. The KWPII maintenance building will provide for two large maintenance bays, shop facilities including an overhead crane to facilitate large equipment repair, and a storage area for spare parts.

Project Lighting

Project lighting will be kept to an absolute minimum necessary for safety and operations to minimize seabird attraction and fallout. To minimize the risk of attracting seabirds to the facility lighting at the project will be limited to that which is required by the Federal Aviation Administration (FAA) for aircraft safety. In March, 2005, KWPI received FAA approval to limit lighting to six of the wind turbines (at intervals of 2,500 to 3,000 ft) using medium intensity, simultaneously flashing red lights, utilizing the minimum flash frequency. KWPII will request from FAA a similarly reduced lighting plan for KWPII.

Lighting will be installed at the operations and maintenance facility and substation for the purpose of illuminating the ground area at night. Such lighting will consist of halogen flood lights that are shielded so the bulb is only visible from below bulb height. Lights will be switched on infrequently and only on the rare occasions when personnel are working at the site during darkness. Inside lights within the maintenance and operations buildings will be switched off at the end of each work day.

Project lighting will be minimized to minimize the potential for seabirds to be attracted to the project area. Seabird attraction and subsequent fallout occurs primarily for fledgling shearwaters on their first nocturnal flight from the burrow to the sea (Ainley *et al* 2001). The young birds are attracted to, and blinded by light sources, and frequently collide with power lines, buildings, cars, and other obstacles, or simply fall to the ground exhausted after fluttering around lights for long periods of time (Ainley *et al* 1997b).

Term of Project Construction and Operation

Construction of the project will occur as soon as all permits and authorizations are obtained and financing is complete. The life of the project is anticipated to be twenty years, after which time KWPII will arrange either to extend the life of the project or remove the facilities. The continuance of the project's operation will be subject to a renewal of KWPII's lease with DLNR, as well as an extension of the term of the KWPII HCP. Should KWPII discontinue the operation of KWPII during or at the end of this twenty-year period, the turbines and other structures will be removed and the site remediated and stabilized (returned to its original condition to the extent practicable).

Project Construction and Operation Impact Avoidance and Minimization Measures

Measures to minimize the potential impacts that KWPII may have to listed species that have been incorporated into the site design and configuration include:

- Employing relatively few turbines situated a single row, rather than a large number of staggered turbines or multiple rows.
- Using "monopole" steel tubular towers for turbines, rather than lattice towers, to eliminate perching and nesting opportunities for birds. The tubular towers may also reduce avian collision risk because they are considerably more visible.
- Utilizing a rotor with a rotational speed (11-20 revolutions per minute) that makes the rotor more visible to wildlife.
- Choosing a site in proximity to existing electrical transmission lines to eliminate the need for a lengthy overhead transmission line from the project to the interconnect location.
- Selecting a site in proximity to the existing KWPI facility so key infrastructure can be shared, thereby minimizing the need for new disturbance and development. The considerable body of data that has been collected on listed species at the KWPI site also informs KWPII site selection and avoidance/minimization measures, as well as likely mitigation requirements.
- Placement of most new power collection lines underground to eliminate the risk of collision.
- Designing and installing the site substation and interconnect to MECO's transmission lines using industry-standard measures to reduce the possibility of wildlife electrocutions.
- Marking guy wires on the temporary meteorological tower with 4-foot 1-inch poly tape, folded on itself and secured to the guy wires with ultra-violet resistant zip ties. The white tape acts as a streamer, making the meteorological tower more visible to birds and bats and increasing the likelihood of collision avoidance (Tetra Tech 2008). A total of at least 56 streamers will be attached to each meteorological tower. In addition, high-visibility bird diverters, and other suitable marking devices will be placed between sections of the white tape.
- Restricting construction activity to daylight hours as much as possible to avoid the use of nighttime lighting that could be an attraction to seabirds.
- Requesting FAA endorsement of a minimal lighting plan to reduce the likelihood of attracting or disorienting seabirds.

- Having minimal on-site lighting at the O&M building and BESS, using fixtures that will be shielded and/or directed downward and only utilized on infrequent occasions when workers are at the site at night.
- Conducting pre-construction surveys for Hawaiian geese and their nests prior to roadway and site clearing and construction to identify and avoid harming or harassing any active nests, eggs, young, or adults; the survey protocol that was developed and used for KWPI will be used at KWPII for this measure.
- Areas temporarily disturbed during construction of the KWPII project will be revegetated in consultation with Division of Forestry and Wildlife (DOFAW) to ensure that the Hawaiian goose will not be attracted to areas where they will be at increased risk of adverse impacts from project operation or create a fire hazard.
- Any ongoing management of vegetation in the project area (such as mowing, clearing, or planting) will be conducted in consultation with DOFAW biologists to ensure that the Hawaiian goose will not be attracted to areas where they will be at increased risk of adverse impacts from project operation.
- A wildlife biologist will make systematic visual observations of Hawaiian goose activity from representative locations within the KWPII project area during the first year of project operation. The objective of these observations will be to document how Hawaiian geese use the project area following construction and to record observations of Hawaiian goose behavior and activity in the vicinity of the WTGs, including in-flight response to collision hazards (e.g., changing flight direction to avoid WTGs). Incidental observations of Hawaiian goose activity and response to the turbines will also be recorded under the wildlife education and observation program (WEOP).
- Implementation of a daily search protocol during construction to minimize the risk of direct impacts to the Hawaiian geese and their nests.
- Immediate notification of designated environmental personnel should a Hawaiian goose and/or a nest(s) be discovered at the site after construction has begun. Construction activities will be modified or curtailed until appropriate measures are implemented, in consultation with DLNR and the Service, to reduce or eliminate adverse risk to Hawaiian geese or their nests.
- Implementation of low wind speed curtailment at night by raising the cut-in speed of the project's wind turbines to 5 m/s. Recent studies on the mainland indicate that most bat fatalities occur at relatively low wind speeds, and consequently the risk of fatalities may be significantly reduced by curtailing operations on nights when winds are light and variable. The times of the year when curtailment is implemented (i.e., year-round or seasonal) at KWPII will be decided based on bat detection data on site, seasonal distributions of observed fatalities on site, and best available science, with concurrence from the Service and DLNR. The curtailment will initially occur during months of July to November, which is when bat activity has been consistently documented. Curtailment will be extended if fatalities are found outside the initial proposed curtailment period with concurrence from the Service and DLNR. Curtailment may also be reduced or shifted with the concurrence of DOFAW and the Service if site-specific data demonstrate a lack of bat activity or during certain periods, or if experimental trials are conducted that demonstrate that curtailment is not reducing collision risk at the project during the entire curtailment period.
- A speed limit of 10 mph will be enforced to reduce possible vehicular collisions with Hawaiian geese and other wildlife.

Voluntary Compliance with Service Guidelines

The KWPII HCP incorporates the recommendations of the Service's Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines (Service 2004b). These guidelines contain materials to assist in evaluating possible wind power sites, wind turbine design and location, and pre- and post-construction research to identify and/or assess potential impacts to wildlife. KWPII is proposing to implement the KWPII HCP to offset the risks of project-related impacts and provide a conservation benefit to the covered species.

Monitoring and Reporting Project-Related Impacts

Collision of covered species with the WTGs, temporary and permanent meteorological towers, overhead collection lines, and cranes used for construction of the turbines will be monitored and reported to track take and evaluate effectiveness of minimization measures. Survival and reproductive success of the covered species will be monitored at mitigation sites to track the benefits of mitigation. Periodic and annual reports will be developed to track implementation of the HCP.

Monitoring

The monitoring protocol for bird and bat injuries and fatalities will be established and administered by DOFAW in coordination with KWPII personnel. Monitoring protocols will be finalized by the agencies prior to the start of project operations. KWPII will review the fatality records in an effort to determine whether measures in addition to the low wind speed curtailment can be implemented that will reduce or minimize take. If causes cannot be readily identified, KWPII will conduct supplemental investigations that may include but not be limited to:

Species usage data will be collected at the site to inform development of measures to reduce potential project impacts. Acoustic detectors, thermal imaging, and night vision equipment will be used to determine spatial, seasonal, and diurnal patterns of Hawaiian hoary bat usage of the wind farm site to guide implementation of turbine curtailment to further reduce potential impacts to bats. Fatality data will be examined to relate deaths to specific conditions such as wind speed, weather conditions, and season to guide modifications to turbine operations. Measures to reduce bat fatalities such as changes such as refining low-wind-speed curtailment at "problem" turbines, modifications to structures and lighting and implementing measures to repel or divert bats from areas of high risk without causing harm may be implemented with the concurrence of USFWS and DLNR.

A wildlife biologist will make systematic visual observations of Hawaiian goose activity from representative locations within the KWPII project area during the first year of project operation. The objective of these observations will be to document how Hawaiian geese use the project area following construction and to record observations of Hawaiian goose behavior and activity in the vicinity of the WTGs, including in-flight response to collision hazards (e.g., changing flight direction to avoid WTGs). Observations will be made from at least three locations (upper, middle and lower points within the project area), and will occur on a weekly basis for at least three hours (one hour at each site). The time spent surveying from a particular location may exceed one hour

if lengthening observation time provides more information useful in characterizing use patterns. The timing of observation periods will vary to cover daylight and crepuscular periods. Night-vision or thermal imaging equipment (as available) may be used during low-light periods. Incidental observations of Hawaiian goose activity and response to the turbines will also be recorded over the life of the project. These observations will contribute to a better understanding of how Hawaiian geese respond to wind facilities and will inform interpretations and management actions relevant to the population ecology of Hawaiian geese in west Maui. Avoidance and minimization measures will be refined and improved as a result of these studies, thereby reducing future Hawaiian goose fatalities at wind facilities.

Reporting

During construction, KWPII will provide DLNR and the Service with weekly reports of Hawaiian goose activity in and around construction areas. When take of covered species occurs, DLNR and the Service will be notified within 24 hours by phone and an incident report will be submitted to the Agencies within three (3) business days.

Semi-annual progress reports summarizing the findings of scavenging and searcher efficiency trials, and the results of mitigation efforts will be provided to DLNR and the Service in preparation for semi-annual meetings with DLNR and the Service. The Service and DLNR will determine, based on progress reports and meetings, anticipated 20-year take levels and anticipated 20-year mitigation benefits to determine if additional levels of mitigation should be implemented.

Annual reports summarizing the results of downed wildlife monitoring will be prepared and submitted to DLNR and the Service. These reports will identify: (1) actual frequency of monitoring of individual search plots; (2) results of searcher efficiency trails and carcass removal trials with recommended statistical analyses, if any; (3) directly observed and adjusted levels of take for each covered species; (4) whether there is a need to modify the mitigation for subsequent years; (5) efficacy of monitoring protocols and whether monitoring protocols need to be revised; (6) results of mitigation efforts and anticipated 20-year benefits of mitigation; (7) recommended changes to mitigation efforts, if any; (8) budget and implementation schedule for the upcoming year; and (9) evidence of KWPII's continued ability to fulfill funding obligations. The annual report will be submitted by August 1 each year along with electronic copies of HCP related data. The report will cover the period from June to July of the previous year. The Service and DLNR will have fifteen calendar days to respond to the report, after which a final report incorporating responses to the agencies will be submitted by September 1.

A table summarizing the results of incidental observations will be submitted to DLNR and the Service twice each year. The first table will be submitted in January (post-fledging for seabirds in the previous year) and the second in July (post-fledging for the Hawaiian goose). In addition, in accordance with the Downed Wildlife Protocol, biologists at DLNR and the Service will be notified whenever a species protected by the Migratory Bird Treaty Act (MBTA), or a listed species, is found dead or injured. KWPII will confer formally with the Service and DLNR at least once a year following submittal of the annual report to review each year's results, review the rates of take (directly observed and as adjusted), and plan appropriate future mitigation and monitoring

measures. Any changes to future mitigation and monitoring will be made only with the concurrence of the Service and DLNR.

Mitigation

Mitigation measures proposed by KWPII to compensate for the expected impacts of the project on covered species were selected in collaboration with biologists from the Service, DLNR-DOFAW, First Wind, and SWCA Environmental Consulting, and with members of the Endangered Species Recovery Committee (ESRC). The mitigation proposed to compensate for impacts to covered 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 other wind projects in Hawaii and elsewhere in the U.S. Mitigation takes into account the expected direct and indirect take.

The proposed mitigation and adaptive management measures included in the KWPII HCP are summarized below (see also Tables 1 and 2 above). Mitigation will be implemented in tiers to offset the impacts of take at that level. The Tier 1 level of mitigation will be implemented even if no project-related mortality of a covered species is detected. If calculations indicate the project's incidental take for a species will exceed the Tier 1 level over the 20-year term of the Permit, the Applicant will implement mitigation sufficient to offset the Tier 2 level of take for that species. Benefits of mitigation will be monitored and calculations of mitigation benefit will be completed and reported for Service and DOFAW (collectively referred to as Agency or Agencies) confirmation. The Agencies will direct KWPII, based on coordination with KWPII and the best available information, to increase mitigation effort as needed to ensure mitigation is sufficient to offset the take tier. Mitigation calculations will ensure all adults, eggs, and juveniles taken are replaced, but calculations can be done to convert one age class to a comparable number of individuals in another age class.

Hawaiian Petrel Mitigation Program

Under the HCP, KWPII is requesting authorization to take 19 adult and 9 fledgling Hawaiian petrels under Tier 1, and29 adult and 19 fledgling Hawaiian petrels under Tier 2 for the term of the Permit. KWPII proposes to fund implementation of mitigation to offset the above Tier 1 levels of take, even if no petrel mortality is detected. The KWPII project's Hawaiian petrel mitigation program shall be conducted in conjunction with the mitigation program for the KWPI project. To offset take of both projects, KWPII has committed to funding and implementing a social attraction project at Makamakaole in west Maui, and a predator control project to protect Hawaiian petrels nesting on the Crater Rim at Haleakala National Park in east Maui.

KWPII retained a team from New Zealand to design a social attraction project at Makamakaole in which predator-proof fencing will be installed and maintained for the 20-year life of the project in an area known as Uau hill (Hawaiian petrel hill). Extensive surveys by a team of New Zealand conservation dogs (Steve Sawyer, pers. comm., 2011) indicated the airspace above the site is heavily used for socializing by Hawaiian petrels nesting farther upslope in west Maui and that birds landing to nest at the site appear to be exposed to extreme levels of mongoose predation.

KWPII will fund the construction of two, approximately five-acre, predator-free, fenced exclosures (one for the Hawaiian petrel and one for the Newell's shearwater), attempt to attract passing birds using acoustics, install and maintain artificial burrows, and maintain a predator control program (Figure 2). Hawaiian petrel survival and reproductive success shall be monitored within the enclosure and mitigation credit shall accrue if the Hawaiian petrel population in west Maui increases above what it would have been in the absence of the social attraction and predator control projects based on modeling results.

Figure 2. Makamakaole social attraction project site with two, five-acre exclosures connected by a possible expansion fencing area.

The best available information indicates the Makamakaole social attraction project is likely to offset the take of 18 adult and 10 fledgling Hawaiian petrels during KWPII's 20-year Permit term (SWCA 2011a, Appendix 24, p.6). These benefits of mitigation were calculated based on the estimated increase in survival and reproductive success of petrels nesting in the protected Makamakaole project site enclosure compared with petrel survival and reproductive success at this site in the absence of the project and the enclosure. On this basis, the Makamakaole social attraction project will be inadequate to offset KWPII's Tier 1 level of Hawaiian petrel take (totaling 19 adults and nine fledglings).

Based on calculations to date, the anticipated 20-year take for the Hawaiian petrel at the KWPI project will be 25.1 birds. The KWPI project offsets take on a bird for bird basis, rather than in tiers, although tiers of anticipated take are specified in KWPI for the petrel (Tier 1 take for KWPI is 25 Hawaiian petrels; Tier 2 is 38 total birds). If the Makamakaole social attraction project is more productive than models indicate it will be, the additional mitigation benefit may be sufficient to offset all or a portion of the KWPII project's Tier 1 and Tier 2 levels of take. However, the best available information indicates the social attraction mitigation project at Makamakaole is likely to be insufficient to offset levels of petrel take beyond KWPI's anticipated level of Hawaiian petrel take.

If, in year five of KWPII operation, the Service determines, in coordination with KWPII and based on the best available information including trigger points specified in the KWPII HCP, the Makamakaole social attraction project's projected 20-year benefits will be insufficient to offset the 20-year projected levels of Hawaiian petrel take caused by the KWPI and KWPII projects, KWPII shall manage as many burrows at an existing Hawaiian petrel colony at the Haleakala National Park's (Park) Crater Rim as necessary to offset the remainder of the anticipated take impacts. The Park has confirmed the locations of 99 Hawaiian petrel burrows at the Crater Rim site (Figure 3) and their field studies indicate there are an additional 600 active burrows farther east along the South Rim (C. Bailey pers. comm.,2011b) which are exposed to predators. In addition, Hawaiian petrel burrows on State land, at the Advanced Technology Solar Telescope project site adjacent to the Park Crater Rim site may be available for management.

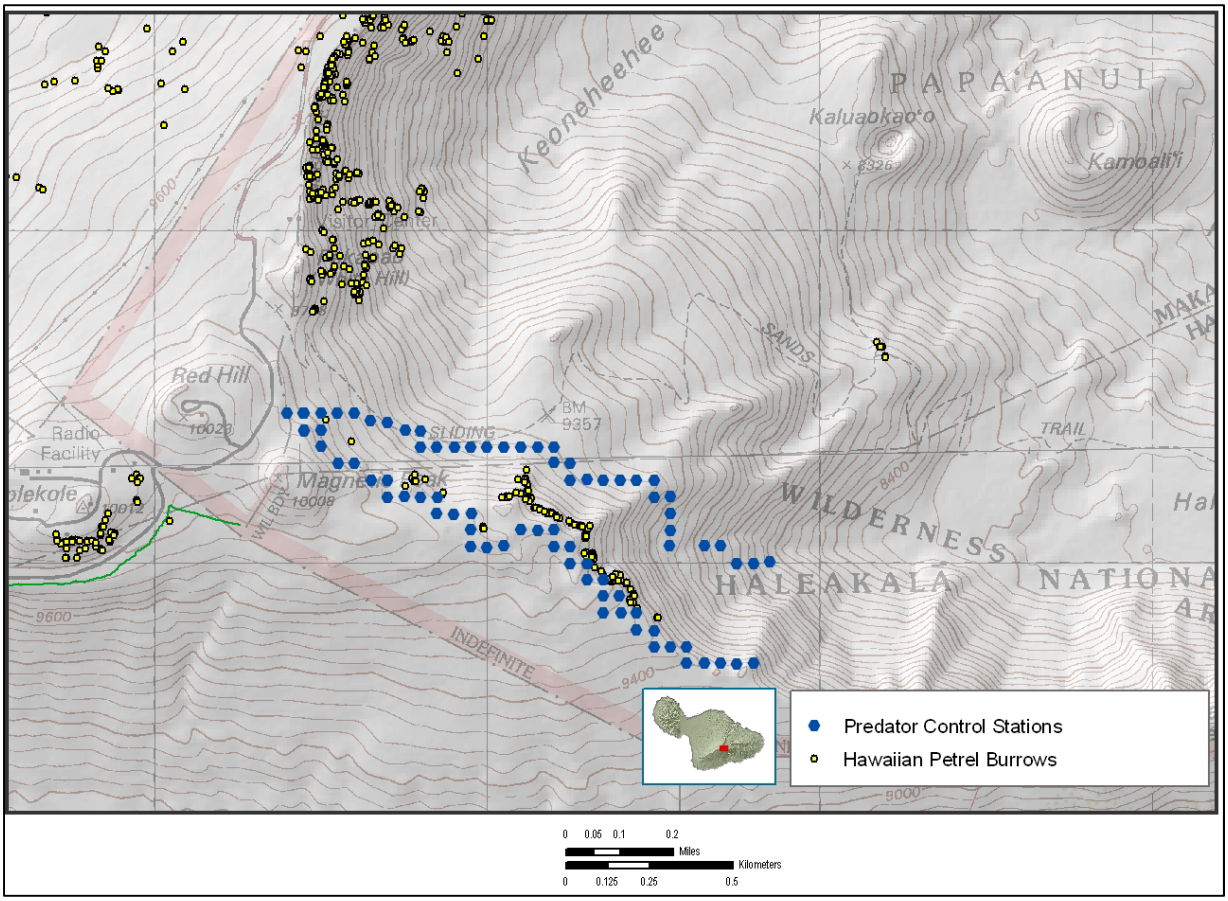

Figure 3. Known Hawaiian petrel burrows and approximate locations of predator control stations at the Haleakala National Park Crater Rim mitigation site.

KWPII shall begin petrel management at the Park Crater Rim in year six of KWPII project implementation and predator control would extend to year 20 (the duration) of the Permit term. KWPII shall install and maintain a predator trapping, snaring, and baiting system to minimize predator impacts without installing a predator fence. KWPII shall monitor rates of petrel survival and reproduction at the managed colony and mitigation credit shall be accrued based on the

comparison of the colony size to the size it would have been in the absence of mitigation actions. Colony size in the absence of management will be determined based on population models incorporating baseline levels of survival and reproduction. Model inputs will be based on control site monitoring or on rates determined by the Service based on the best available information. A Permit condition requires KWPII to monitor Hawaiian petrel survival and reproductive success at a control site (if control site monitoring has not already been completed by other projects which are currently committed to six years of control site monitoring) to better ensure the calculations of mitigation benefit have a solid basis.

Population modeling (presented in the Effects section of this Opinion) indicates that predator control for the 99 known Hawaiian petrel burrows at the Park Crater Rim site is likely, in conjunction with the Makamakaole social attraction project, to adequately offset all KWPI and KWPII permitted and requested levels of Hawaiian petrel incidental take. If the social attraction project is unsuccessful at Makamakaole or the mitigation benefits of management of the 99 burrows at the Park Crater Rim site are insufficient, management of additional burrows at the Crater Rim site shall be incorporated into the mitigation project to offset all incidental take impacts to the Hawaiian petrel caused by implementation of the KWPI and KWPII wind projects.

Newell's Shearwater Mitigation Program

Under the HCP, KWPII is requesting authorization to take two adult and two fledgling Newell's shearwaters under Tier 1 and 5 adult and 3 fledgling Newell's shearwaters under Tier 2 for the 20-year term of the Permit. Under the HCP, KWPII proposes to implement mitigation to offset Tier 1 levels of take, even if no take of the shearwater is detected. Tier 2 mitigation will be implemented if the 5-year take limits for Tier 1 (See Table 1) are exceeded within a five year period (ie., in year 1-5, 6-10, 11-15, or 16-20), or if calculations indicate the 20-year Tier 1 take level will be exceeded. The mitigation program for the Newell's shearwater under the HCP shall be conducted in conjunction with the mitigation program for the KWPI project, which is authorized to take up to five adult and three fledgling Newell's shearwaters. No Newell's shearwater take has been detected at KWPI in its six seasons of operation.

Like the mitigation program for the Hawaiian petrel, a social attraction project at Makamakaole shall be implemented under the HCP. In addition, within the first five years of operation, KWPII will develop, for year-six implementation, the following projects: 1.) a predator control project to protect Newell's shearwater nesting sites, in-situ, in West or east Maui; 2.) a second social attraction project on Maui, and, 3.) if the Service and DOFAW confirm additional in-situ management of the Newell's shearwater on Maui is not feasible, in-situ management and social attraction projects on Molokai and shall be implemented. In year five of project operation, the Service shall determine, in coordination with KWPII and based on the best available information, the projects that KWPII shall implement in year six to ensure the 20-year level of take of Newell's shearwater at KWPI and KWPII will be offset during the 20-year KWPII Permit term.

Under the HCP, the social attraction project for the Newell's shearwater at Makamakaole shall involve the installation and maintenance of predator-proof fencing for the 20-year term of the Permit in an area known as Uau Hill (Hawaiian Petrel Hill). Extensive surveys by a team of New

Zealand seabird conservation consultants (Steve Sawyer, pers. comm., 2011) indicated the airspace above the site is heavily used for socializing by Newell's shearwater nesting farther upslope in west Maui and work they did with conservation dogs indicated that birds landing to nest at the site appear to be exposed to extreme levels of mongoose predation. Under the HCP, an approximately five-acre area shall be fenced in a manner that excludes predators of the Newell's shearwater. Acoustics shall be used to attract passing shearwaters to the site, artificial burrows shall be installed and maintained, and a predator control program shall be implemented within the enclosure (see Figure 2). Newell's shearwater survival and reproductive success shall be monitored and mitigation credit will accrue if the Newell's shearwater population in west Maui increases above what it would have been in the absence of the social attraction project. Baseline levels of survival and reproduction, shown in SWCA 2011a, Appendix 25, p.4, Table 7's "Existing colony" values will be used (as updated with Agency approval) to model the fates birds conserved as a result of mitigation would have had in the absence of the mitigation project.

The best available information indicates the Makamakaole social attraction project is likely to offset take of 9 adults, 12 juvenile, and 4 fledgling Newell's shearwater during KWPII's 20-year Permit term (SWCA 2011a, Appendix 25, p.F-3). These benefits of mitigation were calculated using models that calculated the anticipated increase in survival and reproductive success of Newell's shearwaters nesting in the protected Makamakaole project site compared with their survival and reproductive success in the absence of the project. Results of these models indicate the Makamakaole social attraction project is likely to be adequate to offset 450% of KWPII's Tier 1 requested incidental take (the minimum the Applicant has committed to offset in the absence of observed shearwater mortality) and all of KWPII's Tier 2 (highest) level of take. The models indicate the Makamakaole social attraction project's benefits is likely to offset approximately 81% of all tiers of requested KWPI and KWPII take of the Newell's shearwater.

In year five of KWPII operation, the Service shall determine, in coordination with KWPII and based on the best available information, including trigger points specified in the KWPII HCP, if the beneficial effects of the Makamakaole social attraction project will be sufficient to offset the aggregate impacts of Newell's shearwater take caused by the KWPI and KWPII projects over the 20-year term of the Permit. If not, KWPII shall implement an additional project or projects necessary to ensure that outcome. The potential projects to be developed for possible implementation beginning in year six are listed below in priority order:

1. KWPII shall conduct in situ management of a Newell's shearwater colony in west Maui. During the first five years of KWPII HCP implementation, the location(s) of Newell's shearwater nesting areas in west Maui shall be determined. Based on feasibility criteria set forth in the HCP, a site or sites shall be selected at which Newell's shearwaters shall be protected from predators. For preliminary planning purposes, the HCP delineates an example of predator-proof fence locations in a drainage in the upper reaches of the Kahakuloa and Honokohau valleys (Figure 4). If no sites can be identified that meet the HCP feasibility criteria for cost-effectiveness, KWPII shall consider the next highest priority project alternative.

2. During the first five years of KWPII HCP implementation, KWPII shall identify in-situ and social attraction project sites in east Maui. Haleakala National Park is the only known in-situ Newell's shearwater colony in east Maui and the Park may not approve of fencing and active colony management. The Service and KWPII shall work with the Park to assess the management feasibility of Newell's shearwater colonies within the Park. KWPII shall locate and design a social attraction project or projects in east Maui to provide a predator-proof fenced area for east Maui nesting Newell's shearwaters to use in the event in-situ management is not possible.

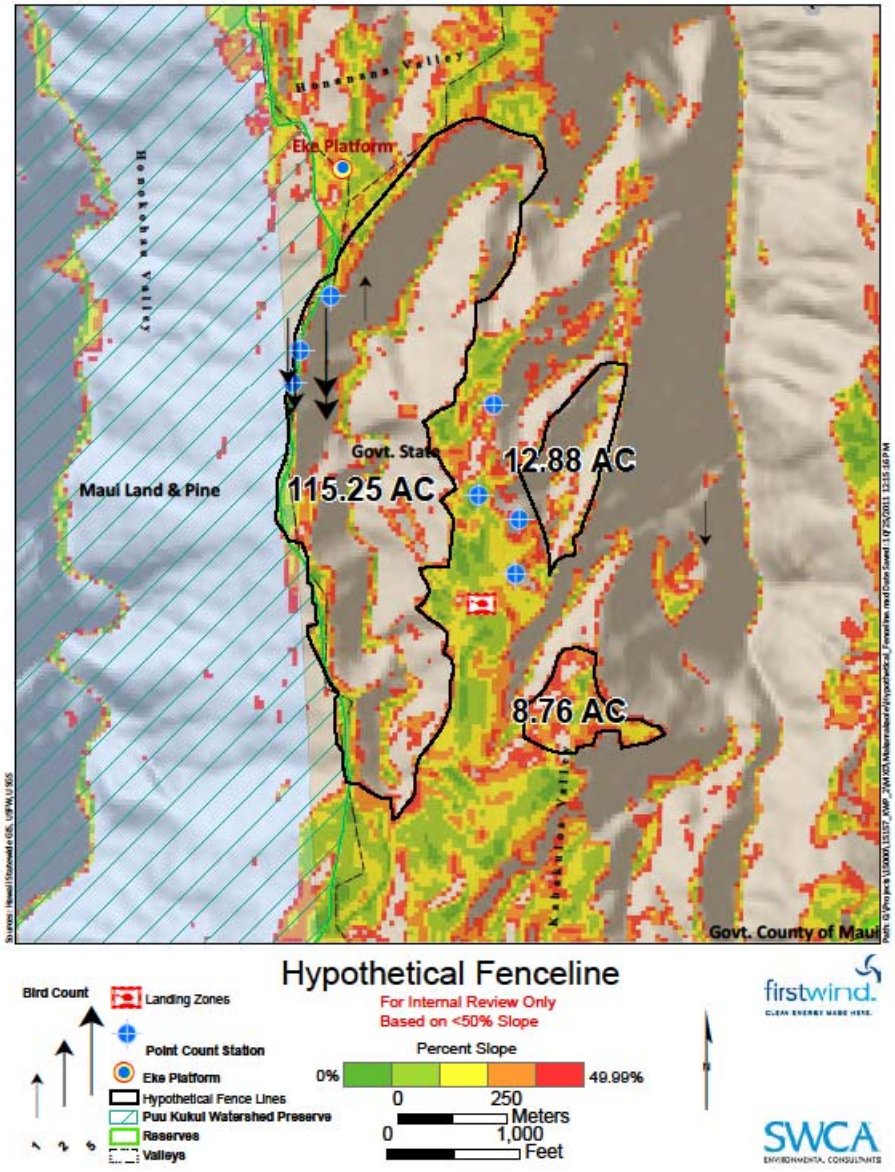

Figure 4. Hypothetical predator-proof fencelines in the upper Kahakuloa drainage of west Maui that KWP II has begun surveying for Newell's shearwater nest sites.

3. During the first five years of KWPII HCP implementation, KWPII shall develop plans to implement management of Newell's shearwater nesting areas on Molokai or in-situ or via social attraction in year-six if the Agencies confirm in-situ management of additional East and west Maui is not feasible, . Preliminary surveys indicate Newell's shearwaters are breeding on both of these islands (Figure 5).

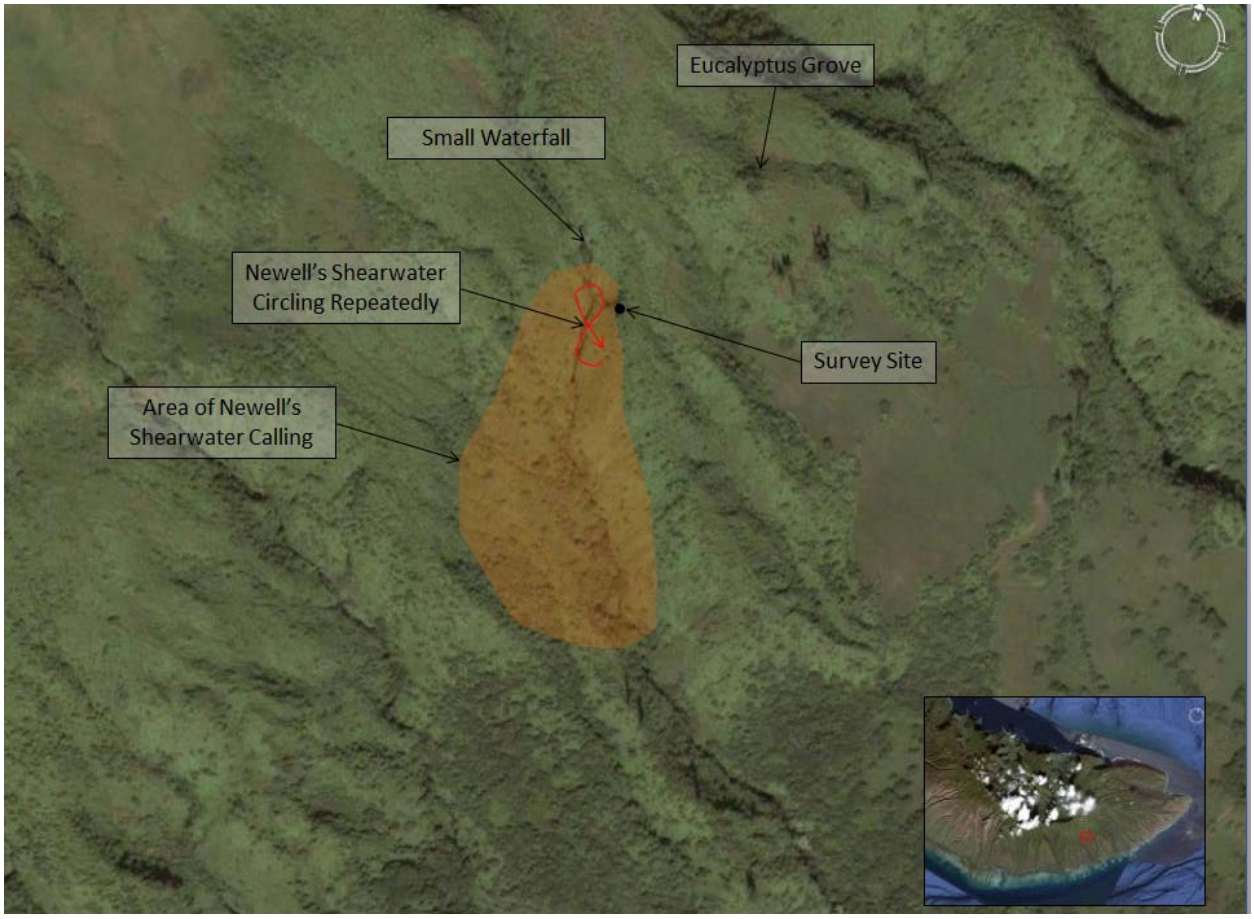

Figure 5. Newell's shearwaters have been detected on the east side of Molokai, indicating a potential opportunity for in-situ management of a nesting site (Siddiqi, pers. comm. 2011).

All mitigation site construction activities shall be conducted outside of the nesting season of the Hawaiian petrel and the Newell's shearwater to minimize adverse impacts. Prior to construction, the final fence alignment would be surveyed by qualified specialists to ensure the fence would be appropriately placed to avoid adverse impacts to seabird burrows. To minimize the potential for seabirds to collide with fencing, steel reinforced white poly-vinyl tape may be woven through the fence.

Removal of trees greater than 15 feet tall will be avoided as much as possible and is not allowed during the Hawaiian hoary bat pupping season (July 1 – August 15). If cutting of trees during this period is required, acoustic surveys will be conducted in the vicinity to document the absence of

any hoary bat use. If a Hawaiian hoary bat (adult or pup) is discovered near construction activities, the area will be avoided as long as the bat is present. There will be no barbed wire on any portion of the fence to reduce impacts to bats.

There is some potential for seabirds to get caught in predator traps, and on rare occasions this can result in the death of the bird. Trapping and monitoring at the HCP mitigation sites shall closely follow National Park Service (NPS) established protocols, including appropriate trap placement and regular monitoring. For that reason, potential adverse impacts to seabirds as a result of the proposed mitigation under the KWPII HCP are not anticipated.

If diphacinone (or another rodenticide) is used to control rats at Haleakala, the adults of the Covered seabird species are not expected to be attracted to the toxin or eat organisms that have been contaminated. Thus, the use of rodenticides is not anticipated to negatively impact seabird populations (DOFAW 2009b). Gear-cleaning procedures to reduce the introduction of invasive plants and arthropods will be strongly enforced for biologists and/or contractors that conduct predator control or monitoring efforts.

Hawaiian Goose Mitigation

The KWPII HCP mitigation program for the Hawaiian goose take is based on two possible levels of mortality-related take: Tier 1 take of 18 adults and three juveniles, and Tier 2 take of an additional 9 adults. Under the HCP, Tier 1 mitigation will be implemented even if no Hawaiian goose mortality is detected. Tier 2 mitigation will be implemented if the 5-year take limits for Tier 1 (See Table 1) are exceeded within a five year period (ie., in year 1-5, 6-10, 11-15, or 16-20), or if calculations indicate the 20-year Tier 1 take level will be exceeded.

Mitigation for Tier 1 Take of the Hawaiian Goose

Under the HCP, KWPII proposes to fund DOFAW to build an additional release pen in Maui Nui to accommodate geese translocated from Kauai pursuant to a Governor's proclamation and manage the new pen for five years, beginning in 2016. On April 14, 2011, the Governor of Hawaii, Neil Abercrombie, signed a proclamation approving the immediate translocation of Hawaiian geese from their nesting grounds within the Kauai Lagoons Resort (located between two runways at the Lihue Airport on Kauai) to neighboring islands. This proclamation invoked provisions of Chapter 128, Hawaii Revised Statutes, and affirmed the State's responsibility to protect the health, safety, and welfare of the people and Hawaiian goose populations by mitigating potential bird-strikes with aircraft and enhancing the population of this federally listed endangered species on those designated neighboring islands.

The Hawaii Department of Land and Natural Resources and Department of Transportation have been directed to develop and implement a five-year Nene Action Plan that will translocate and monitor the Kauai Lagoons Hawaiian goose population. According to the proclamation, "the five-year Nene Action Plan will be consistent with efforts to protect, maintain, restore, or enhance the endangered species to the greatest degree practicable." The emergency proclamation signed by Governor Abercrombie expires on June 30, 2016. The Hawaiian geese are being translocated

from Kauai to release pens on Maui Nui and on the Island of Hawaii. Their monitoring and management subsequent to their release is funded by the proclamation for five years (through June 2016). DOFAW anticipates that the translocated Hawaiian goose populations will increase and by the time the proclamation expires, additional release pens will be needed to accommodate the increased goose population. Under the KWPII HCP, funding shall be provided to continue Hawaiian goose monitoring and management activities funded by the State pursuant to the Governor's proclamation, through June of 2016.

Management shall include predator control, vegetation management and monitoring at the new pen. The best location for the release pen shall be determined by DOFAW and the Service in consultation with Hawaiian goose recovery biologists. Monitoring shall include an annual census, banding of adults and fledglings, identifying nests and quantifying reproductive success at the release pen area. Predator control measures to reduce populations of mammalian predators shall be conducted in and around the release pen and are expected to increase the survival of goose fledglings and adults and increase the productivity of breeding pairs. The actual number of fledglings or adults accrued at the new pen above the baseline productivity from an overcrowded pen will count as mitigation for birds taken at the KWPII wind farm.

If the Service and DOFAW determine that monitoring after the first five years of KWPII operations indicates that additional mitigation is required to compensate for Tier 1 take impacts or, pursuant to Hawaii State law, DOFAW determines that additional mitigation is required to provide a net benefit to the Hawaiian goose, KWPII shall continue to implement the above monitoring and predator management activities until it is determined that Tier 1 take impacts have been adequately offset, and/or a net conservation benefit is provided to the Hawaiian goose. Predator trapping shall be continued if it is shown to be effective. Other measures that may be implemented include habitat improvement measures, such as providing additional water sources at appropriate locations, or mowing grasses in habitat beyond the vicinity of the pen to improve goose foraging habitat as described by Woog and Black (2001). The most appropriate measure(s) to be undertaken will be determined based on data collected from the on-going monitoring and best available science, and approved by DLNR and the Service.

After Tier 1 mitigation obligations are met by KWPII, DOFAW will continue the long-term management of the release pen. Should circumstances regarding Hawaiian goose population status or health change and indications are such that other conservation or management practices are deemed by the Agencies to be more important or pressing in aiding the recovery of the Hawaiian goose, KWPII shall direct the funds toward whatever management or management activity is deemed most appropriate at the time by the Agencies.

If mitigation efforts at the release pens do not exceed the baseline productivity or adult survival rates for two consecutive years, adaptive management measures shall be implemented by KWPII. The magnitude and scope of these measures shall be determined with approval of the Service and DLNR and will be based upon monitoring data recorded from Hanaula, KWPI, and KWPII, and the best available science at that point in time.

Mitigation for Tier 2 Take of the Hawaiian Goose

KWPII shall fund DLNR to manage predators, vegetation, and water sources and monitor the status of the Hawaiian goose population at a third (?) selected release pen site for three years (or longer if needed) to offset Tier 2 take. The term of these mitigation activities shall be based on benefits to the Hawaiian goose documented by the monitoring program. Any mitigation benefits accrued during the five years of KWPII-funded pen management conducted to satisfy Tier 1 mitigation responsibilities that are above those needed to offset Tier 1 take shall be applied towards Tier 2 take mitigation obligations. Likewise, if monitoring indicates that additional management, beyond three additional years, is required to offset Tier 2 take and/or satisfy the State's permit requirement to provide a net benefit to the Hawaiian goose, these management and monitoring activities shall continue until the mitigation obligations are met.

Should circumstances regarding Hawaiian goose 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 Hawaiian goose, KWPII, with Service and DLNR approval, will direct HCP mitigation funds toward whatever Hawaiian goose management activity is deemed most appropriate at the time. After the Tier 2 mitigation obligations are met by KWPII, DOFAW will continue the long-term management of the release pen.

Additional Measures for the Protection of the Hawaiian Goose

KWPII shall fund the construction and operation of an additional Hawaiian goose release pen at an approximate cost of $150,000 and at a location to be determined by DLNR, and provide funding for a truck ($10,000), and funds for up to three years of staffing (@ $20,000 per year)if either of the following two scenarios occurs:

1. Hawaiian goose mitigation occurring at a site covered under a Safe Harbor Agreement (SHA) is terminated before the end of the term of the KWPII HCP and the site is subject to return to baseline conditions. The additional goose release pen shall be established at a new site (approved by the Service and DLNR) prior to the return of the original SHA-related release site to baseline conditions. The geese present at the original SHA-related release site shall be translocated to the new release site, as needed.

2. The Hawaiian goose population at Hanaula (associated with the release facility located above the KWPII project area), which is currently on the increase and believed to be self-sustaining, shows a decline over any five-year period for reasons directly attributable to take resulting from operation of the KWPII project. KWPII shall cover the entire cost of construction and operation of the new release pen if the decline is exclusively attributable to KWPII operations. If the decline is caused by the combined impacts of goose take at both the KWPI and KWPII projects, the cost of construction and operation of the additional release pen shall be shared between KWPII and KWPI. The geese present at Hanaula shall be translocated to the new release pen site, as needed.

Hawaiian Hoary Bat Mitigation

HCP mitigation targets have been identified in the HCP based on two levels of take: "Tier 1" or "Tier 2." Mitigation under the HCP shall be conducted to offset take at the Tier 1 level even if no bat mortality is detected at the KWPII project site. Under the HCP, Tier 1 mitigation will be implemented even if no Hawaiian goose mortality is detected. Tier 2 mitigation will be implemented if the 5-year take limits for Tier 1 (See Table 1) are exceeded within a five year period (ie., in year 1-5, 6-10, 11-15, or 16-20), or if calculations indicate the 20-year Tier 1 take level will be exceeded. If site monitoring indicates take is occurring at the Tier 2 level, mitigation shall be increased as described below.

Mitigation for Tier 1 Take Impacts on the Hawaiian Hoary Bat

The mitigation program for the Hawaiian hoary bat under the KWPII HCP was developed through discussions with the Service, DLNR, and bat experts at the U.S. Geological Survey (USGS), and involved identifying measures believed most likely to contribute to the recovery of the species. Exclusion fencing, ungulate removal, and native forest restoration at the Kahikinui Forest Reserve (Kahikinui) shall be conducted under the HCP to create additional habitat for the Hawaiian hoary bat at a ratio of 84.3 ac per male bat taken.

Tier 1 mitigation in the form of habitat restoration for the hoary bat is based on recommendations provided by the Service and DOFAW in May 2011 That rely on the results of Home Range Tools for ArcGIS®, Version 1.1 (compiled September 19, 2007) calculations based on Hawaiian hoary bat tracking data collected by USGS-BRD Wildlife Ecologist, Dr. Frank Bonaccorso. This dataset from a two-week tracking study indicates that the mean core area of rainforest habitat on the island of Hawai'© used by 14 male bats was 84.3 ac (34.1 ha) per bat and the average size of the core area utilized by the 11 females in the dataset was 41.2 ac (16.7 ha) per bat. Male bat core areas do not appear to overlap; female core areas may overlap with male core areas. A core area was defined as the area that incorporates 50% of tracked movements; therefore, the Service and DOFAW assume that the core area is a minimum habitat requirement for the Hawaiian hoary bats.

Tier 1 covers the take of six adult and three juvenile bats, which equates to a total take of seven adult bats, based on an estimated 30% survival rate of juveniles to adulthood. Assuming a 50:50 adult sex ratio, the potential take of 7 adult bats would result in the take of up to 4 adult male bats. To mitigate for this impact, KWPII shall restore 338 ac (84.3 x 4 = 338 ac) of land at Kahikinui to forest habitat suitable for this species.

As female core areas can overlap with male core areas, and up to two female bat core areas may be found within a male core area, the bat mitigation requirements are based on the number of adult male bats taken. Under the HCP, KWPII shall provide funding to DOFAW to fence, manage and monitor for bats at a distinct area within the Kahikinui project. A 338-ac subunit at Kahikinui has been identified as a suitable mitigation site (Figure 6). The location of the mitigation area may be modified with the approval of DOFAW and the Service.

In addition, if sufficient partnerships can be secured to ensure management of the entire 8,000-ac Kahikinui area, KWPII shall contribute to a portion of the cost for overall management of the area. The exclusion fencing, ungulate removal, and habitat restoration of Kahikinui is expected to take six years with a subsequent yearly maintenance of the habitat and fenceline throughout the remainder of the 20-year Permit period.

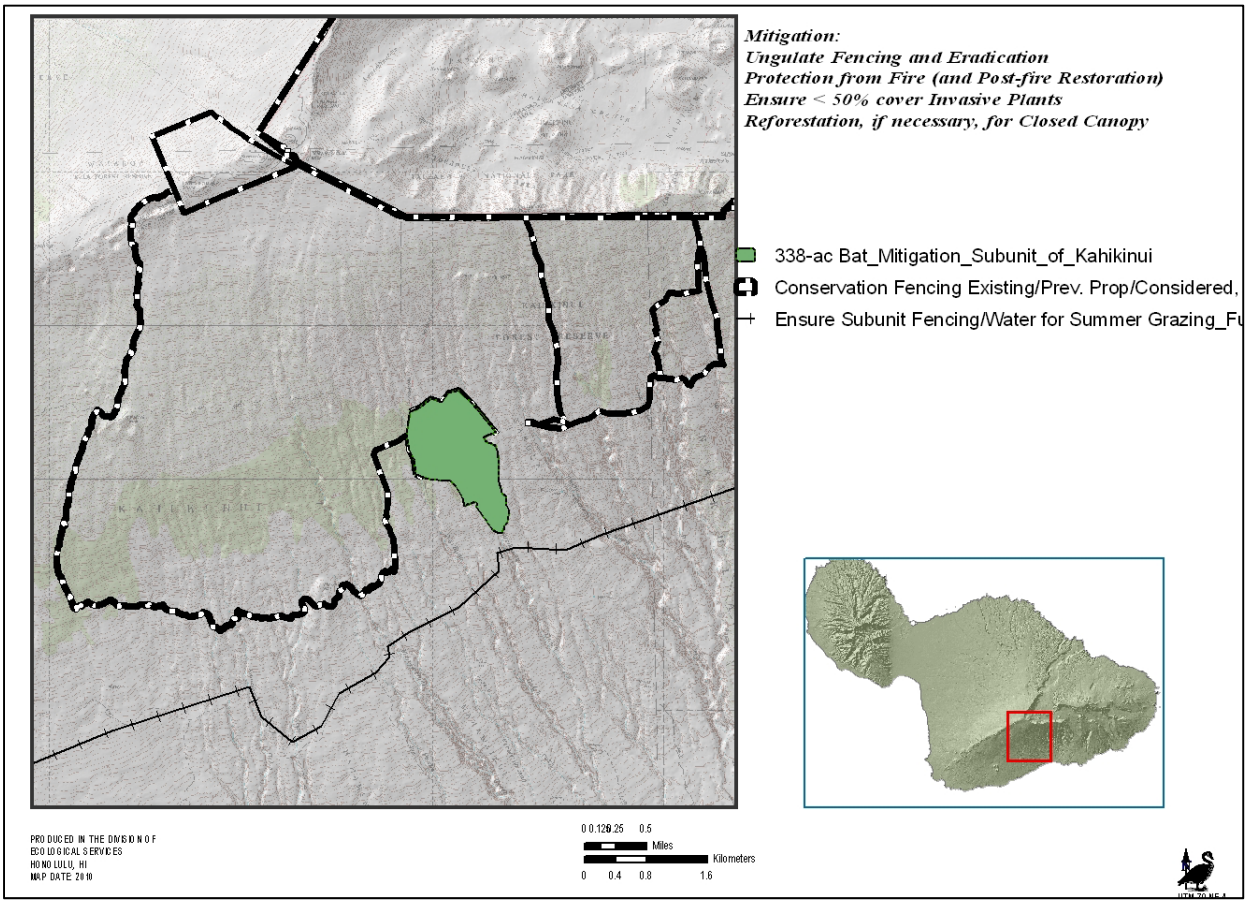

Figure 6. Kahikinui native forest restoration site for Tier 1 Hawaiian hoary bat mitigation (in green, within the larger Kahikinui project area, delineated in heavy black).

KWPII shall meet the following native forest restoration goals within the bat mitigation area by year 20 of the Permit term: (1) cover of non-native species (excluding kikuyu grass) in the managed areas shall be less than 50%; (2) the mitigation area shall have a canopy cover composed of dominant native tree species that are representative of that habitat after 15 years of growth; (3) restoration trials will meet DOFAW standards. Radio-transmitter monitoring of Hawaiian hoary bats (or other measures, as appropriate) shall be conducted every three to five years to detect changes in bat density and home range core area size as the site is restored. The benefits of forest restoration on the bat are likely to extend beyond the 20-year term of the Permit. KWPII shall provide the required conservation measures in full, even if actual costs are greater than anticipated.

Mitigation for Tier 2 Take Impacts on the Hawaiian Hoary Bat

Tier 2 covers take of 9 adult and 5 juvenile bats, which equates to a total of 11 adults (based on an estimated 30% survival rate of juveniles to adulthood). Assuming a 50:50 adult sex ratio, the take of 11 adults is likely to result in the take of up to 6 adult male bats. Tier 1 already mitigates for 4 male bats, therefore, the requirement for Tier 2 mitigation is based on the take of two additional male bats above the Tier 1 take level. Therefore, Tier 2 mitigation shall consist of the additional restoration of 169 ac (84.3 x 2 = 169 ac) of forest at Kahikinui or at another location on Maui.

The Tier 2 mitigation site would be selected and a management plan would be completed for the site within the first five years of Permit issuance. Ungulate removal and forest restoration objectives used in Tier 1 would be applied, as adapted, with the approval of DOFAW and the Service, based on the best available information.

If, at the time the Tier 2 level of take is detected, new scientific information may indicate mitigation measures other than habitat restoration are more important or pressing for recovery of the Hawaiian hoary bat. Under those circumstances, KWPII may revise the Tier 2 mitigation program for the Hawaiian hoary bat with the approval of the Service and DLNR.

2.0 STATUS AND BASELINE OF THE SPECIES

Status of the Species

Hawaiian Petrel

Taxonomy and Species Description

The Hawaiian petrel is a medium-sized seabird in the family Procellariidae (shearwaters, petrels, and fulmars). The Hawaiian petrel is a large petrel; it is approximately sixteen inches long (40 cm) and has a wing span of about three ft (90 cm). It has a dark gray head, wings, and tail, and a white forehead and belly. The Hawaiian petrel has a stout grayish-black bill that is hooked at the tip, and ft that are pink and black. The Hawaiian petrel was formerly treated as a subspecies of *P. phaeopygia*, and was commonly known as the dark-rumped petrel (Service 1983, pp.1-2). The Hawaiian petrel was reclassified as a full species in 1993 because of differences in morphology and vocalization (Monroe and Sibley 1993). In 1997 the evolutionary split was confirmed by genetic analyses (Browne *et al* 1997).

Historic and Current Distribution

The Hawaiian petrel was once abundant on all of the main Hawaiian Islands, except Niihau. Today, Hawaiian petrels breed in high-elevation colonies, primarily on east Maui and Mauna Loa on Hawaii Island, on Lanai, and to a lesser extent, on Kauai, and probably Molokai, Lehua, and sea stacks off Kahoolawe.

Based on pelagic observations, the total population including juveniles and subadults is estimated at 20,000 with a breeding population of 4,500 to 5,000 pairs (Spear et al. 1995, p. 629). Approximately 1,000 Hawaiian petrel burrows have been found in Haleakala National Park, Maui (Bailey, pers. comm. 2011b) and an additional 600 breeding pairs are thought to occupy unsurveyed areas of the Haleakala Crater Rim (Bailey pers. comm. 2011b). Ainley (SWCA 2011a, Appendix 25, p. 2) estimates there is a declining population of 600 breeding pairs of Hawaiian petrels nesting in the west Maui mountains. The colony on Mauna Loa is estimated to be approximately 75 breeding pairs (Hu, pers. comm. 2008). Kauai populations are difficult to assess, and Day and Cooper (1995, p. iv) estimated there were between 1,400 and 7,000 individuals on that island in 1993. Ainley et al. (1997, p. 28) estimated that there were 1,600 breeding pairs of Hawaiian petrel on Kauai. A breeding colony of the Hawaiian petrel was rediscovered on Lanai in 2006, near the summit of Lanaihale. Although the petrel colony was historically known to occur, its status was unknown and thought to have dramatically declined until surveys were conducted in 2006 (Penniman, pers. comm. 2007). The nesting habitat used by the Hawaiian petrel colony on Lanai is within the approximately 420 ac of uluhe fern on Lanai. Eighty-eight burrows (62% were active) were detected within an 18 ac-search area. GIS analysis of this data indicates there may currently be approximately 1,294 active Hawaiian petrel burrows on Lanai (Penniman, pers. comm. 2011).

Life History

Seabirds nest on land and spend much of their time at sea where they are known to feed on squid, small fish, and crustaceans displaced to the surface by schools of tuna (Simons 1985). Hawaiian petrels have been tracked taking single trips exceeding 6,200 mi (10,000 km) circumnavigating the north Pacific during the nestling stage (Adams *et al*. 2006). Hawaiian petrels have been recorded in the Gulf of Alaska (Bourne 1965). Annual survival rates for Hawaiian petrels range from 0.93 (in years with no predation to approximately 0.85 (estimated survival under moderate predation at Haleakala (Simons 1984 p. 1070).

Like other procellariiformes, Hawaiian petrels are highly philopatric, returning to the same burrow and mate each year (Simons 1985 pp. 233-234). Beginning in mid-February to early-March, after a winter absence from Hawaii, breeding and non-breeding birds visit their nests regularly at night. After a period of social activity and burrow maintenance they return to sea until late April, when they return to the colony site and egg-laying commences. From mid-March to mid-April, birds visit their burrows briefly at night on several occasions. Then breeding birds return to sea until late April or early May, when they return to lay and incubate their eggs (Simons 1985). Non-breeding birds visit the colony from February until late July (Simons and Hodges 1998, pp. 13-14). Dr. Fein's analysis of burrow camera data for the ATST site (Fein, pers. comm. 2009) indicates birds intermittently occupy their burrows during the day during this period as well. Many non-breeders are young birds seeking mates and prospecting for nest sites, but some proportion is thought to be mature adults that will not breed.

The mean date of egg-laying recorded on Haleakala in 1980 and 1981 was May 8 (Simons 1985 p. 234). The percentage of years in which adult females laid eggs was estimated to be 89 percent (Simons 1985 p. 234). Fecundity (fledglings produced per egg laid) appears to be primarily

dependent on rate of predation. Moderate predation is likely to depress fecundity to 0.49 (Simons 1985 p. 237). Although Hawaiian petrel nests may fail when they abandon and crush eggs during incubation, higher fecundity (0.72 (Simons 1984 p. 1068)) occurs when predators are absent. Annual survival for juveniles at sea is 0.834 (Simons 1984 p. 1070).

Cooper and Day (1995, pp. 32-34) found that Hawaiian petrels flew inland to their nesting areas primarily between sunset and the point of complete darkness. In the morning hours, Hawaiian petrels first move to sea while it was completely dark, starting 60 minutes prior to sunrise, and movement rates increased rapidly until they peaked just after the point of complete darkness had been crossed and movement continued at a decreasing rate until sunrise (Cooper and Day 1995, pp. 32-34).

Habitat Description

On Hawaii and Maui, Hawaiian petrels have been pushed to the limits of their habitat, nesting in the cold, xeric environment above 8,000 ft primarily in national parks. On Kauai, there is evidence that Hawaiian petrels nest at lower elevations in densely vegetated rainy environments (Ainley et al. 1997, p. 24). Hawaiian petrels are colonial and nest in burrows, crevices in lava, or under ferns. Burrows detected on Haleakala occur almost exclusively on lava substrates; burrows are located within existing crevasses or excavated in softer material adjacent to rock to boulder-sized lava fragments. Their burrows are generally 3- to 6-ft (one- to 1.8-m) long (from entrance to nest chamber), although some may be as long as 30 ft (9.1 m) (Simons and Hodges 1998, p. 14).

Threats, Recovery Strategies, and Ongoing Conservation Measures

Hawaiian petrels were abundant and at one time, widely distributed; their bones have been found in archaeological sites throughout the archipelago (Olson and James 1982a, p. 32). This species has no natural terrestrial predators other than the Hawaiian short-eared owl, (*Asio flammeus sandwichensis*, pueo). Early Polynesian hunting; predation by introduced mammals such as Polynesian rats (*Rattus exulans*), dogs, and pigs; and habitat alteration caused initial decline of the Hawaiian petrel population and probably its extirpation from Oahu (Olson and James 1982b, p. 634). The introduction of cats, mongoose, and two additional species of rats (*R. rattus* and *R. norvegiceus*) since Euro-American contact along with accelerating habitat loss has led to small relict colonies of Hawaiian petrels in high-elevation, remote locations. The primary reason for the relatively large numbers of petrels and their successful breeding around Haleakala summit today is the fencing and intensive predator control maintained by the Park since about 1982. If current elevated levels cat of predation continue, significant declines in even the Park's relatively protected Hawaiian petrel population are likely (Bailey pers. comm., 2011a). Elsewhere on Maui and in Hawaii, the Hawaiian petrel faces severe threats from non-native predators including rats, cats, mongoose, and introduced barn owls (*Tyto alba*). Ainley (SWCA 2011a, Appendix 25, p. 2) estimates there is a declining population of 600 breeding pairs of Hawaiian petrels nesting in the west Maui mountains and population modeling indicates predation impacts may render this relatively large population functionally extinct in 27 years (SWCA 2011a, Appendix 24, p. 8). Other significant anthropogenic sources of Hawaiian petrel mortality are light attraction and

collision with communications towers, power transmission lines and poles, fences, and other structures (Simons and Hodges 1998, pp. 21-22). Unobstructed airspace between their breeding colonies and the ocean, where they feed, is necessary for Hawaiian petrel breeding. These problems are likely to be exacerbated by continuing development and urbanization throughout Hawaii. Predator control in key habitat areas, the establishment of bird salvage-aid stations, and light attraction studies have been initiated to help conserve the Hawaiian petrel.

The recovery goals for the Hawaiian petrel include: 1) protect and enhance existing colonies; 2) create new colonies; 3) mitigate new and existing threats by a) implementing prioritized management actions, and b) undertaking research and outreach to support those actions. Actions identified to accomplish these goals for Hawaiian petrel include conducting surveys for existing colonies, controlling threats at the highest priority colonies, and minimizing and monitoring terrestrial threats away from the colonies (light attraction, power line collisions).

DOFAW has been conducting auditory surveys for new areas containing nesting Hawaiian petrels through the Kauai Endangered Species Recovery Program and will use the same colony ranking criteria to identify where the goals of the action plan can be most successful. As discussed above, only two known nesting colonies occupied by Hawaiian petrel (Hono o Na Pali Natural Area Reserve and Upper Limahuli Valley) are currently suitable for immediate implementation of management actions focused on increasing seabird survival and reproduction. The State has developed a management plan for the Hono o Na Pali NAR that includes feral ungulate control, but little work has been implemented due to the lack of funding. A 400-ac portion of the privately-owned Upper Limahuli Preserve has been fenced to create an ungulate free area known to contain nesting Hawaiian petrels. Efforts to control feral cats within the Preserve have begun, but the landowner does not have funds to sustain the efforts (Standley, pers. comm. 2011).

Efforts to conserve nesting colonies of Newell's shearwater also benefit Hawaiian petrel, but they have been primarily limited to constructing ungulate fencing around remaining areas of relatively intact habitat (Wainiha Valley, Upper Limahuli Valley, etc.). The only active control of cats and/or rats within an area occupied by nesting Hawaiian petrels on Kauai (on private property in Upper Limahuli Valley) began in 2009, but the program has no secure funding source to continue the efforts beyond that which would be available through a proposed short-term HCP.
Efforts to recover and release downed, but still living, seabirds through the Save our Shearwaters program also apply to Hawaiian petrels. Efforts underway to reduce the level of light attraction and power line collisions described for Newell's shearwater also reduce these threats to Hawaiian petrel.

Newell's Shearwater

Taxonomy and Species Description

Newell's shearwater is a member of the genus *Puffinus* and utilizes open tropical seas and offshore waters near its island breeding grounds on forested mountain slopes. Newell's shearwater is approximately 12 to 14 inches long, with a wingspan of 30 to 35 inches, and weighs

approximately 14 ounces. Its plumage is glossy black above, and white below. It has a black bill that is sharply hooked at the tip. Its claws are well adapted for burrow excavation and climbing.

Historic and Current Distribution

Newell's shearwater was once abundant on all of the main Hawaiian Islands. In 1995 the population estimate, based on at-sea surveys was 84,000 birds (Spear *et al* 1995, p. 624), with approximately 90% of the population nesting on the island of Kauai. Newell's shearwater also breeds on several other of the main Hawaiian islands where they nest in mountainous terrain between elevations of 500 and 2,300 ft. This species is known to nest on Hawaii, on Molokai, and may still nest on Oahu. The occurrence on Maui of injured, dead, or grounded adults in the summer, low numbers of radar-detected birds exhibiting Newell's shearwater-like timing of movement, and the presence of juveniles in autumn suggest that this species also nests on Maui.

Recent ornithological radar surveys, combined with returns of downed birds to the SOS program, show an apparent decline of 75% in Newell's shearwater between 1993 and 2009 (Day *et al* 2003, Holmes *et al* 2009), resulting in a current population estimate of 21,000, with 18,900 on Kauai. Significant range reductions as well as an overall decline in distribution are documented, and at least three colonies documented as being active between 1980 and 1994 are now abandoned (Holmes *et al* 2009). As with other long-lived species with low reproductive rates, population modeling has documented that the survival rate of breeding age adults has the biggest impact on the population (Griesemer and Holmes 2010).

Population models incorporating best estimates of Newell's shearwater breeding effort and success yielded a population decreasing at a rate of 3.2% annually (Ainley *et al* 2001, p. 118). When variables describing the anthropogenic mortality suffered by Newell's shearwater (predation, light attraction and collision) were included, these models predicted a population decline of 30 to 60% over 10 years (Ainley *et al* 2001, p. 122).

Life History

Most of the life history information for this species is based on studies of the Kauai population; life histories of birds on other Hawaiian islands may differ slightly. During their nine-month breeding season from April through November, Newell's shearwaters live colonially in burrows under ferns on forested mountain slopes. These burrows are used year after year and usually by the same pair of birds. A single egg is laid in late May or early June (Ainley *et al* 1997b, pp. 13-15). Both sexes incubate and this period lasts approximately 45 days. Fledging occurs between October and November. The Newell's shearwater needs an open downhill flight path to become airborne.

Daily flights of breeding adults to and from the colonies occur only at night and just before dawn. On Kauai, Newell's shearwaters were found to exhibit almost no movement until after complete darkness, whereupon they moved inland in a wave that peaked for 30-40 minutes (Day and Cooper 1995, p. 1015). After that peak, the rate of movement decreased steadily until 90 min after complete darkness, after which few birds were seen. In the morning, 'ewell's shearwaters

begin moving to sea in numbers approximately 40 minutes before the first measurable light and movement rates increase rapidly and peak just before dawn (Day and Cooper 1995, p. 1016).

Three age classes of Newell's shearwaters are recognized based on demographic factors and assumptions (from Ainley *et al* 2001, p. 115): (1) young-of-year; (2) pre-breeding immature/adult (if recognizable); and (3) breeding adults. Only 46% of pairs that actively use a burrow actually breed in a given year on Kauai (Ainley *et al* 2001, p. 117). First breeding occurs at approximately six years of age (Ainley *et al* 1997, p. 17).

A study of reproductive success at one Newell's shearwater colony on Kauai documented an average annual production of 0.66 young per pair (Ainley *et al* 2001, p.117). No specific data exist on the longevity for this species, but other shearwaters may reach 30 years of age or more.

Habitat Description

On Kauai, Newell's shearwaters breed at elevations between 528 and 3,960 ft. Newell's shearwaters usually nest where the terrain is vegetated by an open canopy of trees with an understory of densely matted uluhe ferns (*Dicranopteris linearis*). Some Newell's shearwaters nest in other types of habitat such as on the walls of Waimea Canyon, Kauai, where a forest canopy is absent. Burrows used by Newell's shearwaters are most commonly placed at the base of trees, where the substrate may be easier for the birds to excavate. Unobstructed airspace between their breeding colonies and the ocean, where they feed, is necessary for Newell's shearwater breeding.

Threats, Conservation Needs, and Ongoing Conservation Measures

Newell's shearwater was listed as a threatened species by the Service in 1975 (Service 1975). *The Hawaiian Dark-rumped Petrel and Newell's Manx Shearwater Recovery Plan* was published in 1983 (Service 1983). During the last 150 years, 75% of the forests on the main islands of the Hawaiian archipelago have been converted to agricultural, military, commercial or residential land uses, leading to a depletion of available nesting habitat for this species. The introductions of the mongoose (*Herpestes auropunctatus*), black rat (*Rattus rattus*), and Norway rat (*Rattus norvegicus*) have also played a primary role in the reduction of ground-nesting seabirds. Predation by feral cats (*Felis domesticus*) and barn owls (*Tyto alba*) has been observed. In addition, feral pigs (*Sus scrofa)* are known to collapse burrows as well as consume or prey upon shearwaters.

Another major threat is the species' attraction to light. Increasing urbanization and the accompanying artificial lights have resulted in substantial problems for fledgling Newell's shearwaters during their first flight to the ocean from their nesting grounds. When attracted to man-made lights, fledglings become confused and may suffer temporary night blindness. They often fly into utility wires, poles, trees, and buildings and fall to the ground. Since 1979 the Kauai District of DOFAW has supported the SOS program to collect "downed" Newell's shearwaters and Hawaiian petrels (*i.e.*, birds that have either collided with structures or fallen out, or have been injured or killed due to exhaustion caused by light attraction). According to SOS

files, over 33,000 seabirds have been recovered to date (DOFAW 2008). The majority of the birds are Newell's shearwaters, which nest in greater numbers on Kauai than Hawaiian petrels. The lower number of Hawaiian petrels recovered is thought to be a function of their population size on Kauai, not due to differences in behavior or ability to detect structures in the dark.

The Draft Newell's Shearwater and Hawaiian Petrel Five-year Action Plan describes a recovery strategy that will 1) protect and enhance existing colonies, 2) create new colonies, 3) mitigate new and existing threats by a) implementing prioritized management actions, and b) undertaking research and outreach to support those actions. Actions identified to accomplish this strategy include conducting surveys for existing colonies, controlling threats at the highest priority colonies, and minimizing and monitoring terrestrial threats (light attraction, power line collisions).

The DLNR has been conducting auditory surveys for new areas containing nesting Newell's shearwater through their Kauai Endangered Species Recovery Program (KESRP) and is developing colony ranking criteria to identify where the goals of the action plan can be most successful. The minimum conditions necessary to effectively implement colony management that would be expected to achieve a measureable increase in seabird survival and/or reproduction include species presence, access to the areas occupied by breeding seabirds, and landowner authorization and commitment to maintain the managed area in way that is consistent with seabird conservation. To date, only two known nesting colonies occupied by Newell's shearwater (Hono o Na Pali Natural Area Reserve (NAR) and Upper Limahuli Valley) are currently suitable for immediate implementation of management actions focused on increasing seabird survival and reproduction. The State has developed a management plan for the Hono o Na Pali NAR that includes feral ungulate control, but little progress has been made due to the lack of funding. A 400-ac portion of the privately-owned Upper Limahuli Preserve has been fenced to create an ungulate free area known to contain nesting Newell's shearwaters. Feral cat control is being funded through the KIUC short-term HCP for the next four to five years.

While some efforts to protect existing nesting colonies of Newell's shearwater have been implemented on Kauai, they have been limited to constructing ungulate fencing around remaining areas of relatively intact habitat (Wainiha Valley, Upper Limahuli Valley, etc.). Habitat degradation due to feral ungulates is recognized as the primary threat to native ecosystems in Hawaii and the conservation and restoration of such areas is unsuccessful in the presence of ungulates (Hawaii Conservation Alliance 2005, p. 1). The only active control of cats and/or rats within an area occupied by nesting Newell's shearwaters on Kauai (on private property in Upper Limahuli Valley) began in 2009. Funding for the program is currently through the KIUC short-term HCP for up to the next five years. Long-term funding is anticipated to be obtained through an Island-wide HCP currently under development.

Efforts to reduce the level of light attraction and power line collisions began in the 1980's when Kauai Island Utility Cooperative (KIUC, and its predecessor Kauai Electric) began replacing unshielded street lights with full-cutoff (shielded) lights across the island as part of its normal maintenance program. All of the over 3,500 streetlights operated by KIUC are now shielded, as are the lights at the facilities it operates. In 2002 KIUC prepared an assessment of the power line

segments originally identified by Ainley *et al* (1995) as causing the most collisions (David and Day 2002). In 2007, KIUC began reconfiguring the lines along one of the "hotspot" areas along Kealia Beach by temporarily changing the uppermost electrical circuit from a vertical to a horizontal arrangement which eliminated three of four wire layers in the circuit and reduced the height by about 10 ft. KIUC has been coordinating with the Federal Highways Administration and Hawaii Department of Transportation to plan for the undergrounding of the lines along another hotspot segment near the Wailua River but the implementation has been delayed while issues related to the potential impacts of the project to cultural resources are being resolved.

Hawaiian Goose

Taxonomy and Species Description

The Hawaiian goose is a medium-sized goose, with an overall length of approximately 63 to 69 centimeters (25-27 inches). The plumage of both sexes is similar (Service 2004, p.4). This species is adapted to a terrestrial and largely non-migratory lifestyle in the Hawaiian Islands with limited freshwater habitat (Service 2004, p.iii). Compared to the related Canada Goose (*Branta canadensis*), Hawaiian goose wings are reduced by about sixteen% in size and their flight is weak (Service 2004, p.21). Although Hawaiian geese are capable of inter-island and high altitude flight flight, they do not migrate from the archipelago (Banko *et al* 1999, p.9).

Historic and Current Distribution

It is speculated that Hawaiian geese were once widely distributed among the main Hawaiian Islands, however, subfossil evidence has not been found on Oahu or Niihau (Service 2004, p.6). The fossil record indicates the prehistoric (prior to 1778) range of the Hawaiian goose was much greater than was observed after colonization by Europeans (Banko *et al* 1999). However, it is difficult to estimate Hawaiian goose population numbers, either pre-Polynesian or pre-European contact because there is a limited understanding of species composition, or even the gross structure, of the vegetation prior to the arrival of the Polynesians (Service 2004, p.7). By 1952, approximately thirty Hawaiian geese remained. The release of captive-bred Hawaiian geese, which began in 1960, helped save the species from imminent extinction (Service 2004, p.2-3). As a result of such programs, wild populations of Hawaiian geese now occur on four of the main Hawaiian islands. As of 2009, the statewide population of wild Hawaiian geese was estimated to have reached 1,888-1,938 individuals; the wild populations on the islands of Hawaii, Maui, Molokai and Kauai were estimated to have 457, 416, 165, and 850-900 individuals, respectively (Marshall, pers. comm. 2010; USFWS & NRCS 2010).

Hawaiian geese use shrublands and grasslands and human-altered habitats ranging from coastal to alpine environments (Banko 1988, Banko *et al* 1999). On Hawaii and Maui, Hawaiian geese nest, raise their young, forage, and molt in grassy shrublands and sparsely vegetated lava flows. Some populations on these islands move seasonally from montane foraging grounds to lowland nesting areas. On Kauai, where mongooses are absent, Hawaiian geese are primarily found utilizing lowland habitats (Service 2004, p.19).

Life History

Hawaiian geese have an extended breeding season with eggs reported from all months except May, June, and July, although the majority of birds in the wild nest between October and March (Banko *et al* 1999, p.4). Nesting peaks in December and most goslings hatch from December to January (Banko *et al* 1999). The Hawaiian goose nests on the ground, in a shallow scrape in the dense shade of a shrub or other vegetation. A clutch typically contains three to five eggs, and incubation lasts for 29 to 31 days. Once hatched, the young remain in the nest for one to two days (Banko *et al* 1999, pp. 16-17). Fledging of captive birds occurs at 10 to 12 weeks, but may be later in the wild. During molt, adults are flightless for a period of 4 to 6 weeks, generally attaining their flight feathers at about the same time as their offspring. When flightless, goslings and adults are extremely vulnerable to predators such as cats, dogs, and mongoose. From June to September, family groups join others in post-breeding flocks, often far from nesting areas. The Hawaiian goose reaches sexual maturity at one year of age, but usually does not form pair bonds until the second year. Females tend to nest near their natal nesting area, while males more often disperse (Banko *et al* 1999).

Habitat Description

As mentioned earlier, the current distribution of wild Hawaiian geese has been highly influenced by the location of release sites for captive-bred birds. Hawaiian geese are known to occupy various habitat and vegetation community types ranging from coastal dune vegetation and non-native grasslands (such as golf courses, pastures, and rural areas) to sparsely vegetated low- and high-elevation lava flows, mid-elevation native and non-native shrubland, cinder deserts, native alpine grasslands and shrublands, and open and non-native alpine shrubland-woodland community interfaces (Banko *et al* 1999, pp.4-6). Hawaiian geese are browsing grazers; the composition of their diet depends largely on the vegetative composition of their surrounding habitats and they appear to be opportunistic in their choice of food plant as long as they meet nutritional demands (Banko *et al* 1999, pp.6-8; Woog and Black 2001, p.324). Hawaiian geese may exhibit seasonal movements to grasslands in periods of low berry production and wet conditions that produce grass with a high water content and resulting higher protein content. As such, Hawaiian geese require unobstructed airspace through which to traverse in their movements between breeding, feeding, and socializing sites. The sites used by Hawaiian geese for nesting range from coastal lowland to subalpine zones and demonstrate considerable variability in physiognomic features (Banko *et al* 1999, pp.4-5). However, the distribution of Hawaiian goose nesting sites is influenced by the location of release sites of captive-bred individuals (Banko *et al* 1999).

Threats, Recovery Strategy, and Ongoing Conservation Measures

Approximately thirty Hawaiian geese remained in the wild in 1952 (Service 2004, p.2). The Hawaiian goose was named Hawaii's state bird on May 7, 1957 (Service 2004, p.46) and captive-breeding efforts began in the 1960s (Service 2004, p.2). The Hawaiian goose was federally listed as Endangered in 1967 (Service 2004, p.3). The Service has not designated critical habitat for the Hawaiian goose (Service 2004, p.3). The Hawaiian goose is also listed as Endangered by the

state of Hawaii (Service 2004, p.iii). Although the number of wild Hawaiian geese has substantially increased since 1952, the Hawaiian goose remains to be one of the most endangered geese in the world (Service 2004, p.3).

The current threats to Hawaiian goose recovery are: (1) predation by introduced mammals (especially mongooses, cats, rats, dogs, and feral pigs); (2) insufficient nutritional resources due to habitat degradation; (3) limited availability of suitable habitat due to habitat loss, fragmentation, and degradation; and (4) human-caused disturbance (including habituation to humans) and mortality (especially death due to road collisions). Additional factors that may be affecting Hawaiian goose recovery but require further research include: (1) behavioral problems associated with small population sizes, captive-bred birds, and loss of genetic diversity; and (2) avian disease and parasites (Service 2004, p.27-28; Marshall, pers. comm. 2010).

The Service published a Draft Revised Recovery Plan for the species in 2004, and initiated a 5-year Review in 2009. The overall goal of the Service's "Draft Revised Recovery Plan for the Nene or Hawaiian Goose *(Branta sandvicensis)*" is to remove the Hawaiian goose from the Federal List of Endangered and Threatened Wildlife and Plants (delisting). The plan establishes a framework within which recovery actions are undertaken to ensure the long-term survival of the Hawaiian goose and to control or reduce the threats to the species to the extent that it is no longer in danger of extinction and warrants delisting. The interim goal is to accomplish increases in population sizes and geographic distribution of Hawaiian geese concomitant with control of threats sufficient to consider reclassification or downlisting of this endangered species to threatened status. To reach the recovery goal, there must be multiple self-sustaining Hawaiian goose populations on Hawaii, Maui Nui (Maui, Molokai, Lanai, & Kahoolawe), and Kauai, for at least fifteen years. Additionally, the threats to the species must be reduced to allow for the long-term viability of these populations, and sufficient suitable habitat must be identified, protected, and managed in perpetuity on each of these islands such that the species no longer meets the definition of endangered or threatened under the ESA (Service 2004, p.49-50).

With the exception of Kauai, most wild populations of Hawaiian geese are not self-sustaining (Marshall, pers. comm. 2010). The Service defines "self-sustaining" as maintaining or increasing established population levels without additional releases of captive-bred Hawaiian geese, although habitat manipulation, such as predator control or pasture management, may need to be continued. Downlisting may be considered separately for a subset of the Hawaiian goose population if that population subset is shown to meet the definition of a distinct population segment and satisfy additional recovery criteria set forth by the Service (Service 2004, p.iv). Consideration for delisting can occur once all of the downlisting criteria have been met, and all population levels have shown a stable or increasing trend (from downlisting levels) for a minimum of fifteen additional years (i.e. at least thirty years) (Service 2004, p.vi).

Captive releases have been an important part of the Hawaiian goose recovery strategy, however; the Service has determined that future releases of captive-bred Hawaiian geese must occur only at appropriate locations (i.e. sites chosen in relation to suitability of habitat in general, and uses of surrounding areas), and in conjunction with predator control, monitoring, and habitat maintenance (Marshall, pers. comm. 2010). In order for Hawaiian goose populations to survive, they must

have relatively 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, Hawaiian geese are highly adaptable, successfully utilizing a gradient of habitats, ranging from highly altered to completely natural, which bodes well for the recovery of the species (Service 2004, pp. iv-vi). Since 1962, the majority of Hawaiian goose releases has occurred on at Haleakala National Park on east Maui. Since 1994, Hawaiian geese have also been released at Hanaula in the west Maui mountains (Medeiros, pers. comm., 2007). Little is known about the exact distribution and movements of the birds released at Hanaula, although they have been recorded as far west as Lahaina and as far east as Haleakala National Park, indicating that at least some birds from this release site move extensively around the island (Medeiros, pers. comm. 2011).

Hawaiian Hoary Bat

Species Description

The Hawaiian hoary bat is medium-sized (0.5 to 0.8 ounces) nocturnal, insectivorous bat, with a wingspan of 10.5 to 13.5 inches. "Hoary" refers to the white-tinged, frosty appearance of the bat's grayish brown or reddish brown fur. Although females are slightly larger than males, forearm lengths are similar in both genders. These bats are not colonial, and roost solitarily in tree foliage (Service 1998, pp. 8-10).

The Hawaiian hoary bat is classified under the Family Vespertilionidae of the Suborder Microchiroptera, and is one of three recognized hoary bat subspecies. The other two subspecies are *Lasiurus cinereus cinereus*, one of the most common and widespread bats in North America, and *Lasiurus cinereus vilosissimus*, which occurs in South America and the Galapagos (Shump and Shump 1982, pp.1-5). Morphologically, the Hawaiian hoary bat may have diverged significantly from the North American form, as Hawaiian hoary bats are about 45% smaller. Nonetheless, preliminary genetic analysis indicates the Hawaiian hoary bat may be derived from the North American hoary bat. The low degree of genetic divergence, however, suggests subspecies classification may be appropriate (Service 1998, pp. 8-9).

Listing Status

The Hawaiian hoary bat was listed as an endangered species in October 13, 1970 (Service 1970), pursuant to the Endangered Species Preservation Act of 1966. The original recovery plan was approved in May 11, 1998. A species five-year review has been conducted on September 30, 2011 pursuant to Section 4(c)(2). Critical habitat has not been designated for the Hawaiian hoary bat (Service 1970).

Historic and Current Distribution

The Hawaiian hoary bat is endemic to the State of Hawaii where it is the only existing, native terrestrial mammal. The Hawaiian hoary bat is known to reside on Hawaii, Maui, Oahu, Lanai, Molokai and Kauai, with the largest populations likely on Hawaii and Kauai. There are no

population estimates for the Hawaiian hoary bat and few historical or current records. Unsubstantiated population estimates across the State have ranged from hundreds to a few thousand individuals (Service 1998, p. 14). Data are limited because no feasible method currently exists for surveying the abundance and distribution of solitary, tree-roosting bats. The Hawaiian hoary bat's distribution may be broader than indicated by the current limited information resulting from localized search efforts (Service 1998, p. 14).

Hawaiian hoary bats have been observed year-round in a wide variety of habitats and elevations below 7,500 ft. (2,286 m), and a few sightings from limited surveys have been reported as high as 13,199 ft. (4,023 m). Hawaiian hoary bats have been detected in both wet and dry areas of Hawaii but seem to be more abundant on the drier leeward side (Jacobs 1994, p. 199) and generally less abundant in wet areas (Kepler and Scott 1990, p. 62). Only three researchers have examined spatial and temporal variation in occurrence patterns of bats in Hawaii, with conflicting conclusions about possible altitudinal or regional migration (Jacobs 1994, pp. 193-200; Menard 2001, pp. 1-149; Tomich 1986, pp. 1-30).

Life History

A comprehensive life history assessment for the Hawaiian hoary bat is lacking. Furthermore, the existing information on population status and habitat ecology is often conflicting. Hawaiian hoary bats roost in a variety of tree species, both native and non-native, during the day and forage in a wide range of habitat types during the night (Service 1998, pp. 12-13). There is no information on the Hawaiian hoary bat's average life span, age at first reproduction, and survivorship, or on how age and reproductive condition affect its food habits, habitat selection, home range size, and movement patterns.

A few studies have documented Hawaiian hoary bats in a wide range of locations and habitat types on the island of Hawaii. Bats observed along 611 miles (983 kilometers) of forest bird survey transects and incidentally elsewhere on Hawaii during 1976-1983, at elevations from sea level to 10,007 ft. (3,050 m), were more frequently associated with nonnative vegetation (64%), such as tall eucalyptus and other exotic plants, than with native vegetation (19%) (Kepler and Scott 1990, p. 61). Visual observations and echolocation detections at 22 sites in southeast Hawaii, however, found no significant differences in bat activity among native or non-native vegetation types (Reynolds *et al* 1998, pp. 153-157). In addition, 57% of all bat activity was noted at open sites, forest edges, lava flows, volcanic pit craters, residential and agricultural clearings, and roads. Foraging bats at 14 survey sites over a range of altitudes were more frequently associated with native vegetation (44%) than non-native (16%) or mixed (nine percent) vegetation (Jacobs 1993, p. 22). Bats were detected most often in native mesic koa-ohia forest vegetation at 13 sites in, and adjacent to, Hakalau Forest National Wildlife Refuge (Cabrera 1996, p. 238). All reports of bat occurrences may be biased to varying degrees by sampling efforts concentrated along roads and forest edges.

Roosting habitat for the Hawaiian hoary bat is sparsely documented. However, Dr. Frank Bonaccorso's current research project utilizing radio-tracking with more than 30 Hawaiian hoary bats, reveals all the bats studied roost in trees and all roost more than 20 ft. (6 m) off the ground

(Bonaccorso 2009b, pers. comm.). North American hoary bats roost 10 to 16 ft. (three to five m) above the ground, mostly in hardwood trees (Shump and Shump 1982, p. 3). Hawaiian hoary bats have been observed in a wide variety of trees, including native species (*Metrosideros polymorpha*; *Pandanus tectorius*; *Styphelia tameiameiae*), Polynesian-introduced species (*Aleurites moluccana*), and post-contact introduced species (*Syzygium cumini*) (Service 1998, p. 13). Bats also have been occasionally observed in fern clumps, low scrub, rock crevices, macadamia nut orchards, and buildings (Tomich 1986, p. II-24).

Hawaiian hoary bats forage in a variety of open and vegetated habitats, including open fields, lava flows, open ocean in bays near shore, and streams and ponds. Hawaiian hoary bats on Hawaii forage in both relatively closed habitats near vegetation (such as clearings in lowland mesic ohia forest or town parks) as well as in open habitats and forest edges (Jacobs 1993a; Tomich 1974, pp. 10–13). Foraging generally occurs three to 492 ft. (one to150 m) above the ground or open water, three to 50 ft. (one to 15 m) above the ground in closed forest habitats, and up to 100 ft (30 m) and more above tree canopy (Service 1998, p. 10). Hawaiian hoary bats require unobstructed airspace for foraging. Obstructions such as buildings and other development reduce the area available for Hawaiian hoary bat foraging.

As with other life history parameters, little is known about the breeding biology of Hawaiian hoary bats. Females of most temperate, autumn-breeding, insectivorous bat species become pregnant in the spring by delayed ovulation and fertilization, and young are cared for exclusively by the female. The breeding cycle of the Hawaiian hoary bat on the island of Hawaii consists of pregnancy (April to June), with pups born in May or June; lactation (June through early August and possibly to September); post-lactation, after pups have fledged (September to December); and pre-pregnancy (January to March) (Menard 2001, p. 35). Like North American hoary bats, Hawaiian hoary bat females are believed to give birth to two young at a time. North American hoary bat pups cling to the mother at the roost tree during the day, where she leaves them hanging on a twig while she forages at night (Shump and Shump 1982, p. 3), and Hawaiian hoary bats are presumed to behave similarly. Female North American hoary bats adjust their foraging behavior to meet the increasing energy demands of pregnancy and lactation (Barclay 1989, pp. 31-37). Because newborn bats cannot thermoregulate very well in tree-foliage roosts, the mother's foraging activity may be constrained by the need to roost periodically with her young to keep them warm. Thus, foraging behavior changes with reproductive condition, and females with non-volant young may forage at different times of night and perhaps in different habitats than other bats. Preliminary evidence indicates that pregnant and lactating female Hawaiian hoary bats on Hawaii may prefer roosting in lowland areas rather than in the cooler highlands, perhaps because the warmer lowland environment promotes faster juvenile growth (or, alternatively, because insect food sources may be more readily available) (Menard 2001, pp. 52-105).

Threats

The major threats to the Hawaiian hoary bat are assumed to be the same as those that threaten many bat species in general (Harvey *et al* 1999, p. 13; Service 1998, p. 15). Bats have the slowest reproductive rate and the longest life-span of all mammals of their size (Barclay and Harder 2003, pp. 209-256). Thus, any mortality of breeding-age adults, particularly females, constrains the

recovery of the subspecies. The main factor limiting recovery was thought to be habitat loss, primarily the availability of roosting sites as suitable roosting habitat is particularly important to pregnant and lactating females and non-volant young (Service 1998, p. 15). Other possible threats identified in the recovery plan may include: roost disturbance, predation by native hawks and non-native feral cats, pesticide use (either directly or by impacting prey species), and alteration of prey availability due to introduction of non-native insects. In addition, occasional instances of Hawaiian hoary bat mortality due to collisions with vehicles and structures have been documented (Kepler and Scott 1990, p. 60; Kuhn 2009; Menard 2001, p. 136; Tomich 1986, pp. I 1-30). Clearing of vegetation in areas where there are non-volant bat pups may result in the injury or death of those young. Hoary bats also may be impaled on barbed wire in the continental United States (Anderson 2002; Iwen 1958, p. 438; Wisely 1978, p. 53) and in Hawaii (Burgett 2009, pers. comm.; Jeffrey 2007, pers. comm.; Mansker 2008, pers. comm.; Marshall 2008, pers. comm.).

Conservation Needs of the Species

The overall recovery strategy for the Hawaiian hoary bat is to rely on research that can provide information on the subs'ecies' abundance and distribution, life history, and habitat associations. The primary recovery goal is to conduct research essential to the conservation of the Hawaiian hoary bat. Research should focus on developing standardized survey and monitoring protocols for determining abundance and distribution, roosting habitat associations, basic life history biology, and food habits. Other recovery goals are to protect and manage current populations by identifying and managing threats, including protection of key roosting and foraging areas; conduct a public education program; evaluate progress towards recovery; and revise recovery criteria as necessary (Service 1998, p. 18-20).

Ongoing Conservation Actions

The Service, Hawaii Department of Land of Land and Natural Resources – Division of Forestry and Wildlife (DOFAW), and Bat Conservation International (BCI, a non-profit conservation and education organization) are stakeholders in a public-private Hawaiian Hoary Bat Research Cooperative (Cooperative) which collaboratively prioritizes and funds management-oriented research on the Hawaiian hoary bat's abundance, distribution, and habitat requirements. Major stakeholders include private landowners, agricultural and commercial forestry interests, environmental groups, local governments, and Federal and State agencies. Most of the Cooperative's current funding is provided by the Service's Cooperative Endangered Species Conservation Fund (Section 6 of the Endangered Species Act) grants to the State. The Cooperative awarded funding to the U.S. Geological Survey – Biological Resources Division for telemetry research in years 2004 to 2007, to complete baseline surveys to document Hawaiian hoary bat movements on the island of Hawaii. The Cooperative has secured other funding to continue this research through 2009. The Service is also working with several private landowners in the state to develop Habitat Conservation Plans for the Hawaiian hoary bat. While none of these activities are occurring on the island of Oahu, all may provide conservation benefits to the population as a whole and provide essential information regarding policy and management decisions.

Environmental Baseline

The environmental baseline describes the status of the species or critical habitat and the past and present factors (adverse and beneficial) affecting the species or critical habitat in the action area for the proposed action at the time of consultation. Unrelated Federal actions within the action area that have already undergone formal or informal consultation are also a part of the environmental baseline.

Hawaiian Petrel

Although Hawaiian petrels do not currently nest at the project site, the KWPII wind turbine structures will be constructed in airspace used by a subset of the 600 Hawaiian petrel breeding pairs occupying the upper reaches of the west Maui mountains (SWCA 2011a, Appendix 24, p. 2). These 600 pairs constitute approximately 12 to 13% of the Hawaiian petrel's range-wide population. 4.500 to 5,000 breeding pairs. Radar and night-visual observations were conducted in July and October 2009 to document passage rates of seabirds over KWPII during the nesting season (Cooper and Day 2009, SWCA 2011a). The estimated number of Hawaiian petrel passing through the airspace of KWPII is 6.3 birds/night for the entire spring/summer season and 4.12 birds/night during the fall fledging season. Passage rates in the fall are lower because the visitation rates by adults to feed their chicks decline as much as 80% in the last quarter of the nestling period (Simons 1985). Spring/summer and fall passage rates of Hawaiian petrels and Newell's shearwaters combined at KWPII are within the range of variability of passage rates observed upslope at KWPI over the last 10 years. However, when comparing passage rates over other areas and islands of Hawaii, passage rates over the KWPI and KWPII project areas are lower than the mean rate measured for west Maui (8.7 ± 3.9 targets/hr), east Maui (52.8 ±16.6 targets/hr, Cooper and Day 2003) and are less than 2.5% of the mean passage rates measured on Kauai (131 ± 35 targets/hr, Day and Cooper 2001). Ainley (SWCA 2011a, Appendix 25, p. 2) estimates there is a declining population of 600 breeding pairs of Hawaiian petrels nesting in the west Maui mountains and that even in the absence of the project, predation impacts would render this population functionally extinct in 27 years (SWCA 2011a, Appendix 24, p. 8). As the Hawaiian petrel population declines, passage rates at the project site would decline.

Three Hawaiian petrel carcasses have been detected at the KWPI project site during the first six breeding seasons of operation. Calculations based on the Applicant's searcher efficiency and carcass removal trial data indicate at this rate of take, the KWPI project will, over 20 years, take a total of approximately 25 Hawaiian petrels. KWPI was authorized take of up to 40 Hawaiian petrels over 20 years of project operation; an Amendment to that HCP, requested in 2011, reduces KWPI's authorized take to 38 birds. KWPI mitigation, which will be conducted in conjunction with KWPII mitigation will offset take, based on observed mortality.

Role of the Action Area in the Conservation of the Hawaiian Petrel

The KWPII project will be constructed in airspace used by a portion of the 600 breeding pairs of Hawaiian petrels Ainley (SWCA 2011a, Appendix 24, p.2) calculates occupy the west Maui mountains. Heavy predator impacts may render the west Maui Hawaiian petrel population

functionally extinct in 27 years (SWCA 2011a, Appendix 25, p. 12); unmitigated project impacts would increase the rate of decline and contribute to a reduction in the range of the Hawaiian petrel.

Newell's Shearwater

Although Newell's shearwater do not currently nest at the project site, the KWPII wind turbine structures will be constructed in airspace used by a moderate percentage of the Newell's shearwater in west Maui. Radar and night-visual observations by Day and Cooper (1999) and Cooper and Day (2004a, 2004b) indicate that Newell's shearwaters nest in the west Maui mountains, and that low numbers of these birds regularly fly over or near the proposed KWPII project area at night while traveling to and from nesting colonies either in the west Maui mountains; occasionally Newell's shearwater traversing to nesting sites in east Maui occur in the project airspace. Newell's shearwater nesting has been detected in Kauaula/Violet Lake/Ukanehame Ridge (Oppenheimer, pers. comm. 2011) a few miles west of the proposed wind farm site (Oppenheimer pers. comm. 2011) and the Applicant's staff have detected Newell's shearwater flying from the north, toward the summit of the west Maui mountains (SWCA 2011, Appendix 25, p. 2). Ainley (SWCA 2011a, Appendix 25, p. 2) estimates there is a declining population of at least 40 breeding pairs of Newell's shearwater nesting in the west Maui mountains and that even in the absence of the project, predation impacts would render this population functionally extinct within 20 years (SWCA 2011a, Appendix 25, p. 12). As the Newell's shearwater population declines, passage rates at the project site would decline.

Radar and night-visual observations were conducted over the KWPII project area in July and October 2009 (Cooper and Day 2009; SWCA 2011a). The estimated number of Newell's shearwaters passing through the airspace of KWPII is 4.2 birds/night for the spring/summer season and 2.75 birds/night for the fall. Visitation rates by adults to feed their chicks are expected to decline in the last quarter of the nestling period much like Hawaiian petrels. As described above with petrels, this passage rate is similar to KWPI and lower than rates elsewhere on Maui and Kauai.

During the first four years of KWPI operation there has been no observed take of Newell's shearwaters. KWPI was given take of up to 40 Newell's shearwaters over 20 years of project operation, but an Amendment to that HCP, requested in 2011, reduces that take to eight birds. KWPI mitigation will offset any take observed.

Role of the Action Area in the Conservation of the Newell's Shearwater

The KWPII wind turbine structures will be constructed in an airway that receives significant levels of use by the estimated 40 breeding pairs of Newell's shearwater nesting in the west Maui mountains. Although the 40 breeding pairs constitute fewer than one percent of the total range-wide Newell's shearwater population, they may constitute one half of the Newell's shearwater on Maui. Newell's shearwater nesting on Maui, Mokokai, and Lanai (Maui Nui) are believed to be genotypically and phenotypically divergent from the large Newell's shearwater population on Kauai. Population modeling indicates continued predator impacts will render the Maui Newell's

shearwater populations functionally extinct within 20 years (SWCA 2011a, Appendix 25, p. 12); unmitigated project impacts would contribute to a reduction in the range of the Newell's shearwater.

Hawaiian Goose

Observations at KWP confirm that 138 Hawaiian geese are resident in and around the KWPI and KWPII area (DOFAW 2010). Since 1994, 100 Hawaiian geese have been released at Hanaula, above the KWPI project site (Service 2004). DOFAW estimates that 91 of the 100 birds released between 1994 and 2004 have survived, with a survival rate of 91% over the 10-year period. At this time, there are no additional releases of Hawaiian geese planned at Hanaula release (J. Medeiros, Maui DOFAW, pers. comm., 2005). The 138 Hawaiian geese at the Hanaula site represent approximately 25% of the 416 Hawaiian geese known on Maui, and 8% of the 1,300 Hawaiian geese known statewide. The Hanaula release pen is located near the upper end of the existing KWPI project area, approximately 1,800 ft from the nearest KWPI wind turbine. A number of Hawaiian geese from the Hanaula release site have remained as residents within or near the KWPI project area. Little is known about the exact distribution and movements of the birds released at the Hanaula release pen, although they have been recorded as far west as Lahaina (approximately 7.7 miles from the project area) and as far east as Haleakala National Park, indicating that at least some birds from this release site move extensively around the island (SWCA 2011b). The Hawaiian goose has a high rate of fecundity and birds are long-lived; between 2009 and 2010, the Honaula population increased from 106 birds (Medeiros 2009) to 138 (DOFAW 2011).

In 1998, four goslings were successfully fledged from the first nest reported in the area since reintroduction began (DOFAW 2000). Monitoring studies at KWPI have resulted in discovery of a few Hawaiian goose nests in the vicinity. One successful nest was discovered in 2007 about 330 ft to the west of WTG-15. Spencer (SWCA 2011b) reported that most nesting activity is observed well to the west and southwest of the KWPI area but seldom, if ever, within the KWPII area.

Hawaiian goose presence and nesting behavior have been monitored regularly in the KWPI project area prior to and after commencing operation of KWPI. Data collected from incidental surveys and the WEOP program (December 2006–June 2009) have provided information about Hawaiian goose distribution and behavior at KWPI and KWPII. Monitoring of Hawaiian geese during the construction period at KWPI (January to June 2006) also documented Hawaiian goose use of the KWPI area and KWPII area. Both these data sets combined provide over 800 observations on Hawaiian goose distribution. Results show that Hawaiian geese are seen almost twice as frequently at the KWPI area than at KWPII downroad area. Most of the downroad observations are in the upper elevations of the KWPII area, near the Pali Trail Junction and in the vicinity of MECO's 64kV overhead transmission route crossing. The birds periodically use the area for browsing and socializing (cite EA). Nesting has been documented at KWPI; however, due to habitat limitations nesting is not expected to occur within the KWPII project area.

Systematic surveys were also conducted at KWPI from June 2006 to June 2007. The primary purpose of the systematic surveys was to record Hawaiian goose flight behavior around the existing KWPI wind facility. Surveys were conducted in the mornings (6-10 a.m.), afternoons (10 a.m.–2 p.m.) and evenings (2 p.m.–6 p.m.). These surveys show that flight activity did not vary with time of day. Data from the WEOP surveys and systematic surveys combined document that Hawaiian geese frequently fly within the rotor-swept zone (RSZ) of the turbines at KWPI (66.1% of all flights observed, n=97) with 16.9% occurring below the RSZ and also 16.9% above.

Hawaiian geese within the project area are presently at risk from mammalian predators, including rats, mongoose, feral cats and feral dogs. In an effort to reduce this risk, DOFAW maintains an active program to trap mammalian predators in the vicinity of the release site. Hawaiian geese may also be at risk of colliding with the existing MECO power lines and from collisions with vehicles that are operated within the project area.

During the first four years of KWPI operation have been four observed mortalities of Hawaiian geese due to project operations. KWPI was given take of up to 60 Hawaiian geese over the 20 years of project operation.

Role of the Action Area in the Conservation of the Hawaiian Goose

The 138 Hawaiian geese at the Hanaula site, immediately adjacent to the KWPII project site, account for approximately 25% of the 416 Hawaiian geese known to occupy Maui, and 8% of the Hawaiian goose range-wide population of 1,300 birds. Hanaula in one of only two main breeding and flocking areas for the Hawaiian goose on Maui and persistence of this population is therefore important for the recovery of the species (Marshall pers. comm. 2011). The second site, at Haleakala National Park, is higher elevation; the lower elevation Hanaula is also important because Hawaiian geese generally have higher breeding success at lower elevation (USFWS 2004).

Hawaiian Hoary Bat

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 KWPII 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 KWPII, it is expected that bat activity at KWPII will likely be comparable.

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.

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. This was the first and, to date, the only observed bat fatality associated with the KWP project since issuance of the ITP and ITL (January 2006).

Since August 2008, four to eight Anabat detectors (Titley Electronics, NSW, Australia) have been 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 Hawaii, 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 Hawaii. 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 Hawaii. 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 KWPII, bat call sequences were mostly detected between the months of May and November. Thirty-nine bat passes, were recorded by the four to seven detectors over the sampling period. 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 Hawaii (0.66 bat passes/detector/night) (Bonaccorso, unpub. 2008).

Year-round monitoring aimed at documenting all downed (i.e., injured or dead) Hawaiian hoary bats has been conducted since KWPI began operation. On September 26, 2008, one 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. This remains the only bat fatality that has been observed at KWPI; however it is possible that non-observed mortality also occurred. KWPI was authorized incidental take of up to 20 Hawaiian hoary bats over the 20 years of project operation.

Role of the Action Area in the Conservation of the Hawaiian Hoary Bat

A widespread population of Hawaiian hoary bats must be naturally reproducing and stable or increasing in size on the island of Hawaii for a minimum of five consecutive years before downlisting will considered. Hawaiian hoary bat populations on Hawaii, Kauai, and Maui must be well distributed, naturally reproducing, and stable or increasing in size for at least five consecutive years following downlisting before delisting is considered.

3.0 EFFECTS OF THE ACTION

Wind energy generation facilities in Hawaii are relatively new and few wildlife monitoring impact studies have been conducted to document the direct or indirect impact of wind energy facilities on wildlife. Post-construction monitoring to document downed wildlife has been conducted at the KWPI facility since operations began in June 2006 (KWP 2008b, 2008c). The results of this monitoring offer the best presently available information on the potential impacts of the proposed KWPII HCP Permit action on listed species, as well as a means to assess the accuracy of pre-construction mortality estimates for listed species made for the KWPII project in the HCP.

Construction and operation of KWPII creates the potential for listed species to collide with WTGs, temporary and permanent meteorological towers, overhead collection lines, and cranes used during the construction phase of the project. Cranes used during construction are typically comparable in height to the turbine towers (KWP 2006), but are used only during the day and lowered to a position that will reduce the risk of flight collision when not in use. The potential for

listed species to collide with cranes on-site is negligible because their vertical deployment time will be limited to such an extent a collision is not likely to occur. For this reason, covered species collision with cranes is not discussed further in this document.

The following five types of "take" are analyzed in the KWPII HCP (SWCA 2011a):

Direct take:	Individuals that are killed or injured colliding with turbines or associated on-site structures that are found during post-construction monitoring.
Indirect take:	The adult birds or bats lost to direct take could have been tending to eggs or dependent young. 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.
Unobserved direct take:	Estimated direct take of unobserved individuals based on searcher efficiency and scavenging trial results. Unobserved take accounts for individuals that are killed by collision with project components but that are not found by searchers for various reasons, including vegetation cover and carcass removal by scavenging.
Unobserved indirect take:	Loss of dependent young from unobserved direct take.
Estimated total take:	Sum of the above four types of take.

Estimating the potential for each listed species to collide with project components (direct take) was done using fatality estimate models and the results of on-site surveys, information about the proposed project design, and the results of post-construction monitoring at the adjacent KWPI facility. The fatality estimate models developed for KWPI and used for KWPII incorporated rates of species occurrence, observed flight heights, encounter-rates with turbines and meteorological towers, and estimates of the species' abilities to avoid project components. Post-construction monitoring results shall be used to estimate actual rates of take.

The KWPII HCP identifies two tiers (1 and 2) of take for purposes of defining the HCP mitigation program. Because take of covered species may occur and not be detected, the Applicant has committed to complete mitigation to offset the Tier 1 level of take even if no mortality or injury of covered species is detected. In addition, Tier 1 is the level of take the analysis indicates is likely to occur, while Tier 2 take levels were set based on the level of take which is unlikely to be exceeded.

Estimating the potential for each listed species to collide with these project components (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 KWPI facility. The fatality estimate models developed for KWPI and used for KWPII incorporated rates of species

occurrence, observed flight heights, encounter rates with turbines and meteorological towers, and estimated ability of birds to avoid project components.

For purposes of the analysis below of the effects of the proposed action, the Service is relying upon (with the exception discussed below) the information presented in the KWPII HCP, which is herein incorporated by reference. The Service has reviewed the HCP and has determined that the estimates of take, the assessment of take impacts, and the mitigation benefits for each covered species are reasonable and based on best available information. The exception is the KWPII HCP differs from the Service's assessment of the anticipated benefits of predator control at the Haleakala Crater Rim site. The Service's assessment in the EA and in this Opinion incorporates a more conservative assumption regarding baseline levels of adult survival. Actual mitigation benefits will accrue based on the Service's conservative assumptions or, if they are available, updated life history attributes measured at a control site.

Effects of the Action on the Hawaiian Petrel

Take Impacts

The results of fatality modeling presented in the KWPII HCP (SWCA 2011a, pp. 56-59) indicate a total of up to 29 adult and 14 nestling Hawaiian petrels are likely to be killed or injured, directly or indirectly, by operation of the KWPII project over the 20-year term of the proposed Permit. Those results are herein incorporated by reference. Of this total, Tier 1 includes the death or injury of 19 adults and nine nestling petrels; Tier 2 includes the death or injury of up to 29 adult and 14 nestling petrels.

The Service concurs with this assessment of impact because the KWPII HCP's fatality modeling results were based on the best available information on the expected amount of petrel take. The KWPII project is closely situated to the existing KWPI project, for which mortality monitoring has been in place for six years. The level of information regarding the distribution of Hawaiian petrel nesting and fallout as well as site-specific radar data gathered by KWPII supports the results presented in the KWPII HCP.

Effects of the Hawaiian Petrel Mitigation Program

Under the HCP, KWPII has committed to conduct Hawaiian petrel mitigation to offset the Tier 1 level of incidental take of 19 adult and 9 nestling Hawaiian petrels, even if no mortality or injury is detected based on site monitoring as described in the HCP. Petrel mitigation under the KWPII HCP shall be conducted in concert with the petrel mitigation program for the KWPI HCP. Based on current rates of take, total take for the KWPI project will be approximately 25 Hawaiian petrels. If KWPII take exceeds 28 Hawaiian petrels, KWPII shall, pursuant to the KWPII HCP, offset take of a total of 43 Hawaiian petrels by implementing a social attraction project at Makamakaole in west Maui and a predator control program at Haleakala Crater Rim in east Maui. Based on levels of take observed and the mitigation benefits realized during the first five years of implementing the Makamakaole project, KWPII shall implement predator control for Hawaiian petrels nesting at the Haleakala Crater Rim in east Maui. As few as 99, to more than 600

Hawaiian petrel burrows may be managed to control predators, if needed, to offset the remainder of the 20-year levels of incidental take impacts on the Hawaiian petrel caused by the KWPI and KWPII projects.

The Social Attraction Project at Makamakaole

Best available information indicates the Makamakaole social attraction project is likely to offset the impacts of take of 18 adult and 10 fledgling Hawaiian petrels during the 20-year Permit term of the KWPII HCP (SWCA 2011a, Appendix 24, p.6). These benefits of mitigation were calculated based on the increased survival and reproductive success of petrels nesting in the protected Makamakaole project site compared with the survival and reproductive success they would likely have had in the absence of the project. On this basis, the Makamakaole social attraction project is likely to be adequate to offset KWPI's Tier 1 level of Hawaiian petrel take (SWCA 2011a, Appendix 24, p.6).

Based on monitoring data and calculations to date, the anticipated 20-year take level for the KWPI project is likely to be 25 Hawaiian petrels. The KWPI project offsets take on a bird for bird basis, rather than in tiers, although tiers of anticipated take are specified in the KWPI HCP (the Tier 1 take level for KWPI is 25 Hawaiian petrels; the Tier 2 take level is 38 Hawaiian petrels). If the Makamakaole social attraction project is more productive than models indicate it will be and that is confirmed by monitoring results, the additional mitigation benefit may be sufficient to offset all or a portion of the KWPII project Tier 1 and Tier 2 levels of take. However, best available information (SWCA 2011a, Appendix 24, p.6) indicates the social attraction mitigation project at Makamakaole will be insufficient to offset levels of Hawaiian petrel take beyond those expected for KWPI.

Uncertainty is associated with calculations of anticipated benefits of the Makamakaole social attraction project. Although construction and management of predator-proof areas such as the one proposed for Hawaiian petrel management at Makamakaole is likely to be successful because the methods proposed have been successful at numerous sites in New Zealand (Bell *et al* 2005, Miskelly and Taylor 2004, Sawyer pers. comm. 2011) and at several sites in Hawaii (Hu 2010 pers. comm.; DOFAW 2011), the anticipated numbers of Hawaiian petrels the social attraction site will attract is less certain. Uncertainty in model inputs, including the size of the west Maui population (the pool from which birds will be attracted to the mitigation site) introduces uncertainty into the likelihood of success of the Makamakaole social attraction project. Ainley (SWCA 2011a, Appendix 24, p. 1) assumed there is a population of 600 breeding pairs of Hawaiian petrels nesting in the Makamakaole vicinity. This is a crude estimate based on the 50-70 Hawaiian petrels KWPI surveys have detected in the valley next to the proposed Makamakaole project site. Ainley assumed that these 50-70 cavorting birds are equivalent to approximately 10% of total colony size (SWCA 2011a, Appendix 24, p. 1-2). The Service concurs with Ainley's assessment because it is based on the best available information.

The In-Situ Predator Control at the Crater Rim Site

If, in year five of KWPII operation, the Service determines, in coordination with KWPII and based on the best available information including trigger points specified in the KWPII HCP, that the Makamakaole social attraction project's projected 20-year benefits are likely to be insufficient to offset the 20-year projected level of Hawaiian petrel take caused by KWPI and KWPII project operations, KWPII shall manage as many burrows at an existing Hawaiian petrel colony at the Park Crater Rim as necessary to offset the remainder of the anticipated take impacts. The Park has confirmed the locations of 99 Hawaiian petrel burrows at the Crater Rim site (see Figure 3). Park field studies indicate there are an additional 600 active burrows farther east along the South Rim (C. Bailey pers, comm. 2011) that are exposed to predators. In addition, Hawaiian petrel burrows on State land (at the Advanced Technology Solar Telescope project site adjacent to the Park Crater Rim site) may be available for management of petrel predators.

The anticipated benefits of predator control on the Hawaiian petrel were calculated by comparing future population sizes that would have likely occurred under current predation rates versus the size of the population likely to occur under the reduced rate of predation. We input Hawaiian petrel survival and reproductive success rates which, based on our review of the available literature and data (Table 5), are likely to occur under varying predation levels.

Table 5. Hawaiian petrel vital rates under varying predation levels based on best available local data.

Predation Severity	**Life History Parameters (Annual Rates)**				**Model Results (Lambda)**
	Adult Survival	**Juvenile survival (Simons 1984 p. 1070)**	**Percent of Active Burrows Laying an Egg (Simons 1984 p. 1069)**	**Fecundity (Fledglings per Egg Laid)**	
Mild Predation (Cat/Mongoose/Trapping Only)	0.90 (Simons 1984 p. 1070)	0.8034	0.75	0.60 (Simons 1984 p. 1070)	0.978
Moderate Predation (No Management)	0.85 (Simons 1984 p. 1070)	0.8034	0.75	0.49 (Simons 1985 p. 237)	0.933

Figure 7 shows the modeled trajectory of the number of Hawaiian petrels likely to occupy the 99 known Hawaiian petrel burrows at the Crater Rim site (GIS data the Service received from NPS, Bailey, pers. comm. 2011). Implementation of predator control benefits the population by slowing the rate of population decline.

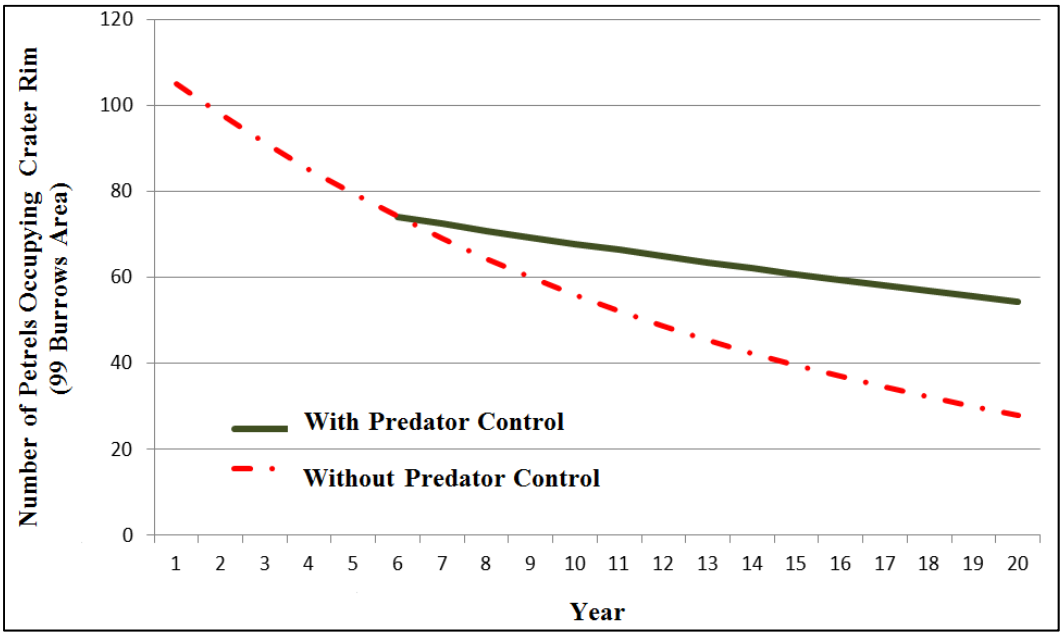

Figure 7. The modeled trajectory of the number of Hawaiian petrels likely to occupy the 99 known Hawaiian petrel burrows at the Crater Rim site with and without predator control.

Population modeling indicates the Hawaiian petrel population at the Crater Rim site, which contained 99 total burrows of which 60 were used by 45 breeding pairs in 2011, would be occupied by 29 more adult petrels if predator control is implemented in years 6 through 20 of the Permit term than would have been there in the absence of predator management. In addition to the 99 confirmed burrows (60 active burrows) used in this estimate, KWPII will, if needed to offset take, manage a portion of the additional 600 active burrows Bailey (pers. comm. 2011b) indicates also occur on the Crater Rim. Management of the 600 active burrows at the Crater Rim would result in ten times the mitigation benefit of management of 60 active burrows; applying the model inputs above, management of 600 active burrows over a 15 year period would boost the east Maui Hawaiian petrel population by 290 (far more than needed to offset KWPII take).

All mitigation site construction activities shall be conducted outside of the nesting season of the covered seabird species to minimize adverse impacts. To minimize the potential for seabirds to collide with the fencing, steel reinforced white poly-vinyl tape will be woven through the fence in areas the Applicant, in coordination with the Agencies, determines the fence poses a flight hazard.

There is some potential for seabirds to get caught in predator traps, and on rare occasions this can result in the death of the bird. Trapping and monitoring at mitigation sites would closely follow National Park Service (NPS) established protocols including appropriate trap placement and

regular monitoring. Therefore, potential adverse impacts to seabirds as a result of the proposed mitigation are not anticipated.

If diphacinone (or another rodenticide) is used to control rats at Haleakala, the adults of the Covered seabird species are not expected to be attracted to the toxin or eat organisms that have been contaminated. Thus, the use of rodenticides is not anticipated to negatively impact seabird populations (DOFAW 2009b).

Gear-cleaning procedures to reduce the introduction of invasive plants and arthropods into the mitigation sites will be strongly enforced for biologists and/or contractors that conduct predator control or monitoring efforts. Prior to construction, the final fence alignment would be surveyed by qualified specialists to ensure the fence would be appropriately placed to avoid adverse impacts to seabird burrows.

Summary of Effects of the Action on the Hawaiian Petrel

The results of fatality modeling presented in the KWPII HCP (on pages 57-61) indicate that up to 29 adult and 14 nestling Hawaiian petrels are likely to be killed or injured by operation of the KWPII project. This impact, if not mitigated, is likely to reduce the west Maui Hawaiian petrel population by up to 2.5% and result in the loss of from 1.4% and 2.15% of the total Hawaiian petrel population on Maui. As much as one quarter of the breeding population of Hawaiian petrels may be on Maui with most of the Maui petrels nesting at Haleakala National Park (Simons and Hodges 1998).

Although it is not currently used for Hawaiian petrel breeding, the wind farm project site does serve as unobstructed airspace through which Hawaiian petrels traverse in their movements between their breeding area and ocean feeding grounds. The wind development will increase the level of obstruction within the airspace, resulting in mortality of Hawaiian petrels, as discussed above. Airspace between the turbines and adjacent development, including the adjacent existing KWPI wind farm, will continue to be adequate for transit of the local Hawaiian petrel population.

Effects of the Action on the Newell's Shearwater

Take Impacts

The results of fatality modeling presented in the KWPII HCP (SWCA 2011a, pp. 60-62) indicate a total of up to 5 adult or immature Newell's shearwaters and up to 3 shearwater chicks or eggs are likely to be killed or injured, directly or indirectly, by operation of the KWPII project over the 20-year term of the proposed action. Those results are herein incorporated by reference. Of this total, Tier 1 includes the death or injury of 2 adult or immature shearwaters and 2 shearwater chicks or eggs; Tier 2 includes the death or injury of up to 5 adult or immature shearwaters and up to 3 shearwater chicks or eggs.

The Service concurs with this assessment of impact because the KWPII HCP's fatality modeling results were based on the best available information on the expected amount of Newell's

shearwater take. The KWPII project is closely situated to the existing KWPI project, for which mortality monitoring has been in place for six years. The level of information regarding the distribution of Hawaiian petrel nesting and fallout as well as site-specific radar data gathered by KWPII supports the results presented in the KWPII HCP.

Effects of the Mitigation Program on the Newell's Shearwater

Under the HCP, KWPII has committed to conduct Newell's shearwater mitigation to offset the Tier 1 level of incidental take impacts to the Newell's shearwater even if no shearwater mortality or injury is detected based on site monitoring described in the HCP. The shearwater mitigation program under the KWPII HCP will be conducted in concert with the shearwater mitigation program under the KWPI HCP. To date, no Newell's shearwater take has been detected at the KWPI project site during six breeding seasons of operation.

KWPII shall initially implement a social attraction project at Makamakaole in west Maui. Based on levels of shearwater take detected at the KWPI and II project sites and the mitigation benefits accrued during the first five years of implementation of the Makamakaole project, KWPII shall implement one or more additional Newell's shearwater mitigation projects in year six if necessary to offset the total amount of shearwater take. Best available information indicates the social attraction project at Makamakole is likely to offset the impacts of approximately 81% of all tier levels of shearwater take at the KWPI and KWPII project sites (SWCA 2011a, Appendix 25, p.F-3).

Implementation of an east Maui social attraction project in years six through 20 is likely to offset the remaining 19% of anticipated shearwater take (SWCA 2011a, Appendix 25, p.F-3). In-situ management projects for shearwaters on Maui and in-situ and social attraction projects for shearwaters on Molokai and Lanai are likely to be very beneficial (Marshall, pers. comm. 2011), but the feasibility of these projects has not been confirmed.

The Social Attraction Project at Makamakaole

Best available information indicates the Makamakaole social attraction project is likely to offset the impacts of take of nine adult, 12 juvenile, and four fledgling Newell's shearwater during KWPII's 20-year Permit term (SWCA 2011a, Appendix 25, p.F-3). These benefits of mitigation were calculated based on the anticipated increased survival and reproductive success of shearwaters nesting in the protected Makamakaole project site compared with their survival and reproductive success in the absence of the project. Modeling results indicate the Makamakaole social attraction project is likely to be adequate to offset 450% of KWPII's Tier 1 level of incidental take and all of KWPII's Tier 2 level of take. The modeling results indicate the Makamakaole social attraction project's benefits will be adequate to offset approximately 81% of all tiers of requested KWPI and KWPII Newell's shearwater take (SWCA 2011a, Appendix 25, p.F-3).

The project's several alternatives to the Makamakaole social attraction project reflect uncertainty in the anticipated benefits of the project. Uncertainty is associated with calculations of

anticipated benefits of the Makamakaole social attraction project. Although construction and management of predator-proof areas such as the one proposed for Newell's shearwater management at Makamakaole is likely to be successful because the methods proposed have been successful at numerous sites in New Zealand (Bell *et al* 2005, Miskelly and Taylor 2004, Sawyer pers. comm. 2011) and at several sites in Hawaii (Hu 2010 pers. comm.; DOFAW 2011), the anticipated numbers of Newell's shearwater the social attraction site will attract is less certain. Uncertainty in model inputs, including the size of the west Maui population (the pool from which birds will be attracted to the mitigation site) introduces uncertainty into the likelihood of success of the Makamakaole social attraction project. The estimated number of Newell's shearwaters occupying west Maui (the pool from which birds will be attracted to the mitigation site) may be inaccurate. Ainley (SWCA 2011a, Appendix 25, p. 2) estimates there is a declining population of at least 40 breeding pairs of Newell's shearwater nesting in the west Maui mountains. The Service concurs with Ainley's (SWCA 2011a, Appendix 25, p. 2) assessment of the size of the west Maui Newell's shearwater population because his results were based on the best available information.

In-Situ PredatorManagement in West Maui

Because Newell's shearwaters are known to nest in west Maui in areas where they are exposed to predators, implementation of effective in-situ predator control is likely to provide significant benefits to the affected population(s). However, because the KWPII HCP does not identify mitigation sites and does not confirm the feasibility of effective, in-situ predator control, the benefits of such a project cannot be assessed. For purposes of this analysis, no beneficial effects are attributed to this component of the HCP.

In the absence of the Makamakaole social attraction project or in-situ management of Newell's shearwater breeding sites in west Maui, the best available information indicates the west Maui Newell's shearwater population is likely to be functionally extinct within 20 years (SWCA 2011a, Appendix 25, p. 12).

In-Situ Predator Management in East Maui

Because information in our files indicates the National Park Service has not granted permission to KWPII to access and develop management plans for Newell's shearwater breeding within the Park, and no other know Newell's shearwater breeding sites have been confirmed in east Maui, the benefits of this action cannot not be assessed. For purposes of this analysis, no beneficial effects are attributed to this component of the HCP.

The Social Attraction Project in East Maui

Because there are a greater number of Newell's shearwaters breeding in east Maui than in west Maui, an east Maui social attraction project is likely to provide benefits comparable to or greater than the Makamakaole social attraction project in west Maui. Social attraction mitigation management is consistent with DOFAW and The Nature Conservancy land management plans, and properties owned by these entities are within flight paths used by the east Maui Newell's shearwater population. Best available information indicates the east Maui social attraction project

is likely to offset the impacts of take of six adult, nine juvenile, and three fledgling Newell's shearwaters if the site is established in HCP implementation year six and managed for 15 years (SWCA 2011a, Appendix 25, p.F-3). These benefits of mitigation were calculated based on the anticipated increased survival and reproductive success of shearwaters in the protected social attraction project site compared with the survival and reproductive success they would have had in the absence of the project. Modeling results indicate the east Maui social attraction project is likely to be adequate to offset 300% of KWPII's Tier 1 incidental take and approximately 56% of all tiers of requested KWPI and KWPII Newell's shearwater take.

Although construction and management of predator-proof areas such as the one proposed for Newell's shearwater management in east Maui is likely to be successful because the methods proposed have been successful at numerous sites in New Zealand (Sawyer pers. comm. 2011) and at several sites in Hawaii (Hu 2010 pers. comm.; DOFAW 2011), the anticipated numbers of Newell's shearwater the social attraction site will attract is less certain. The estimated number of Newell's shearwaters occupying east Maui (the pool from which birds will be attracted to the mitigation site) may be inaccurate. The Service concurs with KWPII's assessment of the size of the west Maui Newell's shearwater population because it is based on the best available information.

In-Situ Management and Social Attraction on Molokai or Lanai

Because Newell's shearwater are known to nest on Molokai and Lanai in areas where they are exposed to predators, implementation of in-situ predator control and social attraction at a protected site may provide significant benefits to these populations. However, because the KWPII HCP does not identify mitigation sites and does not provide a reasonable basis for management feasibility at these locations, for purposes of this analysis, no beneficial effects are attributed to this component of the HCP.

Although each of the mitigation projects may not result in the anticipated mitigation benefits, the KWPII's commitment to implement multiple projects, as needed to offset projected 20-year project take, is likely to result in KWPII's successful offset of project take of the Newell's shearwater.

Summary of Effects of the Action on the Newell's Shearwater

Although it is not currently used for Newell's shearwater breeding, the wind farm project site serves as unobstructed airspace through which Newell's shearwaters traverse in their movements between their breeding area and ocean feeding grounds. The wind development will increase the level of obstruction within the airspace, resulting in mortality of Newell's shearwaters, as discussed above. Airspace between the turbines and adjacent development, including the adjacent existing KWPI wind farm, will continue to be adequate for transit of the local Newell's shearwater population.

Approximately 18,900 of the total range-wide 21,000, Newell's shearwater nest on Kauai. Tier 1 take (4 birds) under the KWPII HCP represents approximately 0.2% of the estimated range-wide

Newell's shearwater population, and Tier 2 take (8 shearwaters) represents approximately 0.4% of the estimated range-wide Newell's shearwater population. KWPII Project-related mortality is likely to have a significant impact on the population of Newell's shearwater in west Maui, which is believed to be composed of as few as 30 breeding pairs (SWCA 2011a Appendix 25, p. 2). Loss of five adult and three fledgling shearwaters under Tier 2 represents a loss of approximately eight percent of the west Maui Newell's shearwater population. Genotypic and phenotypic differentiation between the Maui and Kauai shearwater populations are likely, based on the results of studies of Hawaiian petrel (Welch *et al* 2011; Fleischer pers. comm. 2011). If not mitigated, the proposed action is likely to contribute to the extirpation of the west Maui Newell's shearwater population and a reduction in the species' range.

Although the proposed take authorization levels are likely to adversely impact the overall population of the Newell's shearwater on Maui Nui, the proposed mitigation projects are likely to offset those impacts and should increase the Newell's shearwater population in the long-term. Such an outcome is likely because although there is significant uncertainty regarding the outcome of each individual mitigation project, it is unlikely that, when taken together, the Newell's shearwater projects will fail to offset project take (Tier 1: four Newell's shearwater; Tier 2: eight birds).

Effects of the Action on the Hawaiian Goose

Take Impacts

Observations at KWPI have confirmed that 138 Hawaiian geese are resident in and around the KWPI and KWPII project areas (DOFAW 2011). At KWPI, Hawaiian geese have been observed feeding on the ground, socializing, nesting, and using habitat and terrain features for cover. Hawaiian geese are not expected to nest or forage at the KWPII project area due to a lack of suitable nesting habitat. The results of fatality modeling and assessments presented in the KWPII HCP (SWCA 2011a, pp. 63-68) indicate a total of up to 27 adult or immature Hawaiian geese and up to 3 Hawaiian goose fledglings or eggs are likely to be killed or injured, directly or indirectly, by operation of the KWPII project over the 20-year term of the proposed action. Those results are herein incorporated by reference. Of this total, Tier 1 includes the death or injury of 18 adult or immature birds and 3 fledglings or eggs; Tier 2 includes the death or injury of up to 27 adult or immature Hawaiian geese and up to 3 Hawaiian goose fledglings or eggs.

The Service concurs with this assessment of impact because the KWPII HCP's fatality modeling results were based on the best available information on the expected amount of Hawaiian goose take. The KWPII project is closely situated to the existing KWPI project, for which mortality monitoring has been in place for six years. Site-specific data gathered by KWPI and KWPII supports the results presented in the KWPII HCP.

Effects of the Mitigation Program on the Hawaiian Goose

Under the proposed KWPII HCP, mitigation for project-related Hawaiian goose mortality will take into account the expected annual total take of the species, as well as any loss of productivity

that might occur. Mitigation for project-related take will be provided through increased Hawaiian goose reproductive success and adult survival at managed pen sites over that expected to occur in the absence of management. When take of adult geese is mitigated by fledglings, the survival rate of fledglings to adulthood will be taken into account to determine the number of fledglings needed to offset the expected levels of take of adult birds. The proposed mitigation will also account for possible loss of production during the lag years between take of adult birds and the sexual maturity of fledglings.

Tier 1 Hawaiian Goose Mitigation

When mitigation commences in 2016, monitoring shall document the changes in the Hawaiian goose population and reproductive success at the managed pen site. The actual number of fledglings or adults accrued at the new pen above the baseline productivity from an overcrowded pen will count toward the mitigation requirements of KWPII. Data from all years will also be used to document population trends and identify emerging and existing threats. Preliminary calculations were done for mitigation planning purposes; mitigation may extend beyond five years if actual benefits of five years of management are inadequate to offset take. It is expected that five breeding pairs with their goslings will be transferred to the KWPII-funded pen from overcrowded pens each year (Medeiros pers. comm. 2011). The 5 breeding pairs that are transferred are expected to be moved with at least 10 associated goslings (Medeiros pers. comm.). The baseline will assume a five percent rate of fledging success for goslings in the overcrowded pen, using 2010 data from Puu O Hoku ranch (SWCA 2011a). Calculations, summarized in Table 6 indicate that KWPII's proposed mitigation program is likely to accrue about 43 fledgling Hawaiian geese after 5 years of implementing the proposed pen management.

Table 6. Anticipated annual accrual of Hawaiian goose Fledglings under the KWPII HCP Tier 1 mitigation program.

Year	2016	2017	2018	2019	2020
No. goslings reared in pen (from 5 breeding pairs)	10	10	10	10	10
No. fledge (90% of all goslings)	9.00	9.00	9.00	9.00	9.00
Accrual (minus baseline of 5% survival in a crowded pen)	8.6	8.6	8.6	8.6	8.6
Accumulated Accrual	8.6	17.2	25.8	34.4	43

Assumptions used in the KWP II HCP for these calculations are: 90% of the goslings fledge under managed conditions in the new pen, a low level natural mortality occurs in the managed pen, and the goslings would have had a 5% chance of survival in the overcrowded pen. This rate of accrual will exceed the Tier 1 requested take by 8 fledglings, since a total of 34 fledglings are needed to offset take of 18 adults and 3 fledglings in 5 years. Table 6 does not take into account the increasing number of breeding pairs that will be present each year, only the goslings that are likely to be produced from the 5 breeding pairs that are transferred each year. Fledglings that have matured may return to the pen to breed. Therefore, mitigation benefits are likely to accrue at a much faster rate than these conservative calculations indicate. Construction and management of

Hawaiian goose breeding pens, proposed in the KWPII HCP, is a standard Hawaiian goose management tool; proposed Hawaiian goose mitigation is likely to be successful.

Tier 2 Hawaiian Goose Mitigation

Under the proposed KWPII HCP, an additional 3 years of pen management shall be implemented to address the Tier 2 level of Hawaiian goose take (9 adults) over and above the 5 years of pen management for Tier 1 take impacts. Any extra fledglings already accrued in excess of that required for Tier 1 mitigation will also be applied towards meeting the Tier 2 mitigation requirement. Monitoring shall document any changes in the Hawaiian goose population and reproductive success at the pen. The number of fledgling or adult Hawaiian geese accrued above the baseline level of productivity shall count toward the mitigation requirements of the KWPII project. Likewise, if monitoring after the first three years of HCP implementation indicates that additional mitigation is required to offset Tier 2 take impacts, , additional pen management shall continue until those mitigation obligations are met. By developing an additional Hawaiian goose management pen, the KWPII HCP mitigation program for the Hawaiian goose is likely to contribute to Hawaiian goose recovery by establishing one or more self-sustaining managed populations in Maui Nui.

No adverse impacts are expected from the proposed pen management mitigation activities because established protocols will be followed to avoid disturbance to the affected Hawaiian geese.

Summary of Effects of the Action on the Hawaiian Goose

Although it is not currently used for Hawaiian goose breeding, the wind farm project site serves as unobstructed airspace through which Hawaiian geese traverse in their movements between Hanaula and other Hawaiian goose breeding, feeding, and socializing sites. The wind development will increase the level of obstruction within the airspace, resulting in mortality of Hawaiian geese, as discussed above. Airspace between the turbines and adjacent development, including the adjacent existing KWPI wind farm, will continue to be adequate for transit of the local Hawaiian goose population.

Hanaula, in the vicinity of KWPII, is one of only two main breeding and flocking areas for the Hawaiian goose on Maui. Persistence of this population is therefore important for the recovery of the species (Marshall pers. comm. 2011). The most current statewide population estimate for the Hawaiian goose is between 1,300 and 1,500 individuals, with 416 birds on Maui (Annie Marshall 2010, pers. comm.). The 138 Hawaiian geese at the Hanaula site, immediately adjacent to the KWPII project site, account for approximately 25% of the Hawaiian geese known to occupy Maui, and 8% of the Hawaiian goose range-wide population of 1,300 birds. The Tier 1 and Tier 2 rates of Hawaiian goose take requested under the KWPII HCP over the 20-year period of the proposed Permit term represent approximately 1.0% and 2.1% of the species' population, respectively. The higher take level over 20 years for KWPII is 27 Hawaiian goose adults and three fledglings, which represents 6.5% of the Hawaiian goose population on Maui and 20% of the local population established in the vicinity of the Hanaula release pen. Because the Hawaiian

goose has a high rate of fecundity and it is long-lived, this significant loss of birds over the 20-year Permit period is not expected to result in a decline in the Hanaula population. Between 2009 and 2010, the Honaula population increased from 106 birds to 138 (Marshall pers comm 2011).

The proposed pen management mitigation program is likely to offset all take impacts from the KWPII project by increasing Hawaiian goose reproductive success and adult survival using methods known to be effective.

Effects of the Action to the Hawaiian Hoary Bat

Activities that may affect the Hawaiian hoary bat in the proposed KWPII project area include construction and operation of turbines and a meteorological tower. Low rates of activity by the Hawaiian hoary bat have been detected in the KWPI project area. Due to the similarity in terrain between KWPI and KWPII, the estimated mortality of Hawaiian hoary bats at KWPII is expected to be similar to the mortality rates occurring at KWPI.

Take Impacts

Based on the analysis in the KWPII HCP (SWCA 2011a, pp. 69-71), KWPII is requesting authorization to take up to 6 adult or immature and 3 juvenile Hawaiian hoary bats under Tier 1, and up to 9 adult or immature and 5 juvenile Hawaiian hoary bats under Tier 2. The Service concurs with this assessment of impact because the KWPII HCP's fatality modeling results were based on the best available information on the expected amount of Hawaiian hoary bat take. The KWPII project is closely situated to the existing KWPI project, for which mortality monitoring has been in place for six years. Site-specific data gathered by KWPI and KWPII supports the results presented in the KWPII HCP.

Mitigation for Hawaiian Hoary Bat Take Impacts

Under the KWPII HCP, fencing, ungulate removal, and native forest restoration at the Kahikinui Forest Reserve (Kahikinui) will be conducted to create additional habitat for the Hawaiian hoary bat at a ratio of 84.3 ac per male bat taken. The Service and DOFAW received the results of Home Range Tools for ArcGIS®, Version 1.1 (compiled September 19, 2007) calculations based on Hawaiian hoary bat tracking data collected by USGS-BRD Wildlife Ecologist, Dr. Frank Bonaccorso. This dataset from a two-week tracking study indicates that the mean core area of rainforest habitat on the island of Hawaii used by 14 male bats was 84.3 ac (34.1 ha) per bat and the average size of the core area utilized by the 11 females in the dataset was 41.2 ac (16.7 ha) per bat. Male bat core areas do not appear to overlap; female core areas may overlap with male core areas. A core area was defined as the area that incorporates 50% of tracked movements; therefore, the Service and DOFAW assume that the core area is a minimum habitat requirement for the Hawaiian hoary bat.

The Tier 1 requested take of 6 adult bats and 3 juveniles equates to a total of 7 adults (with an estimated 30% survival rate of juveniles to adulthood). Assuming a 50:50 adult sex ratio, the potential take of seven adults would result in the take of up to four adult male bats. KWPII's

conversion of 338 ac (84.3 x 4 = 338 ac) of pasture at Kahikinui to native forest will provide habitat, during the Permit term and into the future, for four adult male bats. That habitat is expected to also support female and juvenile bats, based on the known biology of this species.

The Tier 2 requested take of 9 adult bats and 5 juveniles equates to a total of 11 adults (with an estimated 30% survival rate of juveniles to adulthood). Assuming a 50:50 adult sex ratio, the potential take of 11 adults would result in the take of up to 6 adult male bats (two male bats higher than Tier 1 take). KWPII's restoration of an additional 169 ac (84.3 x 2 = 169 ac) of forest at Kahikinui or at another location on Maui will increase Maui's Hawaiian hoary bat carrying capacity by an additional two male bats. This habitat is expected to also support female and juvenile bats, based on the known biology of this species. The benefits of the forest restoration will extend beyond the 20-year term of the Permit.

Summary of the Effects of the Action on the Hawaiian Hoary Bat

Because the abundance and distribution of the Hawaiian hoary bat throughout its range is not well known, it is difficult to gauge the effect that take of Hawaiian hoary bats resulting from the proposed project may have on the population of this species. The potential for take of the Hawaiian hoary bat is expected to be low based on results from on-site surveys, and the limited documentation of the species within west Maui. Although the proposed take authorization levels are likely to adversely impact the overall population of the Hawaiian hoary bat in west Maui, the proposed reforestation project is likely to offset those impacts and should increase the carrying capacity of the west Maui area for the Hawaiian hoary bat. Such an outcome is likely because forest restoration has been implemented successfully in similar settings.

4.0 CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur within the area of action subject to consultation. Future Federal actions will be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative for the proposed action.

The KWPII project site at Kaheawa Pastures is situated on State-owned conservation land on the slopes above a predominantly rural area of west Maui. No other projects are planned at Kaheawa Pastures at this time. The nearest large development is Ukumehame Subdivision, a low-density agricultural subdivision where agricultural use of barbed wire is likely to continue to result in Hawaiian hoary bat mortality. Land zoned for agriculture on the eastern and southern slopes below the KWPII wind farm site is likely to continue to be reclassified to enable expansion of and development of new golf course and housing projects. Increased lighting associated with these types of development is likely to increase the risk of "fallout" by the Hawaiian petrel and Newell's shearwater. Increased development may increase the density of mammalian predators adversely affecting the reproductive success and survival of the Hawaiian petrel, Newell's shearwater, Hawaiian goose, and the Hawaiian hoary bat. Areas of mowed grass and standing water maintained in association with new development are likely to attract the Hawaiian goose to areas where it will be exposed to vehicle strike and increased predation. These future non-Federal

development activities with impacts that rise to the level of take will seek incidental take permits from the Service and their take will be mitigated; these actions are therefore not part of our analysis.

5.0 CONCLUSION

After reviewing the current status of the covered species, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that implementation of the proposed action is not likely to jeopardize the continued existence of the Hawaiian petrel, Newell's shearwater, Hawaiian goose, and the Hawaiian hoary bat. The Service reached this conclusion because, as described in the Effects of the Action section above, the proposed mitigation program for each covered species is likely to offset, and in some cases more than offset, the impacts of the proposed taking in a manner that is consistent with addressing the survival and recovery needs of these species in the affected area.

The proposed action is not likely to destroy or adversely modify critical habitat because no critical habitat will be affected by the proposed action.

6.0 INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations promulgated pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The proposed KWPII HCP and its associated documents clearly identify anticipated impacts to affected listed species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize and mitigate those impacts. All conservation measures described in the proposed HCP, together with the terms and conditions described in any associated Implementing Agreement and any section 10(a)(1)(B) permit or permits issued with respect to the proposed HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR 402.14(i). Such terms and conditions are non-discretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the Act to apply. KWPII fails to adhere to these terms and conditions, the protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the

proposed KWPII HCP is as described in the HCP and its accompanying section 10(a)(1)(B) permit. Associated reporting requirements and provisions for disposition of dead or injured animals are described in the section 10(a)(1)(B) Permit.

7.0 CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a) (1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are Service suggestions regarding discretionary agency activities to promote the recovery of listed species.

The process of developing an HCP essentially necessitates the incorporation of this approach into the planning process. In the case of the KWPII HCP, the Service intends to:

1. Work with KWP to ensure all personnel are instructed not to feed nene or leave open trash receptacles in the project area in order to prevent attraction of nene to the project area.

2. To coordinate with KWPII to maximize potentially mutually beneficial conservation actions with actions being undertaken by the West Maui Mountains Watershed Partnership within and around the project area.

8.0 RE-INITIATION NOTICE

This concludes formal consultation on the proposed issuance of the section 10(a)(1)(B) incidental take permit to Kaheawa Wind Power II, LLC. As required in 50 CFR §402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an adverse effect on a listed species that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by this action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding any of the information contained in this biological opinion, please contact Fish and Wildlife Biologist Dawn Greenlee (phone: 808-792-9400).

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