Kaheawa Pastures Wind Energy Generation Facility

Habitat Conservation Plan

FY09 Annual Report: Year 3 HCP Implementation

Prepared by

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KAHEAWA PASTURES WIND ENERGY GENERATION FACILITY
HABITAT CONSERVATION PLAN

YEAR 3 HCP IMPLEMENTATION
JULY 2008 – JUNE 2009

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Kaheawa Wind Power, LLC. 2009. Kaheawa Pastures Wind Energy Generation Facility, Habitat Conservation Plan: Year 3 Annual Report. First Wind Energy, LLC, Environmental Affairs, Boston, MA 02111.

I. EXECUTIVE SUMMARY

In June 2006, Kaheawa Wind Power, LLC (KWP) began operating the island of Maui's first commercial wind energy generation facility in the Kaheawa Pastures area of West Maui. The State Board of Land and Natural Resources approved a Conservation District Use Application (CDUA) for the proposed facility, which is situated on State conservation lands, in January 2003. Pursuant to Section 10(a)(1)(B) of the Endangered Species Act (ESA) of 1973, as amended, and under a similar program, Chapter 195-D, Hawai`i Revised Statutes, KWP developed a project-specific HCP in cooperation with the USFWS, DLNR and the Hawai`i Endangered Species Recovery Committee (ESRC). Upon final approval of the HCP, the federal ITP (TE-118901-0) and state ITL (ITL-08) were issued in January 2006. Both permits have duration of twenty (20) years. This report summarizes how KWP has implemented the provisions of the HCP during the third full year of project operations (July 1, 2007 through June 30, 2009), as specified under the HCP.

The HCP anticipates that the incidental take of four listed species (Hawaiian Petrel, Newell's Shearwater, Nene, and Hawaiian Hoary Bat) may potentially occur as a result of the operation of the wind farm. No other listed, proposed or candidate species are known or believed to be present in the project area.

One Hawaiian Hoary Bat and one Nene fatality were documented during the present one-year reporting period. Applying the results of monitoring, including Searcher Efficiency (SEEF) Trials, Carcass Removal Trials, and search frequency, we estimated an adjusted take of 1.98 Hawaiian Hoary Bats and 1.21 Nene during Year 3. An accounting of take for each covered species through the end of the third year of the project estimates that, on average 0.57 Hawaiian Hoary Bats, 0.75 Hawaiian Petrels, and 1.63 Nene takes may have occurred each year as a result of project operations. No observed take of Newell's Shearwater have been documented. These take levels are within the expected annual baseline levels for each covered species as described in the HCP.

KWP has been in regular contact and ongoing discussion with DLNR since summer 2005 regarding construction and operation of a new Nene release facility on Maui. The timeliness of progress on the proposed SHA is encouraging, suggesting that a new release pen for Nene reintroduction on Maui could accommodate these efforts in the near future.

During 2008, we evaluated seabird mitigation opportunities at Makamaka`ole on West Maui and in 2009 we worked collaboratively with DLNR and USFWS to develop an action plan that could be implemented during the 2009 breeding season.

Since August, 2008 KWP biologists have been conducting acoustic monitoring of bats at Kaheawa using remote acoustic data loggers. Overall, sixteen call sequence files and eight bat passes were documented within the monitoring area from August 8, 2008 through June, 2009.

KWP maintains an active and well coordinated wildlife orientation and outreach process (WEOP) for all personnel on site including numerous staff, contractors, and visitors that regularly perform activities at KWP.

During Year 3, KWP succeeded in planting nearly 25,000 native plants comprising six species (*Metrosideros*, *Dodonaea*, *Bidens*, *Heteropogon*, *Wikstromia*, and *Scaveola*) which were, with the exception of *Heteropogon*, grown solely from seeds collected at Kaheawa. In January, 2009 a survey was performed on and adjacent to the KWP site to document any changes in the plant community following the 2006 wildfire (Hobdy 2009). None of the species identified in this survey are classified as Threatened, Endangered, or candidates for listing under the provisions of the federal ESA.

KWP biologists have been implementing a year-round monitoring program to document downed (i.e., injured or dead) wildlife incidents involving HCP-listed and non-listed species on the project site and its vicinity since operations began in June, 2006. KWP proposes to adopt a modified downed wildlife monitoring protocol that integrates what has been learned during three years of intensive monitoring according to the implementation schedule outlined in the HCP.

There have been no changed and/or unforeseen circumstances nor any significant natural or man-made event cycles that have directly or indirectly altered the landscape or habitat associated with the KWP project during this reporting period.

The HCP provides for a wide range of avoidance, minimization, and mitigation measures intended to result in a net conservation benefit for the four covered species. KWP continues to implement these measures in accordance with the HCP and the recommendations provided by DLNR, USFWS, and the ESRC following the third full year of implementation.

I certify that to the best of my knowledge, after appropriate inquires of all relevant persons involved in the preparation of this report, the information submitted is true, accurate and complete.

11/19/09

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David P. Cowan
Vice President, Environmental Affairs
First Wind Energy, LLC as manager for Kaheawa Wind Power, LLC

II. INTRODUCTION

In June 2006, Kaheawa Wind Power, LLC (KWP) began operating the island of Maui's first commercial wind energy generation facility in the Kaheawa Pastures area of West Maui. The State Board of Land and Natural Resources approved a Conservation District Use Application (CDUA) for the proposed facility, which is situated on State conservation lands, in January 2003. One condition of the CDUA was a requirement to "comply with the Incidental Taking Permit requirements of the U.S. Fish and Wildlife Service, including the preparation of the Habitat Conservation Plan."

Pursuant to Section 10(a)(1)(B) of the Endangered Species Act (ESA) of 1973, as amended, the U. S. Fish and Wildlife Service (USFWS) may permit, under certain terms and conditions, the "taking" of a listed species that is incidental to, and not the purpose of, an otherwise lawful activity. To qualify for a federal Incidental Take Permit (ITP) an applicant must develop, fund, and implement a USFWS-approved Habitat Conservation Plan (HCP) to minimize and mitigate the effects of the incidental take. Under a similar program, Chapter 195-D, Hawai`i Revised Statutes authorizes the Hawai`i Department of Land and Natural Resources (DLNR) to issue an Incidental Take License (ITL).

In fulfillment of this condition, KWP developed a project-specific HCP in cooperation with the USFWS, DLNR and the Hawai`i Endangered Species Recovery Committee (ESRC). Upon final approval of the HCP, the federal ITP (TE-118901-0) and state ITL (ITL-08) were issued in January 2006. Both permits have a duration of twenty (20) years. Commercial operation of the project commenced in June 2006.

As described in Section VI of the HCP, KWP will provide annual monitoring and reporting on project activities. As specified in the federal permit, reporting will include a summary and discussion of incidental take, including adjusted take calculations pursuant to Section V of the HCP; results of searcher efficiency and carcass removal trials; results and discussion of seabird colony searches and management activities; results of Nene nest surveys and protocols; vegetation monitoring of affected plant critical habitat areas; an overall summary of management activities; circumstances that triggered adaptive management and how the adaptive management was implemented; description of all occurrences of changed circumstances and how they were addressed; description of any unforeseen circumstances; progress made in achieving biological goals and objectives; any problems that occurred and how they were handled; description of cost expenditures and other information related to funding assurances; an annual work plan including an implementation schedule and entities responsible for implementation; and any other pertinent information such as actions taken by any State or Federal agencies related to implementation of the HCP.

KWP has submitted three previous reports to the USFWS and DLNR to date: in January 2007, February 2008, and October 2008. Following submission of the first two reports KWP met formally with representatives from both agencies in April, 2007 and again in February, 2008 to discuss agency

comments presented during the annual review process. Meetings with the State of Hawaii Endangered Species Recovery Committee (ESRC) were also held in Honolulu in April, 2007 and 2008 to discuss the reports and specific elements of the monitoring program in greater depth. An amendment to the first report was submitted to the USFWS and DLNR in June, 2007 while responses to address comments provided by USFWS pertaining to the February 2008 report were submitted in early September, 2008. The third report was submitted to the DLNR and USFWS in October, 2008 and was followed by a review meeting with both agencies in Honolulu on December 3, 2008. Several comments and recommendations were provided by the agencies that were discussed with the ESRC in greater depth on January 28, 2009.

This report summarizes how KWP has implemented the provisions of the HCP during the third full year of project operations (July 1, 2008 through June 30, 2009), as specified under the HCP. Year 3 activities have continued to include measures to monitor and minimize the risks of adverse effects (i.e., take) on the four listed species, and mitigate potential take to accomplish a net ecological benefit for the species.

KWP has achieved most, if not all of its obligations according to the terms of the HCP, in addition to implementing measures that in the interest of good stewardship go significantly beyond the minimum requirements of the HCP. Table 1 provides a summary of the status of impact avoidance, minimization, monitoring, and mitigation measures prescribed in the HCP.

TABLE 1. KAHEAWA WIND POWER HABITAT CONSERVATION PLAN COMPLIANCE STATUS AS OF JULY, 2009.

Mitigation Measure	Compliance Period	Status †
Nene Interaction Surveys [3, 4]	Year 1	Completed June, 2007
Funding for Nene Release Pen [4]	Permit Issuance	Completed January 2008
Annual Funding for Nene Gosling Production or Translocation [4]	Years 1-5	Completed First Two Years
Nene Contingency Fund [4]	Permit Issuance	Completed January, 2006
Seabird Colony Searches and Mitigation [4]	Year 1-2	In-Progress
Seabird Contingency Fund [4]	Permit Issuance	Completed January, 2006
Incidental Bat Observations [3, 4]	Year 1-2	Completed June 2007
On-Site Bat Surveys [3]	Year 1	Completed June, 2007
Hoary Bat Research Fund [4]	Permit Issuance	Completed June, 2006
Hoary Bat Contingency Fund [4]	Permit Issuance	Completed January, 2006
Downed Wildlife Surveys [3]	Life of Project	In-Progress
Carcass Removal Trials [3]	Year 1-2	In-Progress
Searcher Efficiency Studies [3]	Year 1-2	In-Progress
WEOP Implementation [1, 2, 3]	Life of Project	In-Progress

1 = impact minimization, 2 = Impact avoidance, 3 = documentation and reporting, 4 = mitigation

† Some measures are inherently ongoing but are referred to in the table as completed for compliance purposes.

The following narrative provides a summary of HCP implementation activities and biological achievements during the Year 3 (FY09) reporting period. Summary data derived from monitoring are submitted electronically to DLNR and are contained in appendices at the end of this report.

Covered Species

The HCP anticipates that the incidental take of four listed species (Hawaiian Petrel, Newell's Shearwater, Nene, and Hawaiian Hoary Bat) may potentially occur as a result of the operation of the wind farm. These species presently, or may, fly in the vicinity of the project site and could be injured or killed if they collide with a wind turbine. No other listed, proposed or candidate species are known or believed to be present in the project area.

The Hawaiian Petrel is known to nest primarily on Maui and, to a lesser extent, on Kaua`i, Lana`i, and Hawai`i. On Maui, these petrels are known to nest on Haleakala Crater on East Maui and studies undertaken by KWP biologists and others have ascertained that nesting is likely in the mountains of West Maui. The anticipated direct take of the Hawaiian Petrel in conjunction with the operation of the wind energy generation facility is up to one individual per year. When indirect impacts are taken into consideration, the overall take is not expected to exceed 1.5 birds per year on average.

The Newell's Shearwater breeds on several of the main Hawaiian Islands, with indications that the species may also nest on Maui, although the status of the species on Maui is unclear at this time. Like the Hawaiian Petrel, the anticipated take of the Newell's Shearwater is up to one individual per year. When indirect impacts are taken into consideration, the overall take is not expected to exceed 1.5 birds per year on average.

As part of the State and Federal plans for Nene recovery, Nene have been re-introduced onto the islands of Kaua`i, Maui, Moloka`i and Hawai`i; this recovery program includes a captive-release pen in the Hana`ula area of the West Maui mountains, near the upper end of the project site. As of 2006, 104 Nene had been released from this pen since releases began in 1994 and, although some monitoring is routinely done by DOFAW, their exact distribution, movements, and present population structure are not well known. The anticipated take of the Nene is up to two individuals per year. When indirect impacts are taken into consideration, the overall take is not expected to exceed three birds per year on average.

Little is known about the distribution or habitat use of the Hawaiian Hoary Bat. While it has been recorded on several islands, it is believed to be most abundant on Hawai`i and present in low numbers on Maui. The species has been detected in the project area, although these limited observations have been seasonal and few, despite ongoing efforts to detect and monitor their presence at the site. The anticipated take of the Hawaiian Hoary Bat in conjunction with the operation of the wind energy generation facility is up to one per year.

III. AVIAN AND BAT FATALITY MONITORING

Monitoring Surveys for Downed Wildlife

KWP biologists have been implementing a year-round monitoring program to document downed (i.e., injured or dead) wildlife incidents involving HCP-listed and non-listed species on the project site and its vicinity since operations began in June, 2006. Protocols are specific concerning HCP-covered downed wildlife which, if encountered injured or dead, are promptly reported to DLNR/DOFAW and USFWS to facilitate response, documentation, and specimen recovery or rehabilitation.

Since systematic intensive surveys began in June, 2006, foot searches by trained monitoring technicians have been the standard method used to conduct daily surveys for downed wildlife at KWP. Each of the 20 rectangular wind turbine (WTG) search plots measure 180x200 meters and is situated in a NE-SW orientation centered on each turbine base. In addition, during the current reporting period there were seven (7) meteorological (met) towers, each centered within their own search plot, included in the standard search effort, including three permanent towers for KWP, and four temporary towers that are assessing wind for a proposed KWP II facility. We established all search plot boundaries using GIS files and a Trimble GPS Pathfinder Geo-XT handheld receiver and compass. The corners of plot boundaries are marked using heavy gauge steel fence posts and labeled for reference. Because they are significantly larger than met tower plots, we maintain WTG search transects parallel to each other using medium gauge 5-ft steel fence posts as transect markers, which enables the searcher to maintain position visually without relying heavily on the GPS.

We change the techniques we use for monitoring activities in the search plot overlap areas adjacent to Papalaua and Manawainui Gulches (WTG 1-3) because, due to steep terrain and sensitive vegetation, the overlap portions of the plots are not searchable on foot. To perform these searches we established observation points from the opposing and surrounding sides of each gulch that afford the clearest obtainable view of the overlap areas. We scan the adjacent canopy and as much of the cover as possible using a spotting scope, binoculars and the naked eye. Performing this portion of the search protocol requires additional logistics and increases survey effort beyond the standardized foot search regime. We possess an Access Permit issued by the DLNR that allows us discretionary access to these plot overlap survey areas as needed.

The downed wildlife monitoring program includes two types of monitoring periods. The year-round baseline monitoring regime consists of full coverage of all plots once per week. During the Nene and seabird fledging seasons, May-June and October-November, respectively, search effort increases to two searches of the site each week in order to provide more coverage during these presumably higher risk periods. KWP wildlife monitoring staff performed systematic searches of the twenty WTG search plots and seven met tower search plots according to this monitoring regime during the Year 3 reporting period. Each of the three met tower search plots (KWP-MET 1-3), located immediately adjacent to the

WTG 1, 7, and 14 plot boundaries, are searched in conjunction with the turbine search plots. Four separate met towers (KWP II-MET 1,2,5, and 6) installed by Kaheawa Wind Power II (KWP II) in October, 2007 were also searched, but because they are not adjacent to any turbine search plots, are searched separately but at the same frequency as described for the KWP site (Appendix 1).

Because vegetation and ground cover can influence the detection of fatalities and behavior of scavengers, we have developed a ground cover classification strategy based on the distribution and abundance of different vegetation and cover types that may help account for the effects of ground cover variability on carcass detection and scavenging (Appendix 9). While not specifically prescribed in the HCP, it is an adaptive measure that may improve the accuracy of our take estimates. Vegetation management continues to receive consideration as a means to improve downed wildlife detection and searcher efficiency; however we have yet to establish a basis for evaluating response of Nene to any vegetation management measures.

Searcher Efficiency Studies

Searcher Efficiency (SEEF) Studies provide an estimate of carcass detection probability and are an important component of downed wildlife monitoring at KWP. In February and April, 2007, we obtained permission from the DLNR and USFWS to use Wedge-tailed Shearwater (*Puffinus pacificus*) carcasses as seabird surrogates to assess searcher efficiency at KWP. We performed SEEF exercises on 48 days during Year 3 (Appendix 2). Each trial is controlled by a proctor and performed in conjunction with a daily search plan. Searchers are not informed in advance that a trial is being initiated. Before initiating a SEEF exercise, specimens are removed from cold storage and thawed (usually overnight). Prior to the arrival of searchers to the site, carcasses are placed inside previously selected search plot boundaries in a pseudo-random manner by tossing the carcass to a resting position. The proctor records location, weather, GPS position, characteristics of ground cover at the carcass site, and obtains photos. Searchers then perform their surveys as normal and report subsequent observations. Any carcasses not reported at the conclusion of a trial and in reasonable condition are immediately recovered and refrozen for subsequent use in Carcass Removal Trials. Each SEEF exercise is discussed afterward between the proctor and searchers to assess factors that may have affected detection.

Specimen detection probability averaged about 0.78 overall. Using the results of these trials to estimate adjusted take assumes that the detection rate for Wedge-tailed Shearwaters is representative of Hawaiian Petrels and Newell's Shearwaters, which is probably reasonable. Nenes are probably more detectable than the seabird species due to their larger size and additional trials are planned using larger species that may demonstrate this. Based on physical size and general morphological characteristics, we used House Sparrows as surrogate species to evaluate detection efficiency for carcasses resembling Hawaiian Hoary Bats. Searchers were able to detect House Sparrows in each type of ground cover with an overall detection efficiency of 0.68 (range 0.33-1.0).

Overall, experimental detection efficiency rates were higher in Year 3 compared to the results from Year 2 (0.64) of this monitoring program. This probably relates in part to the increased number of SEEF exercises performed in Year 3 and the visibility of shearwater carcasses in low grass and bare ground cover. KWP will continue to perform these studies with the aim of providing an ongoing basis for comparing temporal variability in searcher efficiency using Wedge-tailed Shearwaters, House Sparrows and equivalent small avian species, while establishing more robust estimates for larger bird species. While KWP does not presently possess a permit for the use of HCP-covered species in trials, recent amendments to existing USFWS and DLNR permits issued to the project contain provisions for the use of several larger non-ESA listed avian species.

Carcass Removal Trials

The objective of performing carcass removal studies at KWP is to determine the average amount of time an avian or bat carcass is expected to remain visible to searchers before being removed by scavengers or otherwise rendered undetectable. The length of time (expressed in days) that a carcass remained visible to observers in the trial area was calculated for each experimental carcass used in the trial. Mean carcass removal time was calculated for each trial by summing the retention time for all carcasses and dividing by the total number of carcasses used in the trial.

During the first year of trials, KWP biologists used fresh or frozen carcasses of avian species (House Sparrow, Common Myna, and Spotted Dove) obtained from the USDA Wildlife Control branch in Kahului in the carcass removal trials. Though the best available alternative at the time, these species differ from HCP-covered avian species in size, shape, color, and taxonomy. The smaller, dark-colored species approximate the size and general physical qualities of Hawaiian Hoary Bats and are therefore believed to be useful surrogates for this species. In 2007 we received permits from the USFWS and DLNR to begin procuring Wedge-tailed Shearwater carcasses for use in avian carcass removal trials. In Year 3, however we used only Wedge-tailed Shearwaters to evaluate carcass retention time because carcasses of small passerines were limited and most often set aside for SEEF exercises.

Four 14-day carcass removal trials were conducted at KWP during the Year 3 reporting period. Each trial consisted of placing 4-6 individual carcasses on the ground in a random manner (similar to the technique described for SEEF exercises, above) that approximates what would be expected if a bird came to rest on the ground inside the boundaries of each selected search plot after having collided with a structure. Trial plots are chosen to be representative of different portions of the site consistent with protocols established in Appendix 9 of the HCP and as described in the February 2008 and October 2008 Annual Reports. Day 1 represents the day a trial is initiated and establishes a baseline of the specimen's condition including location (both descriptive and GPS coordinates), and ground cover type. The HCP recommends that specimens shall be observed daily for the first 7 days of the trial, then again on Days 10 and 14. On each day the status and condition of specimens are assessed regarding

presence/absence, evidence of scavenging and/or decomposition, change in position/location, visibility, and overall condition of the carcass (Appendix 3).

In Year 2, we observed that during the fall and winter months carcasses tended to be scavenged within the first week. In Year 3 we noted that 50% of the trial carcasses (n = 8) were removed by scavengers within one week during August and November. This is in contrast to what was observed during the February and May trials in which less than 30% of the carcasses (n = 11) were rendered undetectable to observers by Day 7. In most cases, carcasses that remain undisturbed by scavengers for greater than seven days remained present and un-scavenged for the duration of the trial.

Applying the results of these trials to estimate adjusted take assumes that the carcass removal rate for Wedge-tailed Shearwaters is representative of the two seabird species, which is probably reasonable. However, because of their smaller size, estimates derived from medium-sized seabirds are probably conservative for the larger Nene, meaning they over-state removal/scavenging and under-state searcher efficiency. As mentioned, we are obtaining carcasses of larger species which are more representative of Nene, and will resume using small passerine species and perhaps some small mammals as comparison surrogates for bats in these trials.

In order to estimate Adjusted Take of these dissimilar species in the interim, we chose to apply values for searcher efficiency and carcass removal that are representative of large birds (large and medium raptors, geese, waterfowl) and small bird or bat-sized animals obtained from the scientific literature in order to estimate the current Adjusted Take numbers for the larger Nene and smaller Hoary bat.

Direct Observations of Incidental Take

There were two downed wildlife incidents that involved fatalities of HCP-covered species at KWP during the Year 3 reporting period. On September 26, 2008 KWP biologists documented a WEOP-reported fatality of one Hawaiian Hoary Bat near the base of WTG-8. On June 10, 2009 a full grown Nene carcass was discovered during routine monitoring about 23 m southwest of WTG-7. These incidents were treated as authorized takes under the Incidental Take Permit (ITP) and Incidental Take License (ITL) issued to KWP by the USFWS and DLNR, respectively. Each specimen was documented, collected, and reported according to established protocols and terms outlined in the HCP and by agreement with DOFAW and USFWS. Reports describing the circumstances and documentation of these incidents were submitted to USFWS and DLNR in Honolulu and are included in Appendix 11 of this report.

The Hawaiian Hoary Bat observed in September, 2008 was reported by a contractor who followed Wildlife Education and Observation Program (WEOP) protocols and promptly reported the observation to KWP wildlife personnel. Weather conditions preceding the incident consisted of light and variable winds associated with a weakening cold front approaching the islands from the north. Prompt actions

enabled the specimen to be collected and subsequently delivered to USFWS officials in Honolulu. The Nene incident in June, 2009 occurred during a period of active Nene presence coincident with the flocking season in the Kaheawa Pastures. Winds had been light and variable for nearly five weeks prior to the incident. Trade winds resumed at moderate to strong levels in the days preceding the incident, which may have created a risk factor for birds that had become accustomed to flying in the vicinity of stationary obstacles for several weeks. This specimen was recovered by DLNR personnel on Maui and an examination report later stated the individual was an adult female.

The location of each specimen suggested an exceedingly low probability of collision with meteorological structures. In the absence of any directly observed take during searches at the seven met towers, there is no basis for estimating adjusted take levels for HCP-covered species associated with these structures separately.

Information contained in the Incident Reports suggests that at least in the case of the Nene discovered in June, 2009 weather may have contributed to an increased collision risk for birds passing through the site. In the case of the Hawaiian Hoary Bat, there is evidence based on monitoring being performed by KWP that there may have been low-level bat activity at the site accompanied by light winds during the period in which this incident occurred. This pattern of generally low wind speed coupled with the approach of frontal conditions have been shown to be positively correlated with bat activities and incident rates at several North American wind sites (Fiedler 2004, Kerns et. al. 2005). Further monitoring at KWP may enable the development of some predictive cues that might prove useful in forecasting risks to bats. Thus, each incident provides information necessary for assessing impact, relative risk to the covered species, and evaluating the effectiveness of present take avoidance and minimization measures, in addition to enabling an accurate assessment of incidental take to be determined.

Estimating the Adjusted Take

Observed Direct Take (ODT) is a fundamental variable that is adjusted by applying results of searcher efficiency and carcass removal studies, to estimate total direct take, as described in Section V of the HCP. Two occurrences of Observed Direct Take (ODT) were documented during the Year 3 reporting period: one (1) Hawaiian Hoary Bat and one (1) Nene. Although there were no eye witness accounts, these are presumed to be project-related based on the condition of the carcasses. Ongoing SEEF and Carcass Removal trials using Wedge-tailed Shearwaters provide a basis for estimating Adjusted Take for both Hawaiian Petrels and Newell's Shearwaters. However, because they are smaller and dissimilar in many respects, use of the Wedge-tailed SEEF and Carcass Removal results are likely to result in an inflated estimate of take for Nene. To avoid this problem, we looked to the results of numerous mainland projects that have involved larger-bodied birds for reference. While our results using shearwaters yielded searcher efficiencies of 0.78 on average, results for larger-bodied birds such as geese, waterfowl, pheasants, and raptors, commonly exceed 0.80, often approach and sometimes exceed 0.90 (Strickland et. al. 2000, Strickland, Johnson, and Erickson unpublished data). Osborne et. al.

(2000) found a steady increase in observer detection efficiency as a function of increasing bird size class by comparing Brown-headed Cowbirds, Rock Doves, and Snow Geese during a 2-year study conducted at the Buffalo Ridge Wind Resource Area in Minnesota. In this study, searcher detection efficiency ranged between 0.83 and 1.00 for Snow Geese and averaged 0.92 across all ground cover types. To be conservative we chose the lower end of this detection probability range (0.83) for use in estimating adjusted take for Nene. Most studies report a range of scavenger removal rates depending on the size of birds, vegetation and ground cover characteristics, and season. Many of these studies also pool results for all species and size classes, making size-specific scavenging rate comparisons difficult. We hypothesize that removal rates for large birds at KWP would be less than rates observed for large birds at mainland sites because of the reduced capacity of local scavenger species to completely remove carcasses from the trial site. In a comprehensive review of numerous avian mortality studies conducted at wind facilities, Smallwood (2007) reports 73% retention of large non-raptors and up to 99% for large raptors by day seven. Although not directly applicable, the results of trials using Wedge-tailed Shearwaters nevertheless provide empirically derived values that we can use as a floor for purposes of estimating SEEF and Carcass removal values for Nene and seabirds. We use the results of SEEF trials using House Sparrow and scavenger removal rates observed for shearwaters to assess adjusted take levels for the Hawaiian Hoary Bat.

As presented in Section V of the HCP, the principle components that go into estimating the Adjusted Take are, a) Observed Direct Take, b) Unobserved Direct Take, c) Indirect Take, and d) Loss of Productivity. The SEEF and Carcass Removal results are used to estimate the Unobserved Direct Take (UDT). To calculate adjusted estimates of the number of Hawaiian Hoary Bat and Nene fatalities that may have occurred at KWP during the present reporting
period, we used an estimator, *m*, as proposed by Shoefeld (2004) and Kerns and Kerlinger (2003) to estimate fatality rates using the formula:

$$m = \left(\frac{N * I * C}{k * t * p}\right)\left(\frac{e^{I/t} - 1 + p}{e^{I/t} - 1}\right)$$

where *I* represents the number of days between plot searches (search interval), *N* is equal to the number of turbine search plots, *k* is the number of plots searched (in the case of KWP, *N* and *k* are the same value), *t* is the mean carcass retention time, *p* is used to represent the detection probability (searcher efficiency), $e^{I/t}$ is an exponential value, and *C* is the actual number of carcasses observed (ODT) during downed wildlife monitoring.

Timing of each incident provides a basis for applying indirect take, while necropsy reports enable cause of death and condition of the specimen to be determined. Veterinary examination indicated that the Nene was an adult female but no post-examination report is available for the Hawaiian Hoary Bat. The Nene incident occurred in June, which follows the breeding season when dependent young have fledged and adults are completing their molt. Although no breeding has been observed for Hawaiian Hoary Bats on Maui, they are known to breed between April and August on the island of Hawai`i (Menard, 2001).

Because both ODT incidents in Year 3 occurred outside the known breeding season for each of these covered species, no indirect take is assessed for purposes of estimating the adjusted take.

Because Nene and Hawaiian Hoary Bats each may be taken at any time during the year (i.e. neither species is known to be migratory or seasonally absent), we considered values for search interval (I) and carcass retention time (t) that represent annual and seasonal averages, and chose to apply values for these parameters that correspond most closely with the time these takes were observed. We use the lower end of the detection probability (p) range reported by Smallwood (2007) for large birds in the adjusted take calculation for Nene. Table 2 (below) provides a summary of how these variables are applied to the Shoefeld (2004) formula to estimate total direct take for Nene and Hawaiian Hoary Bat at KWP in Year 3.

TABLE 2. ESTIMATION OF THE TOTAL DIRECT TAKE OF NENE AND HAWAIIAN HOARY BAT AT THE KAHEAWA WIND POWER FACILITY DURING YEAR 3 (FY09).

Nene

Observed Direct Take (C) = 1
Total Search Plots (N) = 20
Number of Plots Searched (k) = 20
Search Interval (I) = 3.6
Carcass Retention Time (t) = 12.67
Carcass Detection Probability (p) = 0.83
Natural Log ($e^{t/I}$) = 1.328613

$$m = \left(\frac{N*I*C}{k*t*p}\right)\left(\frac{e^{I/t}-1+p}{e^{I/t}-1}\right)$$

m = 1.207

Hawaiian Hoary Bat

Observed Direct Take (C) = 1
Total Search Plots (N) = 20
Number of Plots Searched (k) = 20
Search Interval (I) = 7.6
Carcass Retention Time (t) = 10
Carcass Detection Probability (p) = 0.58
Natural Log ($e^{t/I}$) = 2.138276

$$m = \left(\frac{N*I*C}{k*t*p}\right)\left(\frac{e^{I/t}-1+p}{e^{I/t}-1}\right)$$

m = 1.978

Since we know the observed Nene fatality was an adult female, we must evaluate whether to assess indirect take or assume that any dependent young were fledgling juveniles at the time the take was observed. The HCP provides a basis for applying indirect take for covered species and presents several scenarios where applying indirect take would be appropriate. However, because takes in Year 3 were observed outside the known breeding season for Nene and Hawaiian Hoary Bats, no further adjustments are made for either covered species in FY09. Appendix 7 provides the stepwise process and calculations required to assess take for each covered species. Table 3 provides an accounting of take for each covered species through the end of Year 3 (FY09).

TABLE 3. SUMMARY OF INCIDENTAL TAKE INCURRED THROUGH YEAR 3 OF THE KAHEAWA WIND POWER HCP.

FY09 Species	Observed Take	Month and Year	Adjusted Take	Indirect Take	Loss of Productivity	FY09 Total Adjusted Take	Annual Take Limit*	FY09 Running Average [2]
Nene	1	Jun-09	1.21			1.21	3	1.63
Hawaiian Petrel	0						2	0.75
Newell's Shearwater	0						2	
Hawaiian Hoary Bat	1	Sep-08	1.98			1.98	1	0.57
FY08 Species	Observed Take	Month and Year	Adjusted Take	Indirect Take	Loss of Productivity	FY08 Total Adjusted Take	Annual Take Limit*	FY08 Running Average [1]
Nene	1	Dec-07	1.60	0.80		2.40	3	0.96
	1	Oct-07	1.41	0.71		2.12	3	0.85
Hawaiian Petrel	1	Aug-07	1.74	0.87		2.61	2	1.04
Newell's Shearwater	0						2	
Hawaiian Hoary Bat	0						1	

[1] The FY08 Adjusted Average is based on 30 months (2.5 years) since permit issuance in January, 2006.

[2] The FY09 Adjusted Average is based on 42 months (3.5 years) since permit issuance in January, 2006 inclusive of FY08 and FY09 Adjusted Take values.

* Annual take limits represent the running average per fiscal year.

The overall estimate of incidental take attributable to the KWP project indicates that the average annual take levels for each covered species are very low, remaining at or below baseline expectations. In FY08 there were two observed direct takes of Nene during the breeding season, resulting in an estimated adjusted take of 3 birds. Indirect take was included in the take estimates for Nene in Year 2 because it is possible that both of these birds could have been reproductively active at the time each take was observed. Because carcass retention in November, 2007 and January, 2008 was short for the medium-sized shearwater carcasses used in the trials (Kaheawa Wind Power 2008), we conservatively applied the value reported by Smallwood (2007) for large birds still present after day 14 (0.80) to adjust removal rates observed at KWP to reflect what we would expect for large birds and used these adjustments in calculations of adjusted take for Nene in Year 2. In June, 2009, following the breeding season, a third Nene was taken, resulting in an estimated adjusted take for Nene of 1.21 in Year 3. At the conclusion of FY09, on average less than two Nene per year are estimated to have been killed during the 3.5 year period that has elapsed since the ITL and ITP were issued to KWP in 2006. One Hawaiian Petrel taken in August, 2007 has resulted in an estimated take for this covered species of less than one individual per year at the end of FY09, which includes an indirect take adjustment. One Hawaiian Hoary Bat fatality was observed in September, 2008, outside the known breeding season for this covered species, and no adjustment was made for indirect take. Thus Hawaiian Hoary Bats are estimated to have been taken at an annual rate of 0.57 individuals per year at KWP.

At the end of Year 3, take levels appear to be at or below those expected for the project, and in each case are below Baseline levels as described in the HCP.

IV. MITIGATION INITIATIVES

NENE

Funding for Construction and Operation of a New Nene Release Facility

KWP has been in regular contact and ongoing discussion with DLNR since summer 2005 regarding the requirement for construction and operation of a new Nene release facility on Maui. Upon permit issuance, KWP set aside funds internally to contribute to a Nene propagation and release or translocation program, as prescribed in the HCP. At the request of the USFWS in December, 2007 KWP disbursed $100,000 to the DLNR to support the first year of this project. A second payment of $41,000 was made during the current reporting period, in February 2009. The DLNR has now selected a desirable site and are securing agreements with the land owner.

Funding for Nene Captive Propagation and Reintroduction

As presented in the HCP, captive propagation of Nene goslings to compensate for take is closely tied to the construction of the new release pen. In December, 2007 KWP disbursed funds to the DLNR to begin supporting this project. KWP continues to provide funding on an annual basis to support this work according to the terms of the HCP.

KWP has inquired of DLNR whether there is an alternative way that captive propagation and reintroduction can proceed elsewhere, prior to construction of the new release pen. So far DLNR has indicated that this is not possible, understandably because there is insufficient capacity for propagation and reintroduction. However, KWP has continued to express interest in exploring interim or alternative options that could accelerate or enhance Nene recovery initiatives.

Because captive propagation and reintroduction are the preferred mitigation for Nene as prescribed in the HCP, it is useful to assess the capacity for this mitigation option to fulfill mitigation requirements as take accrues. Appendix 8 provides a summary of how captive propagation and reintroduction, at the rate described in the HCP, are expected to provide mitigation through Year 5 of the project.

Other Mitigation Opportunities

KWP is committed to supporting reasonable and scientifically sound measures for meeting the goals set forth in the HCP for Nene mitigation on Maui. Gosling production appears to be something we can anticipate in the future and the regulatory and management steps necessary for constructing a new release pen on Maui are progressing. However, because of the unexpected time lag that has occurred to date, KWP encourages consideration of all available alternative options, especially if they may allow at least some mitigation to be accomplished sooner.

One such measure may be translocation/relocation of Nene from situations where they are being exposed to threats elsewhere, perhaps on other islands, to a release site on Maui. Nene relocation, translocation, and reintroduction all have been successfully performed to assist management and as species recovery measures. In parallel with ongoing efforts prescribed in the HCP, KWP will be exploring the potential for Nene relocation and/or translocation strategies, in consultation with DLNR, USFWS, the Nene Recovery Action Group (NRAG), ESRC, and other qualified experts, as a means to fulfill mitigation objectives on Maui.

Another option to consider is predator control. The Hana`ula Nene population which has become established in the Kaheawa region probably experiences significant mortality from predation by feral cats and Indian mongoose, particularly during the nesting and gosling dependency period. By implementing a predator removal effort in selected portions of the Kaheawa region, egg hatching success, gosling survival, and annual recruitment might be expected to improve. Furthermore, carefully selecting areas in the region removed from the KWP site that possess desirable foraging resources could be managed to promote quality browsing habitat. These types of measures could provide a net benefit and improve annual productivity of Nene, and may offer alternative strategies for achieving mitigation requirements under the HCP.

HAWAIIAN PETREL AND NEWELL'S SHEARWATER

Nesting Colony Searches in the West Maui Mountains

Seabird mitigation for KWP gives first priority to locating as-yet unknown or unconfirmed nesting colonies of Hawaiian Petrels and Newell's Shearwaters in West Maui, identifying management needs, and where possible, implementing management measures.

In spring of 2007, KWP biologists located the first ever documented occurrence of an apparent nesting colony of Hawaiian Petrels on West Maui. Initial field observations identified an assemblage of Hawaiian Petrels exhibiting breeding behavior that strongly suggested the presence of a nesting colony located in an area adjacent to Makamaka`ole Stream (Fig. 1). Numerous visits and subsequent observations at the site in 2008 and 2009 reveal a consistent pattern that supports the conclusion that Makamaka`ole contains a dispersed but substantial breeding colony of Hawaiian Petrels (Appendix 4). DLNR/DOFAW wildlife biologists from Maui and seabird researchers from the USGS and H.T. Harvey and Associates accompanied us to the colony in 2007 to help corroborate our findings.

Since that time, KWP biologists have continued gathering information and compiling observations, leading to the development of a mitigation action plan for the area that outlines goals and objectives for implementing seabird mitigation actions during the 2009 breeding season (Appendix 5).

Observations from other survey points in West Maui in 2007 and 2008 resulted in detections of both Hawaiian Petrels and Newell's Shearwaters. Newell's Shearwaters were heard exhibiting calls characteristic of colony attendance behavior from a remote portion of Kahakuloa NAR adjacent to Pu`u Kukui Watershed Preserve in 2007. During Year 2 we performed nocturnal audio and visual observations from several additional areas in lower Kahakuloa Valley near Makamaka`ole Stream and determined that both Hawaiian Petrels and Newell's Shearwaters are actively using portions of Kahakuloa to access colonies nearby and further interior.

It became evident in 2008 that accessing the more remote, interior areas would be impractical for meeting our mitigation goals. During the 2008 season we chose to evaluate mitigation opportunities at Makamaka`ole and in 2009 we worked collaboratively with DLNR and USFWS to develop an action plan that could be implemented during the 2009 breeding season. Developing an action plan was necessary in part to obtain permission from the DLNR to implement management actions in the West Maui Forest Reserve. KWP obtained authorization to proceed with initiatives outlined in the action plan in early June, 2009.

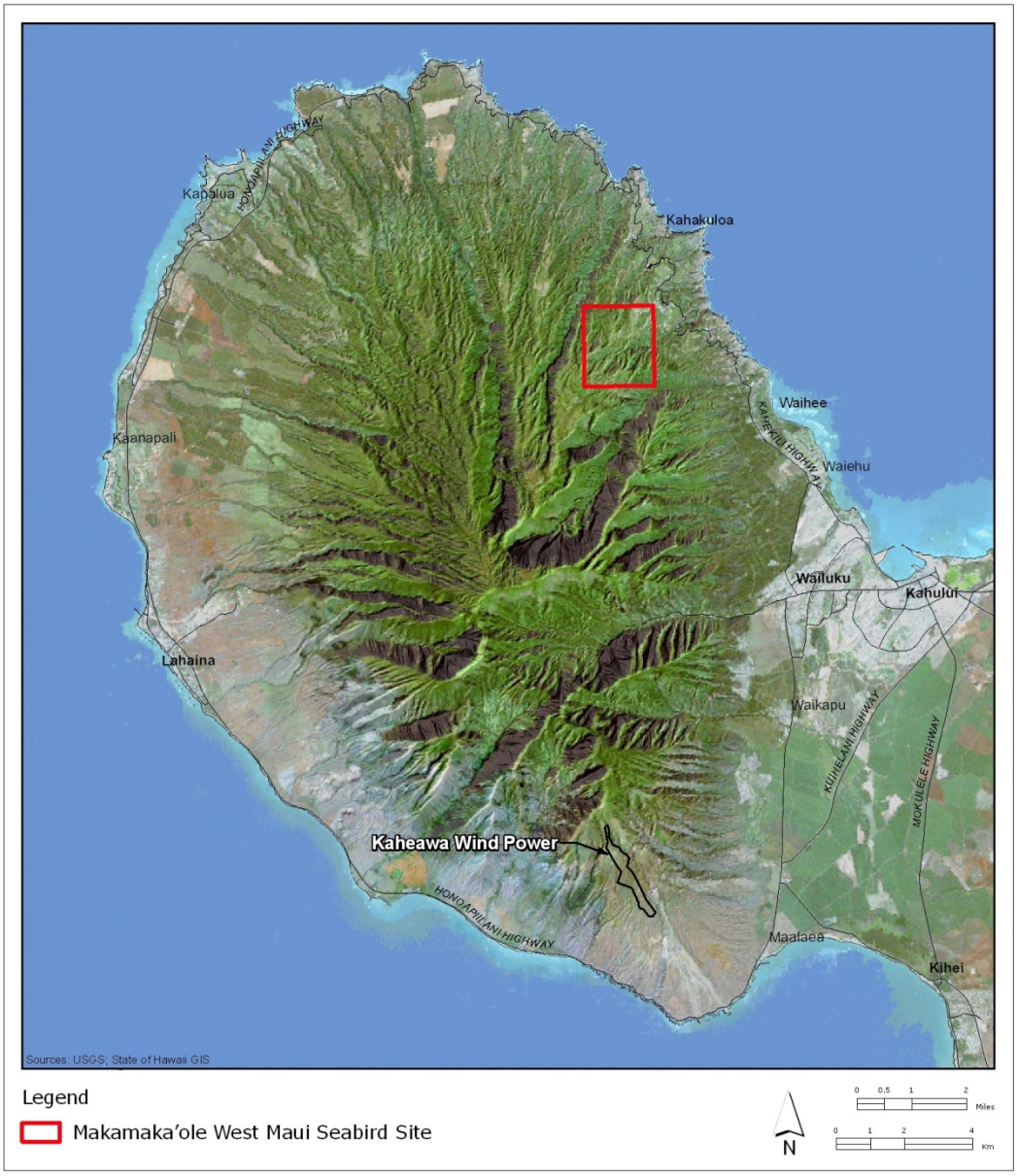


Figure 1.
Vicinity map showing the location of the Makamaka`ole Hawaiian Petrel mitigation site near lower Kahakuloa Valley along the NE slopes of the West Maui Mountains.

West Maui Seabird Mitigation Initiatives

The response from DLNR, USFWS, and the ESRC to the findings at Makamaka`ole has been favorable and encouraging. The information KWP biologists have obtained concerning the occurrence of both Hawaiian Petrels and Newell's Shearwaters at previously unconfirmed regions of West Maui has enhanced understanding of the distribution of both species in Hawai`i, alongside other recent advancements state-wide.

Threats from introduced mammalian predators and habitat alteration are believed to be key factors affecting the survival and reproductive success of Hawaiian Petrels at Makamaka`ole. Cats and mongoose are recognized as severe threats to the stability of burrow-nesting seabird populations in Hawai`i and are well-documented predators of both species.

To directly address predation, KWP has begun a trapping effort targeting cats and mongoose in the drainage corridor and along the existing ungulate fence at Makamaka`ole. While finalizing the action plan and awaiting permission to begin implementing predator removal and other measures at the site, KWP biologists performed several excursions along the fence and stream corridor to identify suitable trap deployment sites, evaluate factors that might affect trap placement and retention, and to collect mammalian scat in the vicinity of the mitigation site to be analyzed for indications of seabird predation.

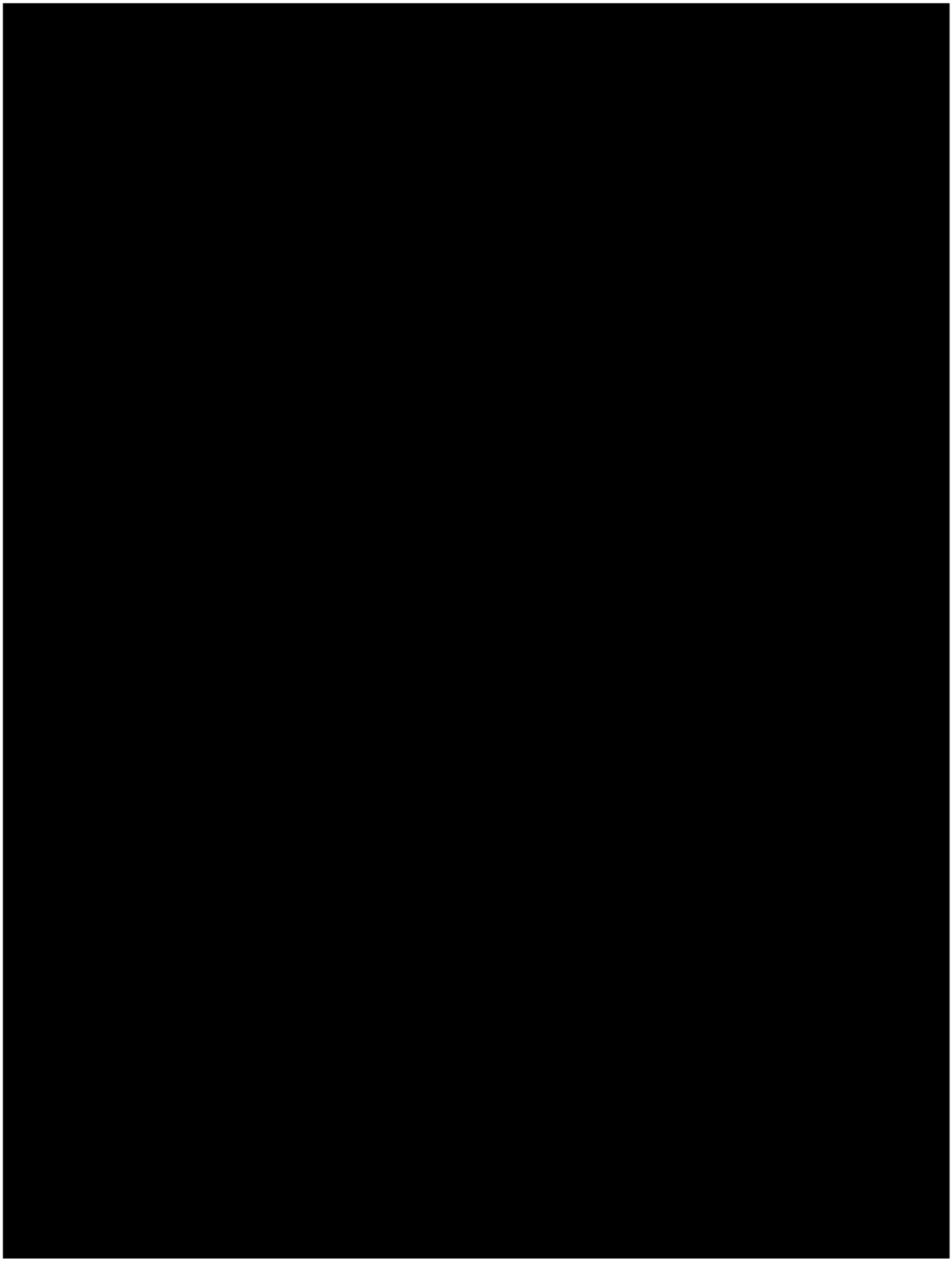
Based on site characteristics and estimates of the time required to adequately manage an active trap-line, biologists chose to start with 20 traps (Havahart®, Model 1088 and 1089) and begin evaluating which type of bait system would provide the most effective and persistent attractant. The first deployment is expected to involve setting 7 traps along the fence between 1850-1930 ft (Fig. 2) followed by deployment of the remaining traps within the stream corridor adjacent to suspected nesting habitat. No traps were deployed during the relatively short interim between receiving permission to proceed and the end of the Year 3 reporting period.

In the summer of 2008, with the approval of local Natural Areas Reserve System (DLNR/NARS) managers, KWP biologists marked a section of the fence running along the Kahakuloa NAR boundary adjacent to the Makamaka`ole seabird mitigation area by installing strands of reinforced white poly-vinyl marking tape to increase visibility to birds – a technique which has shown success in reducing petrel collision fatalities elsewhere in the Hawaiian Islands. For example, marking ungulate fences to enhance visibility near breeding seabird colonies has been shown to reduce collision mortality at the newly rediscovered Hawaiian Petrel breeding colony on the island of Lana`i and adjacent to breeding petrels at Mauna Loa on the island of Hawai`i. KWP biologists have not observed any petrel carcasses at this new fence section prior to or after marking the fence, although petrels have been observed flying within a few precarious inches of the fence, which prompted concerns about the risk to this covered species. And, a Barn owl carcass was observed on a nearby segment of this fence in December, 2008 that confirmed the fence does pose a collision risk to birds.

Table 4. Summary of conservation measures being implemented at Makamaka`ole seabird colony and proposed mitigation value for each. Measures assigned a "net conservation benefit" value do not accrue direct credit, but will satisfy the net conservation benefit requirement when direct credit is at or near 1:1.

Conservation Measure	Mitigation Value
Research and field surveys from 2006-2008 resulting in the discovery of a previously undocumented seabird breeding colony in West Maui	Net conservation benefit
Voluntary installation of flagging along DLNR's ungulate fence	Net conservation benefit
Trapping of predators from vicinity of colony	Direct compensation for take (compensation ratio to be determined)
Experimental radar surveys to document activity levels	Net conservation benefit

Late in the current reporting period First Wind wildlife staff began performing radar surveys at Makamaka`ole to explore radar's potential as a monitoring tool for characterizing attendance and activity levels at the colony. If successful, quantifying activity levels could be used as a means to measure success of mitigation efforts, by documenting changes (i.e., increases) in activity levels over time. In 2009, our audio and IR-enhanced visual observations at Makamaka`ole indicated that birds returned to the area between late May and early June, several weeks later than we had observed in the previous two years. We conducted night-time radar surveys during June 8-9, 2009 to evaluate movement rates and behavior of petrels flying inland during the early portion of the arrival and courtship period. We also observed targets converging toward the mid- and upper portions of the study area where visual observations suggest concentrated activity (Fig. 2). Radar surveys are expected to continue through the 2009 breeding season and will provide some basis for assessing the effectiveness of radar as a monitoring tool for evaluating success of mitigation measures.



Finally, because human trails and activities adjacent to seabird breeding areas often create pathways of access for predators that, if left unmanaged, can result in significant predation mortality for breeding seabirds, public outreach and/or enforcement of no trespassing regulations might substantially change recreational and other use patterns to benefit the colonies. It is hoped that effective outreach may help identify the most prevalent set of users along with traditional access points to determine how best to implement a community-based solution to unencumbered access that is consistent with local needs, will preserve and protect the colony, and promote lasting conservation benefits.

HAWAIIAN HOARY BAT

Monitoring to Assess Presence and Activity Levels

In the first year of HCP implementation, KWP biologists performed systematic visual surveys directed at documenting the presence of Hawaiian Hoary Bats at Kaheawa (June, 2006 through June, 2007) as prescribed in the HCP No bats were observed during any of the visual surveys. During Year 2 there were two separate bat sightings reported by contractors, but subsequent interviews did not provide enough information to confirm and the reports remained inconclusive. Since August, 2008 KWP biologists have been conducting acoustic monitoring of bats at Kaheawa using Anabat (Titley Electronics, New South Wales, and Australia) remote acoustic data loggers.

Four Anabat (Titley Electronics, NSW, Australia) acoustic bat detector sampling stations were established at KWP and nearby prospective KWP II development sites beginning August 8, 2008. The survey period was separated into three sampling periods, each 2-5 months in duration. The first two periods represent sampling performed at KWP and areas immediate downwind to the west and southwest of the KWP site (KWP II-DW), while the third period was expanded to include additional sites along the KWP access road (KWP II-DR). Sequential sampling periods are characterized by changes in the distribution of some, and addition of other detectors in order to maximize sampling coverage as additional detectors became available (Figure 3). Each detector station consisted of a detector attached to a double T-post platform and recorded on a 12-hour duty cycle (1800-0600) at a height of about five feet above ground level along an elevation gradient between 1900-2600 ft (asl). Detectors were visited every 7 to 12 days to check the overall status of the systems and download data from on-board CF storage cards.

Recorded call files were sorted by night and visually inspected on a computer screen using Analook® software to determine the origin of sounds recorded into the file.

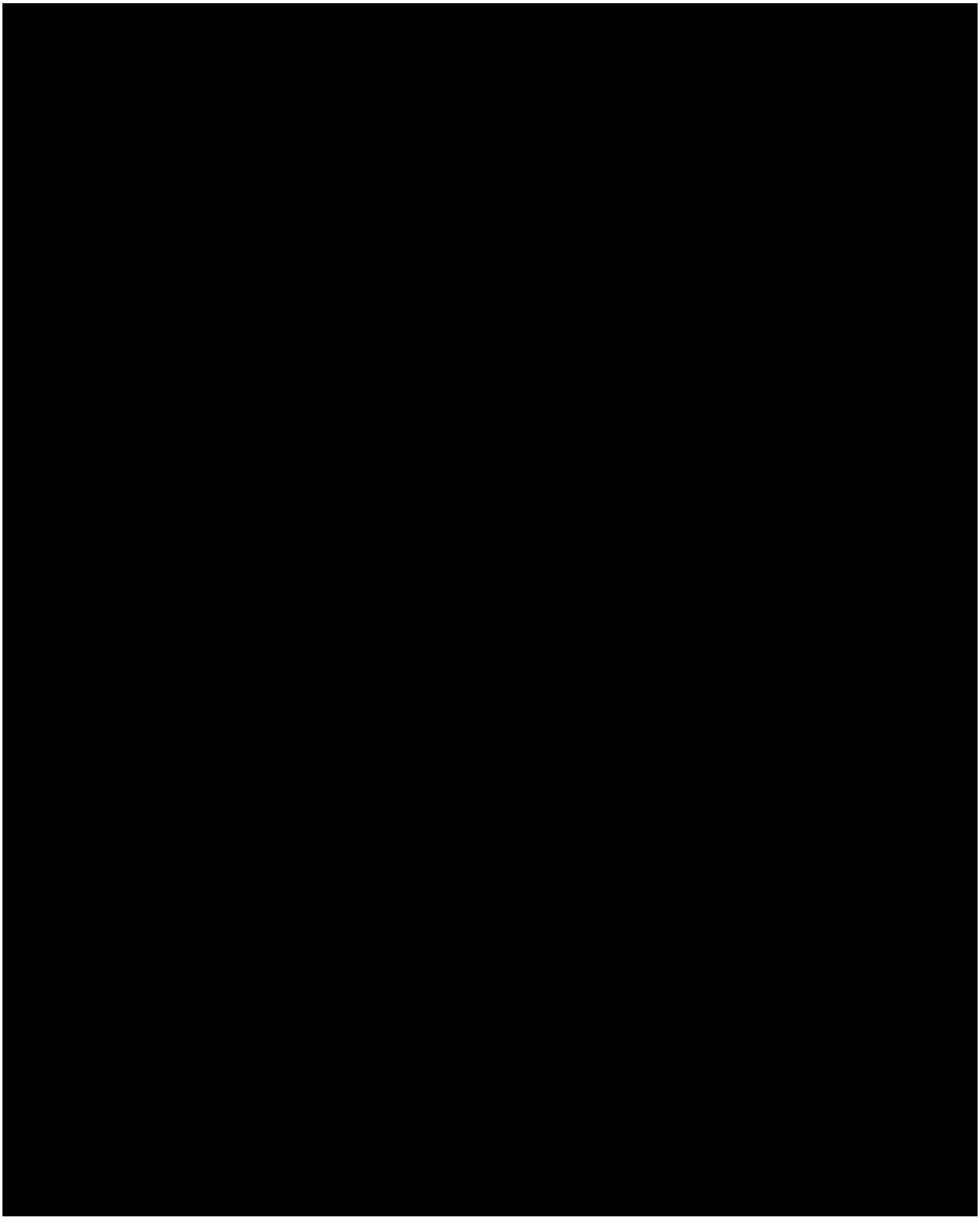


Figure 3.
Distribution of Hawaiian hoary bat acoustic detection stations at Kaheawa Pastures during the August, 2008-June, 2009 monitoring period.

Summary data is provided in Table 5 and include the total recorded bat call files and bat passes for all detectors combined as well as for each individual detector. Detection rates were then calculated for each detector based on the number of bat passes and the number of nights during the deployment period during which the detectors were operating correctly (also known as detector-nights). Bat activity was also assessed relative to the hour of the night that call files and bat passes were recorded.

TABLE 5. RESULTS OF ACOUSTIC BAT DETECTION AND MONITORING EFFORTS AT KAHEAWA PASTURES, WEST MAUI, 2008-2009.

Detector	Location	Survey Dates*	Number of Operating Nights	Number of Call Sequence Files	Qualifying Bat Passes**	Detection Rate (passes/detector-night)
Unit F	KWP II	Aug 8 - Nov 14	81	3	2	0.02
Unit H	KWP I	Aug 8 - Nov 14	99	7	3	0.03
Unit I	KWP I	Aug 8 - Nov 14	99	4	2	0.02
Unit J	KWP II	Aug 8 - Nov 14	99	1	0	0
		Subtotal KWP I	198	11	5	0.03
		Subtotal KWP II-DW	180	4	2	0.01
		Phase 1 Subtotal	378	15	7	0.02
Unit G	KWP I	Nov 12 - Apr 8	147	0	0	0
Unit H	KWP I	Nov 12 - Apr 15	154	0	0	0
Unit I	KWP I	Nov 12 - Apr 15	154	0	0	0
Unit J	KWP II	Nov 12 - Jan 1 Mar 4 - Apr 5	88	0	0	0
		Subtotal KWP I	455	0	0	0
		Subtotal KWP II-DW	88	0	0	0
		Phase 2 Subtotal	543	0	0	0
Unit G	KWP I	Apr 28 - Jun 30	75	0	0	0
Unit H	KWP I	Apr 17 - Jun 30	86	1	1	0.012
Unit I	KWP I	Apr 17 - Jun 30	86	0	0	0
Unit J	KWP II	Apr 28 - Jun 30	75	0	0	0
Unit K	KWP II	Jun 2 - Jun 30	28	0	0	0
Unit L	KWP II	Jun 2 - Jun 30	28	0	0	0
Unit M	KWP II	Jun 2 - Jun 30	28	0	0	0
Unit N	KWP II	Jun 2 - Jun 30	28	0	0	0
		Subtotal KWP I	247	1	1	0.004
		Subtotal KWP II-DW/DR	187	0	0	0
		Phase 3 Subtotal	434	1	1	0.002
		Overall Totals	1355	16	8	**0.006**

* Bat detector surveys are ongoing. Results represented here reflect all data recorded and analyzed to date.
** "Qualifying Bat Passes" represent recorded call sequence files that conform to data quality standards (such as number of call pulses and signal strength) commonly used to report detector data. As such, those call sequence files that do not conform to those standards are not included in the calculation of Detection Rates. Detection rates using 'passes' provides a more comparable data set with other studies.
Unit G malfunctioned early in the second monitoring cycle resulting in data loss from 11/12/08 to 12/04/08.
Unit J was damaged in January and was taken out of service. It was later replaced with a new unit.

Overall, sixteen call sequence files and eight bat passes were documented within the monitoring area from August 8, 2008 through June, 2009. Seven of the bat passes were documented between September 11 and October 22, 2008. No detections were recorded by any of the Anabat units during the winter and spring months, until a single pass was detected from Unit H near the head of Papalaua Gulch on May 23, 2009.

Detection rates varied between the two project study areas with 0.035 passes/detector-night in the KWP project area and 0.011 passes/detector-night in the combined downwind and access road (KWP II-DW and -DR) portions of the study area, despite similarities in habitat among several detector sites. Overall, very low levels of Hawaiian Hoary Bat activity were documented during Year 3 at KWP. The apparent concentration of activity in the fall, and the absence of call detections between late October, 2008 and late May, 2009, might be related to seasonal use patterns or key life history stages. The ongoing monitoring efforts will continue to provide information on whether there are seasonal or other detectable trends in the presence and activities of Hawaiian Hoary Bats observed at KWP . In addition to the in-house studies of bats being performed at KWP, First Wind expects to continue fostering collaboration with other researchers in hopes of contributing to a better understanding of the population ecology and requirements necessary to meet recovery goals for this species on Maui.

Observations of Bats during Seabird Colony Searches

Observers paid close attention to the potential occurrence of Hawaiian Hoary Bats during nocturnal seabird colony searches and observations of seabirds in the West Maui Mountains. These observations are incidental to the main task of making audible and visual detections of seabirds during colony searches and while collecting data on activity patterns observed at study areas. Bats have been observed in the past during nocturnal surveys as previously reported. No Hawaiian Hoary Bats were observed during nocturnal surveys for seabirds in West Maui during the Year 3 reporting period. These observations will continue during any and all nocturnal and crepuscular field studies.

V. WILDLIFE EDUCATION AND OBSERVATION PROGRAM

Personnel Orientations, Information Exchange, and Reporting

The Wildlife Education and Observation Program (WEOP) continues to be an important avoidance and minimization measure that has proven to be a valuable component of the HCP. KWP maintains an active and well coordinated wildlife orientation and outreach process for all personnel on site. Numerous staff, contractors, and visitors regularly perform activities at KWP which necessitates timely orientations with personnel as they arrive at the work site, and often combining these with refresher sessions for those present on a longer basis. Regular staff and visitor updates include announcements concerning recent wildlife observations, such as adult Nene pairs browsing in the vicinity of work zones or travel corridors, current levels of Nene activity being observed on site, and recommendations for

safely performing activities in the vicinity of covered wildlife. The WEOP orientations include verbal and visual descriptions of the covered species, an overview of requirements and guidelines for minimizing interactions and disturbance to wildlife, and instructions for reporting observations. In addition, all staff and project personnel are given two laminated fact sheets explaining the natural history of each HCP covered species along with detailed procedures for promptly reporting any downed wildlife events. Throughout the year, and especially during the Nene breeding season, regular staff updates by KWP biologists, sometimes in coordination with DLNR/DOFAW, enable KWP and contractor personnel to anticipate the likelihood of encountering Nene on the site. These measures enable project personnel to report their observations and exchange important information with wildlife staff in a timely and proactive manner.

KWP Operations staff informs the Senior Wildlife Biologist in advance of new personnel arriving to ensure that adequate wildlife orientations can be provided. A Wildlife Observation Logbook is posted on site and enables all staff and contract personnel to enter the details of their observations of HCP covered wildlife. The logbook contains fields for entering data that include:

- Observer Name, Date and Time of observations
- Species and Number of Individuals
- Location
- Proximity to Wind Turbine(s) and other Structures
- Apparent Behavior
- if in flight, Estimated Height Above Ground in meters
- Flight Direction
- Pertinent Comments
- Weather

The Logbook has proven an effective means of obtaining observations that might otherwise have not been possible relying on verbal communication alone. Observations recorded in the WEOP logbook during the present reporting period are summarized in Appendix 6. During the present reporting period we obtained over 200 independent records of mostly Nene on and around the KWP site, including a number of observations of Nene flight interaction and turbine avoidance behavior. The WEOP guidelines and protocols have significantly improved our ability to track and monitor the movements of Nene on site, even when environmental staff can not directly observe their presence. Many of the operations and maintenance personnel and contractors have had few opportunities to view species like Nene in the wild. Thus, this program serves to promote a sense of responsibility for the resources, and has been an important part of our efforts to care for the well-being of HCP covered species. Furthermore, WEOP provides the training capacity necessary to facilitate the documentation of downed wildlife incidents, evidenced during the Hawaiian Hoary Bat mortality incident in September, 2008, clearly demonstrating the success of this program.

VI. BOTANICAL RESOURCES

Several botanical resource assessments have been performed at KWP in the past and are discussed in the first two Annual Reports (January, 2007 and February, 2008). Those surveys focused primarily on describing the plant community on the KWP site and along the access road prior to construction of the facility and road network, in addition to identifying sensitive native plant communities and ESA-listed plant species that occur in the search plot overlap portions of WTG 1-3. In January, 2009 a survey was performed on and adjacent to the KWP site to document any changes in the plant community following the 2006 wildfire (Hobdy 2009). None of the species identified in this survey are classified as Threatened, Endangered, or candidates for listing under the provisions of the federal ESA.

No significant or apparent impacts are known to have occurred in the search plot overlap portions of WTG 1-3 in Year 3. Because all of the downed wildlife monitoring in this area is performed from outside the sensitive overlap portions of these plots, there is no reason to believe that any increased or cumulative impacts to the sensitive botanical resources in these areas are occurring.

As described in Section II, no trials have yet been performed to evaluate the efficacy of selective vegetation management aimed at improving searcher efficiencies. KWP remains amenable to exploring practical and appropriate options for managing non-native vegetation in certain portions of the site to perhaps facilitate other HCP initiatives, but only in the event it remains consistent with promoting a healthy ecological balance.

Native Plant Establishment

For the last two years KWP has been implementing a native plant reestablishment program within the site. The results have been encouraging and have involved considerable coordination with other community conservation partners, volunteers, and the community. Even with the challenges of a harsh, often dry climate, survival has been high, on the order of 80-90 % overall for established transplants and seedlings. During the Year 3 reporting period, KWP succeeded in planting nearly 25,000 native plants comprising six species (*Metrosideros*, *Dodonaea*, *Bidens*, *Heteropogon*, *Wikstromia*, and *Scaveola*) which were, with the exception of *Heteropogon*, grown solely from seeds collected at Kaheawa. In part, through successful long-term working relationships with Maui Cultural Lands, Inc., other conservation groups, including local native plant growers and restoration enthusiasts, significant portions of the site are becoming re-established with native species common in the area. Benefits we have observed at the end of the Year 3 planting effort include an increase in overall ground cover and diversity of native plant species, natural recruitment, and soil stabilization.

In Year 3 the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) provided KWP with Pili Grass (*Heteropogon contortus*) seed for use in promoting native ground cover and facilitating soil and land conservation at the wind facility. Results of previous collaboration with the NRCS enabled KWP to conduct field trials with Pili to determine efficient treatment methods. The

seed has been used sparingly to supplement ground cover establishment throughout the site and has shown a great deal of success as application techniques have improved. In addition, about 6,000 individual Pili Grass plants grown from seed were included in the Year 3 planting efforts. We are finding that this method enables the plants to become quickly established, facilitating early seed production, enhanced seed retention in substrates, and improved germination rate.

Minimizing and Managing Invasive Species

KWP continues to work actively with stakeholders, agency staff, and several conservation groups on Maui to minimize the ingress of undesirable invasive plant species to the Kaheawa area. Soon after Fireweed (*Senicio madagascariensis*) was first encountered at Kaheawa following the 2006 wildfires that swept through the region, KWP biologists co-established the Fireweed Working Group to address the Fireweed issue and its potential to affect the landscape of West Maui. The group is composed of representatives from the County of Maui, State of Hawaii, Maui Invasive Species Committee, KWP, and other concerned parties. This species has been a considerable concern for rangeland managers throughout Hawaii for many years because of its toxicity to livestock. KWP continues to welcome the support and collaboration we share with the DLNR, USDA Rangeland Extension Office, and the State Plant Quarantine Division to evaluate constructive management options to control this invasive species. The hope among Working Group participants and others is to identify effective methods which do not specifically rely on chemical treatments, identify new management approaches based on the best available information, identify how natural processes affect the growth and distribution of Fireweed, and share these findings with other land owners facing similar challenges with Fireweed on Maui and elsewhere.

VII. ADAPTIVE MANAGEMENT CONSIDERATIONS

Comments and Recommendations: Year 2 Annual Review

The Year 2 Annual Review resulted in several recommendations by the DLNR and USFWS that are intended to facilitate the adaptive management process and continued improvements in monitoring and reporting. These recommendations and the actions taken by KWP to address them are presented in Table 5.

TABLE 5. RECOMMENDATIONS PRESENTED BY USFWS AND DLNR DURING THE YEAR 2 HCP ANNUAL REVIEW.

Recommendation	Action Taken
Submittal of electronic copies of records and data gathered during annual monitoring activities.	Agreed to submit annually, semi-annually, and as requested by DLNR and USFWS.
A certification statement that attests to the validity and accuracy of annual reporting materials.	Agreed to incorporate a certification statement with each annual and semi-annual report.
Provide a standard citation format for each annual report.	A standard citation is now included with each report.
Broaden the use of surrogate species used in SEEF and scavenger removal trials that includes the use of small mammals, passerines, and larger-bodied avian species to better characterize detection by searchers and retention times for bats and Nene.	KWP obtained amended permits for possession and use of a broader range of species on July 16, 2009. Use of specimens of larger and smaller surrogate species will begin immediately as carcasses become available.
Increase the number and frequency of SEEF trials and ensure that search intervals do not exceed the minimum carcass retention time.	The number and frequency of SEEF exercises conducted in FY09 was significantly increased.
Develop an alternative monitoring scheme that does not rely solely on the intensive search effort presently being implemented, but rather utilizes the results of three years of survey effort, including SEEF and scavenger removal data, to inform an adaptive design.	KWP biologists have developed a modified monitoring design that draws upon the results of routine monitoring, SEEF exercises, carcass removal trials, preliminary vegetation and ground cover analysis, and locations of directly observed downed wildlife in the present monitoring area (see Appendix 10 in this report).
Design scavenger removal studies to adequately evaluate seasonal differences in removal rates.	Scavenger removal studies are being designed to enable seasonal variability to be adequately detected and used to adjust removal rates by season at KWP.
Provide an organizational structure for First Wind that illustrates business relationships among projects and entities.	First Wind provided DLNR and USFWS an organizational structure that illustrates relationships among project and business in December, 2008.
Provide an analysis of Nene in-flight avoidance response and activity profiles that can inform risk.	KWP has developed an index of the distribution of Nene at Kaheawa Pastures for use in assessing spatial and temporal habits and informing additional analysis.
Add streamers to all guyed met towers as towers are serviced and deployment opportunities arise.	KWP biologists are working closely with First Wind engineers to ensure that streamers will be added to guyed met towers as towers are serviced and whenever new towers are deployed.

TABLE 5 (CONTINUED). RECOMMENDATIONS PRESENTED by the DLNR and USFWS DURING THE YEAR 2 HCP ANNUAL REVIEW.

Recommendation	Action Taken
Explore the feasibility of low wind speed curtailment to minimize bat collision risk.	Low wind curtailment as a mitigation measure is used elsewhere and may be evaluated further at KWP; thus far it has received minimal consideration for KWP due to low risk and insufficient need.
Report met tower search plot dimensions.	The met tower search plot dimensions were provided following the FY08 annual review.
Work with DLNR and USFWS to facilitate a Nene translocation protocol.	KWP continues to work collaboratively with both agencies to facilitate this process, although the recent draft translocation protocol compiled by the NRAG has not been circulated for review.
Study best approaches to enable predator removal at Makamaka`ole to be used to provide mitigation credit by off-setting predation mortality of nesting seabirds, establishing a basis for successful mitigation.	Preliminary agreements were reached with DLNR, USFWS, and the ESRC that predators removed from the vicinity of Makamaka`ole constitute a benefit to petrels (and shearwaters) using the area for breeding; removal of predators is assumed to reduce predation-based mortality but an appropriate mitigation credit ration has not yet been established.
Consider developing a third party monitoring system that would be performed in more direct collaboration with DLNR and USFWS.	KWP has expressed an interest in exploring third party monitoring and would like to see greater exchange on this subject as the modified monitoring protocol is implemented.
Work collaboratively with DLNR and USFWS to establish a timeline and process for enabling Nene mitigation measures to be implemented	KWP has continued to work collaboratively with DLNR and USFWS to establish a timeline for Nene reintroduction that is dependent on construction of the new release site while continuing to evaluate alternative interim measures; KWP independently funded the consulting firm Planning Solutions to prepare a Draft SHA to facilitate the release program.
Evaluate whether net benefit is being achieved and maintained for each covered species	This is an ongoing process that receives considerable attention. At this time, KWP believes that a net benefit is being maintained despite the challenges that mitigation presents.

Proposed Adaptations to Monitoring

Implementation of the KWP HCP is entering its fourth year, and a strong record of fatality monitoring has been established. With regard to fatality monitoring, the HCP states that, "…intensive searches will be conducted for the first two years, after which the approach may be modified based on the results obtained up to that point… In subsequent years, if less intensive monitoring measures are agreed to by USFWS and DLNR, monitoring will consist of a reduced level of effort, consisting of smaller search plots at a subset of turbines, with plots and turbines being relocated periodically to sample a variety of locations. The ongoing effort will be supplemented by the WEOP Program, as implemented by on-site staff. Depending upon the findings, the location and focus of the ongoing effort can be modified, with the concurrence of the USFWS and DLNR, to target areas or times of particular interest".

Given the increased effort in Year 3 (increased SEEF exercises, better estimates of scavenger removal rates, and consistent monitoring), which corroborate the results of Years 1 and 2, KWP proposes that alternative monitoring regimes be evaluated that will continue to provide adequate monitoring coverage but at a significantly reduced labor effort. Determining the scope and design of any alternative monitoring regimes will have to be conducted in consultation with DLNR and USFWS.

Proposed New Monitoring Design

The present configurations of the search plots at KWP (180 x 200 m) represent 100% of the maximum height of the turbines plus 10 m up- and down-wind to compensate for possible wind drift. However, none of the downed wildlife (including two non-covered species; 1 Ring-necked pheasant and 1 Barn owl) incidents observed at KWP during 3.5 years of steady monitoring have been documented at distances beyond 50% of maximum turbine height (range 2-42 m, n = 7). Several studies that have examined the distribution of avian and bat carcasses at wind facilities indicate that most carcasses are found within 50% of maximum turbine height (Arnett 2005, Jain et al. 2007, Fiedler et al. 2007). Most of these studies documented fatalities of small songbirds and bats. However, these fatality distributions are also expected to apply to larger bodied birds which, due to their higher body mass would be expected to fall closer to the base of turbines than animals of lesser body mass.

Given these considerations, KWP proposes that following the Year 3 Annual Review, turbine search plots should be modified from their present rectangular shape and monitored under a new schedule. A full description with background is provided in Appendix 10. Under the proposed modifications, each search area would contain a single concentric plot centered on each turbine base representing the 50% maximum turbine height radii. Monitoring would entail searching each plot within the 50% radius each week over the entire monitoring year. Thus, each week all search areas are monitored within the 50% maximum turbine height, which is expected to provide the coverage necessary to account for all downed wildlife that might result from collisions with wind turbines at KWP.

Carcass removal trials and SEEF exercises would continue in order to maintain accurate estimates of carcass retention time and carcass detection efficiency of searchers, detect changes in these variables, and ensure these adjustment parameters are applied properly in the annual estimates of direct take.

VIII. CHANGED OR UNFORESEEN CIRCUMSTANCES

There were no changed and/or unforeseen circumstances during the Year 3 reporting period at KWP. The results of annual collaborative monitoring of the Hana`ula-Kaheawa Nene population do not suggest that this West Maui population is experiencing any ill effects or changes in population status owing to natural or project related impacts. Although data are limited at this time, KWP observations suggest the West Maui population is stable and may be increasing. Little is known about the current status of Hawaiian Petrels and Newell's Shearwaters on Maui, though no unexpected impacts or significant changes in the status of these species have emerged that might prompt elevated concerns for their survival. Hawaiian Hoary Bats do not appear common in the KWP area and the results of continued monitoring suggest no changes or unforeseen circumstances appear to have affected this covered species or its habitat. No significant natural or man-made event cycles have directly or indirectly altered the landscape or habitat associated with the KWP project during this reporting period.

IX. FUNDING

A summary of HCP-related expenditures for Years 1-3 is attached (Appendix 12). This summary lists all costs (including staff labor) that KWP has expended toward fulfilling the terms of the HCP, and compares them against the budgeted amounts specified in Appendix 11 of the HCP. In general the total expenditures are running fairly close to the total budgeted amount for the three-year period. Expenditures within categories do vary, however. Nene expenditures are currently lagging due to the one-plus-year delay that occurred before commencing payment of the Nene propagation funds to DOFAW. A double payment has been budgeted for 2010, which will bring this into line. Spending on seabird mitigation is also lagging slightly, due to the time it has taken to secure access and approvals for implementing management at the Makamaka`ole site. These too are expected to come into line with expenditures planned for 2010 activities. Spending has exceeded budgeted amounts for fatality monitoring efforts. The rate of spending on monitoring should decrease markedly if the revised methods proposed herein are adopted.

Also included in the attached Appendix 12 is a summary of the three Contingency Funds and related interest accrual at 2.5% per the HCP and Implementing Agreement.

Finally, a listing of additional conservation measures being implemented by KWP and their approximate costs is provided. These are either related to CDUP compliance, or voluntary on the part of KWP. They are not included in the HCP budget.

X. LOOKING AHEAD

The HCP provides for a wide range of avoidance, minimization, and mitigation measures intended to result in a net conservation benefit for the four covered species. KWP has continued to implement these measures in accordance with the HCP and the recommendations provided by DLNR, USFWS, and the ESRC through the third full year of implementation. Several specific items have been presented that point to challenges and accomplishments encountered during Year 3. Finding innovative solutions and building on the successes thus far are expected to enable continued fine-tuning and improvement.

Continued progress, in close collaboration with DLNR and USFWS, on Nene mitigation appears very encouraging. KWP looks forward to exploring ways to facilitate Nene translocation, relocation, and reintroduction, coupled with captive propagation in more depth. The timeliness of progress on the proposed SHA is encouraging, suggesting that a new release pen for Nene reintroduction on Maui could accommodate these efforts in the near future.

KWP has begun implementing mitigation for seabirds according to the action plan adopted in May, 2009. As mitigation continues, new insights will emerge that are likely to inform assessments of success and provide a basis for subsequent adaptive management where warranted.

Searcher Efficiency and Carcass Removal trials using avian carcasses that are more representative of Nene are expected to improve the estimation of Adjusted Take of large vs. small to medium sized birds.

Finally, KWP wishes to adopt a modified downed wildlife monitoring protocol that integrates what has been learned during three years of intensive monitoring according to the implementation schedule outlined in the HCP. KWP has developed a draft modified protocol for consideration, in consultation with DLNR, USFWS, and the ESRC.

XI. LITERATURE CITED

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Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
1-Jul-08	WTG 12-13, MET01,02	8:00	11:30	DM, KM	7.0	2		
2-Jul-08	WTG 13-17	7:45	12:00	DM, KM	8.5	4		
3-Jul-08	WTG 17-20 & WTG 1-3, MET 3-7	7:30	12:30	DM, KM	10.0	6		
				Weekly Totals:	**25.5**	**12**	**0.60**	
7-Jul-08	WTG 04-11, MET 4	7:45	12:00	DM,KM	8.5	8		
8-Jul-08	WTG 12-17, MET 3	7:30	11:30	DM,KM	8.0	6		
9-Jul-08	WTG 17-20, WTG 1- 3, MET 1, 5	7:45	11:30	DM,KM	7.5	3		
10-Jul-08	WTG 1-6, MET 02	7:45	12:00	DM,KM	8.5	6		
11-Jul-08	WTG 07-10, MET 6,7	12:30	14:00	KM	1.5	4		
				Weekly Totals:	**34.0**	**27**	**1.35**	
14-Jul-08	WTG 10-15, MET 5	8:45	11:45	DM,KM	6.0	6		
15-Jul-08	WTG 15-20	8:00	12:00	DM,KM	8.0	5		
16-Jul-08	WTG 01-03, MET 1,3,4,6,7	8:00	12:00	DM,KM	8.0	3		
17-Jul-08	WTG 3-7, MET 2	8:00	12:00	DM,KM	8.0	4		
18-Jul-08	WTG 7- 12	8:00	12:00	DM,KM	8.0	5		
				Weekly Totals:	**38.0**	**23**	**1.15**	
21-Jul-08	WTG 13-16, MET 5	8:00	12:45	DM,KM	9.5	4		
22-Jul-08	WTG 16-20	8:00	12:30	DM,KM	9.0	4		
23-Jul-08	WTG 05-08, MET 2	10:00	12:15	DM,KM	4.5	4		
24-Jul-08	WTG 1-4	8:00	12:30	KM, IB	9.0	4		
25-Jul-08	WTG 9-12	8:00	12:00	KM, IB	8.0	4		
				Weekly Totals:	**40.0**	**20**	**1.00**	

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
28-Jul-08	WTG 1-4	13:00	15:00	IB,DM	6.0	4		
29-Jul-08	WTG 4-7	7:45	12:00	IB,DM	8.5	3		
30-Jul-08	WTG 7-11	8:45	12:00	IB,DM	6.5	4		
31-Jul-08	WTG 12-16	7:45	11:30	IB,DM	6.5	5		
1-Aug-08	WTG 17-20 Met 1, 2, 3	7:00	12:30	IB,DM	11.0	4		
				Weekly Totals:	**38.5**	**20**	**1.00**	
				WTG search interval	6.2			
				Met search interval	7.6			
4-Aug-08	WTG 7-11, Met 2	7:30	12:45	DM	5.3	5		
5-Aug-08	WTG 12-16, Met 3	7:30	12:00	DM, IB	9.0	5		
6-Aug-08	WTG 17-20	7:30	12:00	DM	4.5	4		
7-Aug-08	WTG 1-, Met 1	7:45	11:30	KM,DM	7.5	4		
8-Aug-08	WTG 4-7, Hana'ula overlap	7:30	14:30	KM,DM,IB	18.0	3		
				Weekly Totals:	**44.3**	**21**	**1.05**	
11-Aug-08	WTG 7-11	7:30	12:00	DM	4.5	5		
12-Aug-08	WTG 12-15, Met 3, 4, 5	9:00	12:30	KM, DM	7.0	4		
13-Aug-08	WTG 16-20, Met 6,7	8:45	12:45	KM, DM	8.0	5		
14-Aug-08	WTG 1-4, Met 1, Hana'ula/Manawainui	7:30	11:00	KM, DM	7.0	4		
15-Aug-08	WTG 4-7, Met 2	8:00	10:30	DM	2.5	3		
				Weekly Totals:	**29.0**	**21**	**1.05**	
18-Aug-08	WTG 7-11	7:30	10:00	KM	2.5	5		
19-Aug-08	WTG 12-14, Met 3	11:45	13:30	KM, DM	3.5	3		
20-Aug-08	WTG 15, 16, 18-20	7:45	11:30	KM, DM	7.5	5		
21-Aug-08	Met 1-7	9:00	13:00	KM, DM				
22-Aug-08	WTG 1-7	8:00	13:00	KM	5.0	7		
				Weekly Totals:	**18.5**	**20**	**1.00**	

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
25-Aug-08	WTG 8-11	9:00	13:00	KM, DM	8.0	4		
26-Aug-08	NO MONITORING - Heavy Rains			KM, DM, IB	0.0	0		
27-Aug-08	WTG 12-18, Met 3	8:00	14:15	KM, DM	12.5	7		
28-Aug-08	WTG 19-20, 1-3, Met 1, 4, 5, 6, 7	8:00	12:00	KM, DM	8.0	5		
29-Aug-08	WTG 4-7, Met 2	11:45	14:30	KM, IB	5.5	4		
				Weekly Totals:	**34.0**	**20**	**1.00**	
				WTG search interval	6.9			
				Met search interval	11.0			
1-Sep-08	HOLIDAY - Labor Day				0.0	0		
2-Sep-08	WTG 7-9, Met 2	8:45	10:45	KM, DM	4.0	3		
3-Sep-08	WTG 10-16, Met 3, 4, 5	7:45	12:30	KM, DM	9.5	7		
4-Sep-08	WTG 1-6, Met 6, 7	10:30	14:15	KM, DM	7.5	6		
5-Sep-08	WTG 17-20/Hana'ula overlap/WTG 1-3	7:30	15:30	KM, DM	16.0	7		
				Weekly Totals:	**37.0**	**23**	**1.15**	
8-Sep-08	WTG 4-9, Met 2	7:30	11:15	KM, DM	7.5	6		
9-Sep-08	WTG 10-15, Met 3, 4, 5	6:30	13:00	KM,DM	13.0	6		
10-Sep-08	(Internal Training Session)				0.0	0		
11-Sep-08	WTG 16-20, Hana'ula overlap	9:00	11:45	KM, DM	5.5	5		
12-Sep-08	WTG 1-5, Met 1, 6, 7	8:00	11:30	KM, DM	7.0	5		
				Weekly Totals:	**33.0**	**22**	**1.10**	
15-Sep-08	WTG 6-9, Met 2	10:30	12:30	KM, DM	4.0	3		
16-Sep-08	WTG 10 -13 / (Heavy Rains)	9:30	12:30	KM, DM	6.0	4		
17-Sep-08	WTG 14 -19, Met 3	8:00	14:15	KM, DM	12.5	6		
18-Sep-08	WTG 20, 1-4, Hana'ula overlap, Met 1	8:00	12:30	KM, DM	9.0	5		
19-Sep-08	WTG 5-8, Met 2, 4, 5	7:15	10:30	DM	3.5	4		
				Weekly Totals:	**35.0**	**22**	**1.10**	

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
22-Sep-08	WTG 9-11	11:00	13:00	KM, DM	4.0	3		
23-Sep-08	WTG 12-16, Met 3, 4, 5	6:45	11:00	DM, IB	8.5	5		
24-Sep-08	WTG 17-20	9:00	12:20	DM,KM	6.4	4		
25-Sep-08	WTG 1-4, Hana'ula overlap, Met 1	9:00	12:30	KM, IB	7.0	4		
26-Sep-08	WTG 4-6, Met 2, 6, 7	8:30	12:00	KM	3.0	3		
				Weekly Totals:	**28.9**	**19**	**0.95**	
29-Sep-08	WTG 7-11, Met 2	7:00	13:00	KM	6.0	6		
30-Sep-08	WTG 12-17, Met 3	8:30	12:00	KM,IB	7.0	6		
1-Oct-08	WTG 18-20, Met 4, 5	7:30	11:00	KM	3.5	3		
2-Oct-08	WTG 1-4/Hana'ula overlap	8:00	13:00	KM	5.0	4		
3-Oct-08	WTG 5-12, Met 6, 7	9:30	16:30	KM, IB	14.0	8		
				Weekly Totals:	**35.5**	**27**	**1.35**	
				WTG search interval	6.3			
				Met search interval	7.6			
6-Oct-08	WTG 13-20, Met 3	7:00	13:30	KM, DM	13.0	7		
7-Oct-08	WTG 1-7, Met 1, 2, 4, 5	7:00	12:30	KM, DM	13.0	7		
8-Oct-08	WTG 8-16, Met 3, 6, 7	7:00	14:00	KM, DM, IB	21.0	9		
9-Oct-08	WTG 17-20, 1-3, Met 1	8:00	14:00	KM, IB	12.0	7		
10-Oct-08	WTG 4-13, Met 2, 3	7:00	13:00	DM, KM, IB	18.0	10		
				Weekly Totals:	**77.0**	**40**	**1.00**	
13-Oct-08	HOLIDAY: Columbus Day				0.0	0		
14-Oct-08	WTG 13-20, 1-4	7:00	13:45	KM,DM,IB	20.3	12		
15-Oct-08	WTG 5-12	7:00	12:00	KM,DM	10.0	8		
16-Oct-08	WTG 13-20, 5-8	8:00	16:00	KM, DM, IB	15.0	12		
17-Oct-08	WTG 9-12, 1-4; Hana'ula Site Visit	7:00	12:00	KM, DM, IB	10.0	8		
				Weekly Totals:	**55.3**	**40**	**1.00**	

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
20-Oct-08	WTG 5-11	7:00	12:00	KM, DM	12.0	7		
21-Oct-08	WTG 12-20, 1-4	7:00	12:00	KM, DM, IB, RR	20.0	13		
22-Oct-08	WTG 5-12	7:00	12:00	KM, DM	12.0	8		
23-Oct-08	WTG 13-20, 1-4	7:30	12:30	KM,DM,IB	15.0	12		
24-Oct-08	Hana'ula overlap, Met 1-7	7:30	13:00	KM, DM				
				Weekly Totals:	**59.0**	**40**	**1.00**	
27-Oct-08	WTG 5-12	7:30	13:00	KM, DM	11.0	8		
28-Oct-08	WTG 13-20, Met 3, 4, 5	7:45	14:45	KM, DM	20.0	8		
29-Oct-08	WTG 1-8, Met 1-2	7:30	12:30	KM, DM	10.0	8		
30-Oct-08	WTG 9-16, Met 3	7:30	13:00	KM, DM	11.0	8		
31-Oct-08	WTG 17-20, 1-4, Met 1, 3, 6, 7	7:30	13:30	KM, DM	12.0	8		
				Weekly Totals:	**64.0**	**40**	**1.00**	
				WTG search interval	4.6			
				Met search interval	8.0			
3-Nov-08	WTG 5-12, Met 2	7:00	13:00	DM, KM	10.0	8		
4-Nov-08	WTG 13-20, Met 3	7:30	12:30	KM, IB	10.0	8		
5-Nov-08	WTG 1-8, Met 1, 2	7:30	12:30	KM,DM	10.0	8		
6-Nov-08	WTG 9-16, Met 3, 4, 5, 6, 7	7:00	14:30	KM,DM	15.0	8		
7-Nov-08	WTG 17-20, 1-4, Hana'ula overlap, Met 1	7:00	15:45	KM, DM	17.5	8		
				Weekly Totals:	**62.5**	**40**	**1.00**	
10-Nov-08	WTG 5-12, Met 2	6:30	12:00	KM, DM	11.0	8		
11-Nov-08	HOLIDAY: Veterans Day							
12-Nov-08	WTG 13-20, Met 3	7:00	12:30	KM,DM	11.0	8		
13-Nov-08	WTG 1-12, Met 1, 2, 6, 7	7:30	13:30	KM,DM	12.0	12		
14-Nov-08	WTG 09-20, Met 3, 4, 5	7:15	13:45	KM,DM,IB	19.5	12		
				Weekly Totals:	**53.5**	**40**	**1.00**	

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
17-Nov-08	WTG 5-12, Met 2	8:00	12:00	KM,DM	8.0	7		
18-Nov-08	HEAVY RAIN - NO VISIBILITY							
19-Nov-08	WTG 13-20, 1-5, Met 3, 4, 5	8:00	13:00	KM, DM, IB	15.0	13		
20-Nov-08	WTG 4-14, Met 2, 3, 6, 7	8:00	12:30	KM,IB	9.0	10		
21-Nov-08	WTG 14-20, 1-4, Met 1	7:30	15:30	KM,IB	16.0	10		
				Weekly Totals:	**48.0**	**40**	**1.00**	
24-Nov-08	WTG 5-12, Met 2, 4, 5	9:30	13:45	KM, DM	8.5	8		
25-Nov-08	WTG 13-20, 1-3, Met 1, 3	7:00	14:00	KM, DM, IB	21.0	11		
26-Nov-08	WTG 4 -12, Hana'ula overlap, Met 6, 7	7:30	13:30	KM,DM	12.0	8		
27-Nov-08	HOLIDAY: Thanksgiving							
28-Nov-08	HOLIDAY							
				Weekly Totals:	**41.5**	**27**	**0.68**	
				WTG search interval	3.6			
				Met search interval	5.3			
1-Dec-08	WTG 13-16, Met 3, 4, 5	8:30	13:00	KM,DM	9.0	4		
2-Dec-08	WTG 17-20, Met 6, 7	8:30	12:00	KM,DM	7.0	4		
3-Dec-08	WTG 1-4, Met 1, Hanaula overlap	7:30	12:30	KM,DM	10.0	4		
4-Dec-08	WTG 5-8, Met 2	9:00	12:00	KM,DM	6.0	4		
5-Dec-08	WTG 9-12	7:30	11:00	KM,DM	7.0	4		
				Weekly Totals:	**39.0**	**20**	**1.00**	
8-Dec-08	WTG 13-17, Met 3, 4, 5	7:00	11:30	KM, DM	9.0	5		
9-Dec-08	WTG 18-20, 1-4, Met 1	7:30	12:00	KM, DM, IB	13.5	7		
10-Dec-08	Planting: volunteers							
11-Dec-08	Rain out							
12-Dec-08	WTG 5-12, Met 2, 6, 7	7:15	12:15	KM, DM	10.0	8		
				Weekly Totals:	**32.5**	**20**	**1.00**	

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
15-Dec-08	WTG 13- 16, Met 3, 4, 5	8:30	13:30	KM, DM	10.0	4		
16-Dec-08	WTG 17-20, Met 6, 7	8:45	12:15	KM, DM	7.0	4		
17-Dec-08	WTG 1-4, Met 1	8:15	11:30	KM, DM	6.5	4		
18-Dec-08	WTG 5-8, Met 2	8:00	11:00	KM, DM	3.0	4		
19-Dec-08	WTG 9-11, Hana'ula overlap	7:30	10:30	DM, GS	6.0	3		
				Weekly Totals:	**32.5**	**19**	**0.95**	
22-Dec-08	WTG 12-15, Met 3, 4, 5	7:30	11:30	DM, GS	8.0	4		
23-Dec-08	WTG 16-19, Met 2, 6, 7	7:30	12:00	DM, GS	9.0	4		
24-Dec-08	HOLIDAY - CHRISTMAS EVE							
25-Dec-08	HOLIDAY - CHRISTMAS DAY							
26-Dec-08	HOLIDAY - DAY AFTER CHRISTMAS							
				Weekly Totals:	**17.0**	**8**	**0.40**	
29-Dec-08	WTG 20, 1-3, Met 1, 6, 7	8:00	12:00	KM, DM	4.0	4		
30-Dec-08	WTG 4-11, Met 2	8:00	14:30	KM, DM	9.0	8		
31-Dec-08	WTG 12-19, Met 3, 4, 5	8:00	15:00	KM, DM	14.0	8		
1-Jan-09	HOLIDAY - NEW YEAR'S DAY							
2-Jan-09	HOLIDAY - DAY AFTER NEW YEAR'S							
				Weekly Totals:	**27.0**	**20**	**1.00**	
				WTG search interval	8.1			
				Met search interval	7.3			
5-Jan-09	WTG 1-3, Met 1, Hana'ula overlap	11:00	14:00	IB	3.0	3		
6-Jan-08	WTG 4-7, Met 2, 6, 7	12:30	16:00	DM, IB	7.0	4		
7-Jan-09	WTG 8-11	12:30	16:00	DM, IB	7.0	4		
8-Jan-09	WTG 12-15, Met 3, 4, 5	10:00	13:45	DM, IB	7.5	4		
9-Jan-09	WTG 16-20	8:00	13:30	DM, IB	11.0	5		
				Weekly Totals:	**35.5**	**20**	**1.00**	

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
12-Jan-09	WTG 1-4, Met 1	10:00	13:00	DM, IB	6.0	4		
13-Jan-09	WTG 5-7, Met 2	10:30	13:30	DM, IB	6.0	3		
14-Jan-09	WTG 8-11	9:15	12:30	DM, IB	6.5	4		
15-Jan-09	Heavy Fog / No Visibility, Met 3-7							
16-Jan-09	Rain-Out / No Visibility							
				Weekly Totals:	**18.5**	**11**	**0.55**	
19-Jan-09	WTG 12-15, Met 3	9:00	12:30	DM, IB	7.0	4		
20-Jan-09	WTG 16-20, 1-4, Met 1	10:45	16:30	DM, IB	11.5	9		
21-Jan-09	WTG 5-7, Met 2	10:30	14:00	DM, IB	7.0	3		
22-Jan-09	WTG 8-11			DM, IB	4.0	4		
23-Jan-09	WTG 12-16, Met 3, 4, 5	10:00	13:30	DM, IB	3.5	5		
				Weekly Totals:	**33.0**	**25**	**1.25**	
26-Jan-09	WTG 16-20, Met 6, 7	7:30	12:00	DM, GS	9.0	4		
27-Jan-09	Heavy Rains / Zero Visibility			DM, IB				
28-Jan-09	Heavy Rains / Zero Visibility			DM, IB				
29-Jan-09	WTG 1-7, Met 1-2	7:30	13:30	DM, IB	6.0	5		
30-Jan-09	WTG 8-12, Met 3, 4, 5	7:30	14:30	DM, GS	14.0	7		
				Weekly Totals:	**29.0**	**16**	**0.80**	
				WTG search interval	8			
				Met search interval	7.6			
2-Feb-09	WTG 13-20	9:00	12:45	DM, IB	7.5	8		
3-Feb-09	Heavy Rains / Zero Visibility			DM, IB				
4-Feb-09	WTG 1-6 / Hana'ula overlap, Met 1	8:45	15:00	DM, IB	12.5	6		
5-Feb-09	WTG 7-12, Met 6, 7	9:00	15:45	DM, IB	13.5	6		
6-Feb-09	Met 2, 3, 4, 5	7:15	13:45	DM, IB				
				Weekly Totals:	**33.5**	**20**	**1.00**	

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
9-Feb-09	WTG 13-18, Met 3	9:00	14:00	DM, GS	10.0	6		
10-Feb-09	WTG 19-20, 1-3, Met 1	8:30	13:30	DM, GS	10.0	5		
11-Feb-09	WTG 4-9, Met 2	12:00	16:00	DM, GS	8.0	6		
12-Feb-09	WTG 10-17, Met 3	7:30	14:00	DM	6.5	8		
13-Feb-09	Hana'ula overlap	7:30	10:00	DM, IB				
				Weekly Totals:	**34.5**	**25**	**1.25**	
16-Feb-09	HOLIDAY: President's Day							
17-Feb-09	WTG 6-11, Met 2, 4, 5	7:45	12:30	DM	4.8	5		
18-Feb-09	WTG 12-16, Met 3	9:00	14:00	IB, DM	10.0	5		**Barn Owl**
								Time: **12:15**
								Nearest WTG: **15**
								Dist to WTG: **40.8 m**
								Dir from WTG: **SW**
								Gr Cov: **Shrub/Grass**
19-Feb-09	WTG 17-20, Met 6, 7	9:30	13:15	DM	3.8	4		
20-Feb-09	WTG 1-6, Met 1	7:45	13:30	IB, DM	11.5	6		
				Weekly Totals:	**30.0**	**20**	**1.00**	
23-Feb-09	WTG 7-11, Met 2	7:15	12:00	DM, IB	9.6	5		
24-Feb-09	WTG 12-16, Met 3, 4, 5	7:30	12:30	DM, I B	10.0	5		
25-Feb-09	WTG 17-20, 1-2, Met 1	9:00	14:30	IB, DM	11.0	6		
26-Feb-09	WTG 3-6, Hana'ula overlap	12:00	16:00	IB, DM	8.0	4		
27-Feb-09								
				Weekly Totals:	**38.6**	**20**	**1.00**	
				WTG search interval	6.5			
				Met search interval	8.4			

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
2-Mar-09	WTG 7-11, Met 2	9:00	13:30	DM, IB	9.0	5		
3-Mar-09	WTG 12-16, Met 3, 4, 5	9:00	14:00	DM, IB	10.0	5		
4-Mar-09	WTG 17-1, Met 1	9:30	13:30	DM, IB	8.0	5		
5-Mar-09	WTG 2-6, Met 6, 7	8:30	12:30	DM, IB	8.0	5		
	Hana'ula overlap							
				Weekly Totals:	**35.0**	**20**	**1.00**	
9-Mar-09	WTG 7-11, Met 2	7:30	12:00	DM	4.5	5		
10-Mar-09	WTG 12-16, Met 3, 4, 5	8:30	13:00	DM	4.5	5		
11-Mar-09	WTG 17-20, Met 6, 7	12:00	15:45	IB, DM	7.0	4		
12-Mar-09	WTG 1-6, Met 1	7:15	12:30	DM	5.3	6		
				Weekly Totals:	**21.3**	**20**	**1.00**	
16-Mar-09	WTG 7-11, Met 2	9:15	13:45	DM	4.5	5		
17-Mar-09	WTG 12-16, Met 3	9:30	13:30	IB, DM	8.0	5		
18-Mar-09	WTG 17-20, Met 4, 5, 6, 7	9:30	14:00	DM	4.5	4		
19-Mar-09	RAIN-OUT: ZERO VISIBILITY							
				Weekly Totals:	**17.0**	**14**	**0.70**	
23-Mar-09	WTG 1-5, Met 1	10:00	14:00	IB, GS	8.0	4		
24-Mar-09	WTG 6-9, Met 2, 6, 7	12:30	15:30	IB, DM	6.0	4		
25-Mar-09	WTG 10-14, Met 3, 4, 5	11:30	14:30	IB, DM	6.0	5		
26-Mar-09	WTG 15-20, Hana'ula overlap	9:00	17:30	DM, IB	17.0	6		
27-Mar-09	WTG 1-5, Met 1	9:30	13:00	DM, IB	7.0	5		
				Weekly Totals:	**44.0**	**24**	**1.20**	
				WTG search Interval	7.4			
				Met search interval	9.7			

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
30-Mar-09	WTG 6-10, Met 2	9:30	14:00	DM, GS	9.0	5		
31-Mar-09	WTG 11-14, Met 3	9:00	13:00	DM, IB	8.0	4		
1-Apr-09	WTG 15-20, Met 6, 7	9:00	15:00	DM, IB	12.0	6		
2-Apr-09	WTG 1-5, Met 1, 4, 5	9:30	13:30	IB, DM	8.0	5		
3-Apr-09	Hana'ula overlap			IB, DM				
				Weekly Totals:	**37.0**	**20**	**1.00**	
6-Apr-09	WTG 6-9, Met 2	9:15	13:15	DM	4.0	4		
7-Apr-09	WTG 10-14, Met 3, 4, 5	10:00	14:00	IB, DM	8.0	5		
8-Apr-09	WTG 15-18	8:30	12:30	DM, IB	8.0	4		
9-Apr-09	WTG 19-20, Hana'ula overlap, Met 1	10:00	13:30	DM, IB	7.0	4		
10-Apr-09	WTG 3-6, Met 6, 7	9:00	12:00	IB, DM	6.0	3		
				Weekly Totals:	**33.0**	**20**	**1.00**	
13-Apr-09	WTG 7-10, Met 2	12:00	15:15	DM	3.3	4		
14-Apr-09	WTG 11-14, Met 3, 4, 5	11:00	14:30	IB, GS	7.0	4		
15-Apr-09	WTG 15-19, Met 6, 7	9:00	14:00	DM, IB	10.0	5		
16-Apr-09	WTG 20-3, Met 1	10:15	14:15	DM, IB	8.0	4		**Ring-neck Pheasant**
								Time: **13:02**
								Nearest WTG: **3**
								Dist to WTG: **1.8 m**
								Dir from WTG: **NW**
								Gr Cov: **Gravel/Grass**
17-Apr-09	Hana'ula overlap, WTG 4-6	9:00	13:00	IB, DM	8.0	3		
				Weekly Totals:	**36.3**	**20**	**1.00**	

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
20-Apr-09	WTG 7-11, Met 2	11:15	14:30	DM, I B	6.5	5		
21-Apr-09	WTG 12-15, Met 3, 4, 5	10:45	14:45	IB, DM	8.0	4		
22-Apr-09	WTG 16-19, Met 6, 7	10:00	14:00	IB, DM	8.0	4		
23-Apr-09	WTG 20-3, Met 1	8:30	14:00	DM, IB	7.0	4		
24-Apr-09	WTG 4-8, Met 2	9:00	12:30	DM	3.5	5		
				Weekly Totals:	**33.0**	**22**	**1.10**	
27-Apr-09	WTG 09-12, Met 4, 5	11:30	15:30	IB, DM	8.0	4		
28-Apr-09	WTG 13-16, Met 3	9:15	13:00	DM, GS	7.5	4		
29-Apr-09	WTG 17-20	9:30	13:30	DM, GS	8.0	4		
30-Apr-09	WTG 1-6, Met 1, 6, 7	9:00	14:00	DM	5.0	6		
1-May-09	WTG 7-9, Met 2, Hana'ula overlap	12:00	17:00	DM, GS	10.0	2		
				Weekly Totals:	**38.5**	**20**	**1.00**	
				WTG search interval	6.7			
				Met search interval	6.8			
4-May-09	WTG 10-18, Met 3, 4, 5	10:00	16:30	DM, IB	13.0	9		
5-May-09	WTG 19-6, Met 1, 2, 6, 7	9:30	14:30	DM, IB	10.0	7		
6-May-09	WTG 7-15, Met 2, 3	8:30	15:30	DM, IB	14.0	9		
7-May-09	WTG 16-3, Met 1	8:30	15:30	DM, IB	14.0	8		
8-May-09	WTG 4-8, Met 2, Hana'ula overlap	9:00	15:30	IB, DM	13.0	5		
				Weekly Totals:	**64.0**	**38**	**0.95**	
11-May-09	WTG 9-17, Met 3, 4, 5	9:30	16:00	IB, DM, GS	19.5	9		
12-May-09	WTG 18-4, Met 1	9:00	15:00	IB, DM	12.0	7		
13-May-09	WTG 5-14, Met 2, 3, 4, 5	9:30	16:00	IB, DM	13.0	10		
14-May-09	WTG 15-20, Met 6, 7	8:00	14:00	IB, DM	12.0	6		
15-May-09	WTG 1-8, Met 1	9:30	15:00	IB, DM	11.0	8		
				Weekly Totals:	**67.5**	**40**	**1.00**	

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
18-May-09	WTG 9-17, Met 3, 4, 5	8:00	14:00	IB, DM	12.0	9		**Black Francolin**
								Time: **12:10**
								Nearest WTG: **15**
								Dist to WTG: **6.7 m**
								Dir from WTG: **NE**
								Gr Cov: **Bare/weeds**
19-May-09	WTG 18-5, Met 1	8:30	15:00	IB, DM	13.0	8		
20-May-09	WTG 6-15, Met 2, 3	8:30	15:00	IB, DM	13.0	10		
21-May-09	WTG 16-3, Met 1	10:00	13:00	IB, DM, GS	6.0	8		
22-May-09	WTG 4-7, Met 2, Hana'ula overlap	8:00	14:30	IB, DM	13.0	4		
				Weekly Totals:	**57.0**	**39**	**0.98**	
25-May-09	Memorial Day Holiday							
26-May-09	WTG 8-17, Met 3, 4, 5	9:00	16:00	IB, DM	14.0	10		
27-May-09	WTG 18-6, Met 1	8:30	14:30	IB, DM	12.0	9		
28-May-09	WTG 7-15, Met 2, 3	8:00	15:00	IB, GS, CP	12.0	9		
29-May-09	WTG 16-3, Met 1, 6, 7	12:00	15:45	IB, GS, BR	11.3	8		
				Weekly Totals:	**49.3**	**36**	**0.90**	
				WTG search interval	3.8			
				Met search interval	6.0			
1-Jun-09	WTG 4-13, Met 2, 3, 4, 5	10:45	16:00	GS, BR, DM	15.8	10		
2-Jun-09	WTG 14-20, Met 6, 7	9:15	15:15	GS, DM	12.0	7		
3-Jun-09	WTG 1-9, Met 1, 2	9:00	15:15	GS, DM	12.5	9		
4-Jun-09	**WTG 1-20 (Nene Survey)**	8:30	14:00	GS, BR, DM	16.5	20		
				Weekly Totals:	**56.8**	**46**	**1.15**	

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
8-Jun-09	WTG 10-18, Met 3, 4, 5	9:00	15:30	DM, IB	11.0	9		**Eurasian Skylark**
								Time: **10:20**
								Nearest WTG: **13**
								Dist to WTG: **13.3 m**
								Dir from WTG: **SW**
								Gr Cov: **Bare**
9-Jun-09	WTG 19-5, Met 1	10:00	15:00	DM, GS	10.0	9		
10-Jun-09	WTG 6-12, Met 2	10:30	17:30	DM, IB	14.0	7		**Hawaiian Goose (Nene)**
								Time: **13:07**
								Nearest WTG: **7**
								Dist to WTG: **22.8 m**
								Dir from WTG: **SSW**
								Gr Cov: **Bare/Grass**
11-Jun-09	WTG 13-17, Met 3, 4, 5	9:00	14:30	DM, GS	11.0	5		
12-Jun-09	WTG 18-7, Met 1, 2	11:00	17:00	IB, DM	12.0	10		**Spotted Dove**
								Time: **12:00**
								Nearest WTG: **12**
								Dist to WTG: **1 m**
								Dir from WTG: **NNE**
				Weekly Totals:	**58.0**	**40**	**1.00**	Gr Cov: **Bare**

Date	Search Plot ID	Start Time	End Time	Observers	Searcher Hours	# of Plots Searched	Sweeps Per Week	Downed Wildlife Observed (Species)
15-Jun-09	WTG 8-17, Met 2, 3, 4, 5	8:30	17:00	IB, DM	17.0	10		**Barn Owl**
								Time: **7:15**
								Nearest WTG: **20**
								Dist to WTG: **>300 m**
								Dir from WTG: **ESE**
								Gr Cov: Road edge/gravel
16-Jun-09	WTG 18-5, Met 1	9:00	15:30	IB, DM	13.0	8		
17-Jun-09	WTG 6-14, Met 2, 3	9:00	14:30	IB, DM	11.0	9		
18-Jun-09	WTG 15-20, Met 6, 7	9:00	13:30	IB, DM	9.0	6		
19-Jun-09	Hana'ula overlap, WTG 1-7, Met 1, 2	9:30	15:30	IB, DM	12.0	7		
				Weekly Totals:	**62.0**	**40**	**1.00**	
22-Jun-09	WTG 9-17, Met 3, 4, 5	12:30	16:30	IB, DM	8.0	9		
23-Jun-09	WTG 18-5, Met 1, 6, 7	9:15	13:15	IB, DM	8	8		
24-Jun-09	WTG 6-14, Met 2, 3	9:30	13:00	IB, DM	7	9		
25-Jun-09	WTG 15-2, Met 1	10:00	14:00	IB, DM	8	8		
26-Jun-09	Hana'ula overlap, WTG 3-8, Met 2	10:30	15:00	IB, GS	4.5	6		
				Weekly Totals:	**35.5**	**40**	**1.00**	
				WTG search interval	3.4			
				Met search interval	5.5			

Annual Average Search Interval (WTG)	**5.96**
Annual Average Search Interval (Mets)	**7.57**

Observers	Date	Proctor	Search Plots	Number of Carcasses	Trial Species	Number Detected	Detection Efficiency	Ground Cover Class
D. Medrano	8-Jul-2008	G. Spencer	Met 3	2	WTSH	2	1.00	Grass
K. Mokross			WTG 18	1	WTSH	1	1.00	Shrub
D. Medrano	10-Jul-2008	G. Spencer	WTG 6	2	WTSH	2	1.00	Grass
K. Mokross			WTG 6	2		1	0.50	Shrub
			Met 2	2	WTSH	2	1.00	Grass
D. Medrano	16-Jul-2008	G. Spencer	WTG 2	2	WTSH	1	0.50	Shrub
K. Mokross			WTG 3	3	WTSH	3	1.00	Grass and shrub
D. Medrano	18-Jul-2008	G. Spencer	WTG 8	2	WTSH	2	1.00	Grass
K. Mokross			WTG 8	1	WTSH	1	1.00	Bare
			WTG 9	2	WTSH	2	1.00	Grass
			WTG 11	2	WTSH	2	1.00	Bare
			WTG 11	1	WTSH	1	1.00	Grass
						July Average	**0.92**	

Observers	Date	Proctor	Search Plots	Number of Carcasses	Trial Species	Number Detected	Detection Efficiency	Ground Cover Class
I. Bordenave	1-Aug-2008	G. Spencer	WTG 17	1	WTSH	1	1.00	Grass
D. Medrano				1	WTSH	1	1.00	Bare
				1	WTSH	0	0.00	Shrub
			WTG 18	1	WTSH	1	1.00	Shrub
				1	HOSP	1	1.00	Bare
			WTG 19	2	WTSH	1	0.50	Grass
I. Bordenave	5-Aug-2008	G. Spencer	WTG 14	2	WTSH	1	0.50	Grass
			WTG 15	3	WTSH	2	0.67	Grass/Shrub
			Met 3	2	WTSH	2	1.00	Grass
D. Medrano	6-Aug-2008	G. Spencer	WTG 18	2	WTSH	1	0.50	Shrub
			WTG 18	1	WTSH	1	1.00	Bare
			WTG 20	2	WTSH	2	1.00	Shrub
			ROAD	2	WTSH	2	1.00	Bare
D. Medrano	12-Aug-2008	G. Spencer	WTG 13	2	WTSH	1	0.50	Grass
K. Mokross			WTG 13	1	WTSH	1	1.00	Bare
			WTG 14	3	WTSH	2	0.67	Grass
			WTG 14	1	WTSH	1	1.00	Bare
D. Medrano	15-Aug-2008	G. Spencer	WTG 5	2	WTSH	2	1.00	Grass
			WTG 7	1	WTSH	1	1.00	Grass
			WTG 7	1	HOSP	1	1.00	Bare
K. Mokross	29-Aug-2008	S. Trunkey	WTG 4	2	WTSH	1	0.50	Grass/shrub
I. Bordenave			WTG 6	2	WTSH	1	0.50	Grass/shrub
			WTG 7	2	WTSH	2	1.00	Grass/shrub
						August Average	**0.80**	

Observers	Date	Proctor	Search Plots	Number of Carcasses	Trial Species	Number Detected	Detection Efficiency	Ground Cover Class
D. Medrano	4-Sep-2008	I. Bordenave	WTG 1	3	WTSH	2	0.67	Shrub
K. Mokross			WTG 2	2	HOSP	1	0.50	Shrub
D. Medrano	9-Sep-2008	I. Bordenave	WTG 11	3	WTSH	2	0.67	Grass
K. Mokross			WTG 11	1	WTSH	0	0.00	Shrub
			Sub-station pad	2	HOSP	2	1.00	Bare
			WTG 12	2	WTSH	1	0.50	Grass/shrub
D. Medrano	24-Sep-2008	I. Bordenave	WTG 17	2	HOSP	0	0.00	Grass
K. Mokross			WTG 20	3	WTSH	2	0.67	Bare/grass
						September Average	0.50	

Observers	Date	Proctor	Search Plots	Number of Carcasses	Trial Species	Number Detected	Detection Efficiency	Ground Cover Class
D. Medrano	16-Oct-2008	I. Bordenave	WTG 14	3	WTSH	2	0.67	Grass
K. Mokross			WTG 17	3	WTSH	2	0.67	Shrub
D. Medrano	30-Oct-2008	I. Bordenave	WTG 9	2	WTSH	2	1.00	Grass/Bare
			WTG 9	1	WTSH	0	0.00	Shrub
			WTG 11	3	WTSH	2	0.67	Grass
K. Mokross			WTG 15	2	WTSH	1	0.50	Grass
			WTG 15	2	WTSH	2	1.00	Bare
						October Average	0.64	

Observers	Date	Proctor	Search Plots	Number of Carcasses	Trial Species	Number Detected	Detection Efficiency	Ground Cover Class
D. Medrano	3-Nov-2008	I. Bordenave	WTG 5	2	WTSH	2	1.00	Grass
K. Mokross			WTG 10	3	WTSH	2	0.67	Grass/Shrub
D. Medrano	5-Nov-2008	I. Bordenave	WTG 2	2	WTSH	1	0.50	Shrub
K. Mokross			WTG 5	2	WTSH	2	1.00	Grass
			WTG 5	1	WTSH	1	1.00	Bare
			WTG 8	3	WTSH	3	1.00	Grass/Bare
D. Medrano	13-Nov-2008	I. Bordenave	WTG 4	2	WTSH	2	1.00	Grass/Shrub
K. Mokross			WTG 5	3	WTSH	3	1.00	Shrub
			WTG 7	2	WTSH	1	0.50	Grass/Shrub
			WTG 7	2	HOSP	2	1.00	Bare
D. Medrano	14-Nov-2008	G. Spencer	WTG 12	3	WTSH	3	1.00	Bare
K. Mokross			WTG 16	3	WTSH	3	1.00	Grass
I.Bordenave			WTG 19	3	WTSH	2	0.67	Shrub
K. Mokross	20-Nov-2008	G. Spencer	WTG 8	3	WTSH	3	1.00	Grass
			WTG 8	1	HOSP	1	1.00	Bare
I. Bordenave			WTG 14	2	WTSH	2	1.00	Grass
			WTG 14	1	WTSH	0	0.00	Shrub
						November Average	**0.84**	

Observers	Date	Proctor	Search Plots	Number of Carcasses	Trial Species	Number Detected	Detection Efficiency	Ground Cover Class
K. Mokross D. Medrano	2-Dec-2008	I. Bordenave	WTG 17	2	HOSP	1	0.50	Grass
			WTG 17	3	WTSH	2	0.67	Grass
			WTG 18	1	WTSH	0	0.00	Shrub
			WTG 18	2	WTSH	2	1.00	Bare
			WTG 18	3	WTSH	3	1.00	Grass
			Met 7	2	WTSH	2	1.00	Grass
K. Mokross D. Medrano	3-Dec-2008	I. Bordenave	WTG 1	2	WTSH	2	1.00	Bare
			WTG 1	3	WTSH	2	0.67	Grass/Shrub
			WTG 4	3	WTSH	2	0.67	Grass/Shrub
			WTG 4	1	HOSP	1	1.00	Bare
K. Mokross D. Medrano	8-Dec-2008	G. Spencer	WTG 16	2	WTSH	2	1.00	Shrub
			WTG 17	3	HOSP	2	0.67	Bare
			Met 3	3	WTSH	2	0.67	Grass
			Met 4	1	WTSH	1	1.00	Grass
			Met 4	1	HOSP	1	1.00	Grass
K. Mokross D. Medrano	12-Dec-2008	G. Spencer	WTG 5	2	WTSH	2	1.00	Grass
			WTG 6	1	WTSH	1	1.00	Bare
			WTG 6	2	HOSP	1	0.50	Shrub
			WTG 7	3	WTSH	3	1.00	Grass
			WTG 10	1	WTSH	1	1.00	Bare
			WTG 10	2	WTSH	1	0.50	Grass
K. Mokross D. Medrano	18-Dec-2008	G. Spencer	WTG 7	3	WTSH	2	0.67	Grass
			WTG 7	2	WTSH	2	1.00	Bare
			WTG 8	1	WTSH	1	1.00	Grass
			WTG 8	2	WTSH	1	0.50	Shrub
K. Mokross D. Medrano	31-Dec-2008	I. Bordenave	WTG 13	1	WTSH	1	1.00	Grass
			WTG 13	2	WTSH	1	0.50	Shrub
			WTG 13	1	WTSH	1	1.00	Grass
			WTG 14	1	WTSH	0	0.00	Grass
			WTG 14	1	WTSH	1	1.00	Bare
			WTG 19	1	HOSP	1	1.00	Bare
			WTG 19	2	HOSP	1	0.50	Grass/Shrub
						December Average	0.78	

Observers	Date	Proctor	Search Plots	Number of Carcasses	Trial Species	Number Detected	Detection Efficiency	Ground Cover Class
I. Bordenave, D. Medrano	12-Jan-2009	G. Spencer	WTG 20	2	WTSH	1	0.50	Shrub
			WTG 20	1	WTSH	1	1.00	Bare
			WTG 4	2	WTSH	1	0.50	Grass/Shrub
			WTG 4	2	WTSH	2	1.00	Shrub
			WTG 6	3	WTSH	2	0.67	Grass
			WTG 6 roadside	2	WTSH	2	1.00	Bare
I. Bordenave D. Medrano	14-Jan-2009	G. Spencer	WTG 9	2	WTSH	2	1.00	Grass
			WTG 9	1	WTSH	1	1.00	Shrub
			WTG 9	1	WTSH	1	1.00	Bare
			WTG 10	2	WTSH	2	1.00	Bare
			WTG 10	3	WTSH	1	0.33	Grass
I. Bordenave D. Medrano	21-Jan-2009	G. Spencer	WTG 5	3	WTSH	2	0.67	Grass
			WTG 6	3	WTSH	3	1.00	Grass
			WTG 6	1	HOSP	0	0.00	Shrub
			WTG 7	2	WTSH	2	1.00	Grass
			WTG 7 roadside	1	HOSP	1	1.00	Bare
I. Bordenave D. Medrano	23-Jan-2009	G. Spencer	Met 4	2	WTSH	2	1.00	Grass
			Met 5	2	WTSH	2	1.00	Grass
			Met 5	2	HOSP	1	0.50	Grass
			WTG 13	2	WTSH	1	0.50	Shrub
			WTG 15	3	WTSH	2	0.67	Grass
			WTG 15	2	WTSH	2	1.00	Bare
						January Average	**0.79**	

Observers	Date	Proctor	Search Plots	Number of Carcasses	Trial Species	Number Detected	Detection Efficiency	Ground Cover Class
D. Medrano I. Bordenave	10-Feb-2009	S.Trunkey	WTG 12	1	WTSH	1	1.00	Shrub
			WTG 13	2	WTSH	1	0.50	Grass
			WTG 13	1	WTSH	1	1.00	Bare
			roadway	1	WTSH	1	1.00	Bare
I. Bordenave D. Medrano	20-Feb-2009	G. Spencer	WTG 5	2	WTSH	1	0.50	Shrub
			WTG 6	2	WTSH	2	1.00	Grass
			WTG 6	2	WTSH	1	0.50	Shrub
I. Bordenave D. Medrano	26-Feb-2009	S.Trunkey	WTG 2	1	WTSH	1	1.00	Shrub
			WTG 3	2	WTSH	2	1.00	Shrub
			WTG 5	2	WTSH	1	0.50	Grass
						February Average	**0.80**	

Observers	Date	Proctor	Search Plots	Number of Carcasses	Trial Species	Number Detected	Detection Efficiency	Ground Cover Class
I. Bordenave D. Medrano	11-Mar-2009	G. Spencer	WTG 17	1	WTSH	1	1.00	Grass
			WTG 18	2	WTSH	2	1.00	Shrub
			WTG 20	2	WTSH	2	1.00	Shrub
I. Bordenave D. Medrano	17-Mar-2009	G. Spencer	WTG 12	1	WTSH	0	0.00	Shrub
			WTG 12	1	WTSH	1	1.00	Bare
			WTG 14	1	WTSH	1	1.00	Bare
			WTG 14-15	1	WTSH	0	0.00	Shrub
			WTG 15	1	WTSH	1	1.00	Grass
			WTG 16	1	WTSH	1	1.00	Grass
I. Bordenave D. Medrano	18-Mar-2009	G. Spencer	WTG 17	1	WTSH	1	1.00	Bare ground
			WTG 18	1	WTSH	1	1.00	Grass
						March Average	**0.82**	

Observers	Date	Proctor	Search Plots	Number of Carcasses	Trial Species	Number Detected	Detection Efficiency	Ground Cover Class
I. Bordenave D. Medrano	7-Apr-2009	G. Spencer	WTG 11	1	WTSH	0	0.50	Shrub
			Lower Sub-Sta	1	WTSH	1	1.00	Bare
			WTG 12	2	WTSH	2	1.00	Grass
			WTG-13	2	WTSH	1	0.50	Grass
			WTG-14	1	WTSH	1	1.00	Shrub
D. Medrano I. Bordenave	16-Apr-2009	G. Spencer	WTG 20	2	WTSH	2	1.00	Shrub
			WTG 1	1	HOSP	1	1.00	Bare
			WTG 2	2	WTSH	1	0.50	Shrub
D. Medrano I. Bordenave	22-Apr-2009	G. Spencer	WTG-16	1	WTSH	1	1.00	Grass
			WTG-17	1	WTSH	1	1.00	Shrub
			WTG-18	1	WTSH	1	1.00	Bare
			WTG-18	1	HOSP	1	1.00	Bare
D. Medrano I. Bordenave	24-Apr-2009	G. Spencer	WTG 4	1	WTSH	0	0.00	Grass
			WTG 6	1	WTSH	1	1.00	Shrub
			WTG 6	1	WTSH	1	1.00	Bare
			WTG 8	1	HOSP	1	1.00	Grass
I. Bordenave D. Medrano	27-Apr-2009	G. Spencer	WTG 9	1	HOSP	1	1.00	Bare
			WTG 10	1	WTSH	1	1.00	Bare
			WTG 10	1	WTSH	1	1.00	Grass
			Sub-Sta Slope	1	WTSH	1	1.00	Bare; entangled in erosion mesh
						April Average	0.88	

Observers	Date	Proctor	Search Plots	Number of Carcasses	Trial Species	Number Detected	Detection Efficiency	Ground Cover Class
I. Bordenave D. Medrano	11-May-2009	G. Spencer	WTG 12	1	WTSH	1	1.00	Shrub
			WTG 12	1	WTSH	1	1.00	Grass
			WTG 15	1	HOSP	0	0.00	Grass
			WTG 15	1	WTSH	1	1.00	Shrub
I. Bordenave D. Medrano	13-May-2009	G. Spencer	WTG-5	1	WTSH	1	1.00	Bare
			WTG-6	1	WTSH	0	0.00	Shrub
			WTG 7	2	WTSH	2	1.00	Grass
I. Bordenave G. Spencer B. Roy	29-May-2009	K. Medrano	WTG-9	1	HOSP	1	1.00	Bare
			WTG 10	1	WTSH	1	1.00	Grass
			WTG 10	1	WTSH	1	1.00	Bare
						May Average	0.80	

Observers	Date	Proctor	Search Plots	Number of Carcasses	Trial Species	Number Detected	Detection Efficiency	Ground Cover Class
I. Bordenave D. Medrano	3-Jun-2009	G. Spencer	WTG 19	1	WTSH	1	1.00	Grass
			WTG 19	1	WTSH	1	1.00	Bare
			WTG 20	1	WTSH	1	1.00	Grass
			WTG 20	1	HOSP	0	0.00	Shrub
I. Bordenave D. Medrano	12-Jun-2009	G.Spencer	WTG-12	1	WTSH	1	1.00	Bare
			WTG-12	1	WTSH	1	1.00	Shrub
			WTG-14	1	HOSP	1	1.00	Grass
			WTG-14	2	WTSH	1	0.50	Grass
			WTG-15	1	WTSH	1	1.00	Bare
						June Average	0.83	

Winter Averages (November-April)

WTSH -- Bare	**1.00**
WTSH -- Grass	**0.81**
WTSH -- Shrub	**0.67**
WTSH -- Overall	**0.83**

HOSP -- Bare	**1.00**
HOSP -- Grass	**0.70**
HOSP -- Shrub	**0.33**
HOSP -- Overall	**0.68**

Summer Averages (May-October)

WTSH -- Bare	**0.97**
WTSH -- Grass	**0.82**
WTSH -- Shrub	**0.62**
WTSH -- Overall	**0.80**

HOSP -- Bare	**1.00**
HOSP -- Grass	**0.50**
HOSP -- Shrub	**0.25**
HOSP -- Overall	**0.58**

Overall Average	**0.78**

WTSH = Wedge-tailed Shearwater
HOSP = House Sparrow

Carcass Removal Trial - August 2008

Trial species: Wedge-tailed Shearwater (*Puffinus pacificus)*

Date	Trial Day	Carcass ID	Location	Status	Condition	Comments
26-Aug-08	1	A	20m NNE of WTG 01	P	Fr, I	
	1	B	40m W of WTG 04	P	Fr, I	
	1	C	25m N of KWP II - 2	P	Fr, I	
	1	D	35m NE of WTG 16	P	Fr, I	
27-Aug-08	2	A	20m NNE of WTG 01	P	I, U	
	2	B	40m W of WTG 04	P	I, U	
	2	C	25m N of KWP II - 2	P	I, U	
	2	D	35m NE of WTG 16	P	I, U	
28-Aug-08	3	A	20m NNE of WTG 01	P	I, D	Ants.
	3	B	40m W of WTG 04	P	I, D	Some decomposition evident around the neck area.
	3	C	25m N of KWP II - 2	P	I, D	Ants.
	3	D	35m NE of WTG 16	P	I, D	Ants.
29-Aug-08	4	A	20m NNE of WTG 01	P	I, D	Ants.
	4	B	40m W of WTG 04	P	I, D	Hole in neck area with ants and flies going in and out
	4	C	25m N of KWP II - 2	P	I, D	Ants.
	4	D	35m NE of WTG 16	P	I, D	Ants.
30-Aug-08	5	A	20m NNE of WTG 01	P	I, D	Ants.
	5	B	40m W of WTG 04	P	I, D	Hole in neck area with ants and flies going in and out.
	5	C	25m N of KWP II - 2	P	I, D	ants
	5	D	35m NE of WTG 16	P	I, D	ants
31-Aug-08	6	A	20m NNE of WTG 01	P	I, D	ants
	6	B	40m W of WTG 04	S	R	Carcass moved 5 ft S into lantana & ulei shrub; head and chest mostly consumed.
	6	C	25m N of KWP II - 2	P	I, D	Ants.
	6	D	35m NE of WTG 16	S	R	Carcass moved 2 ft E beneath ohia/aalii/pukiawe; head and abdomen consumed.

Carcass Removal Trial -September 2008

Trial species: Wedge-tailed Shearwater (*Puffinus pacificus)*

1-Sep-08	7	A	20m NNE of WTG 01	P	I, D	Ants
	7	B	40m W of WTG 04	A	R, F	Carcass removed, some feathers remain.
	7	C	25m N of KWP II - 2	P	I, D	ants, maggots
	7	D	35m NE of WTG 16	A	R, F	Carcass removed, some feathers
4-Sep-08	10	A	20m NNE of WTG 01	P	I, D	Ants
	10	B	40m W of WTG 04	A	R, F	Some feathers remain.
	10	C	25m N of KWP II - 2	P	I, D	ants, maggots
	10	D	35m NE of WTG 16	A	R, F	Some feathers remain.
8-Sep-08	14	A	20m NNE of WTG 01	P	I, D	
	14	B	40m W of WTG 04	S	R, F	Few feathers remain
	14	C	25m N of KWP II - 2	P	I, D	Body desiccated, overall untouched; beetles and ants beneath after removal.
	14	D	35m NE of WTG 16	S	R, F	Few feathers remain

Results

Status Codes
S = Scavenged, P = Present, A = Absent

Condition Codes
Fr = Fresh; I = Intact; U = Undisturbed; ; R = Remains discovered
D = Natural decomposition (insects usually visible)
F = Feathers and Bone fragments; Des = Dessication evident

Carcass	Retention Time (t_i)
A	14
B	6
C	14
D	6
	Average Retention Time
	10

Carcass Removal Trial - November 2008

Trial species: Wedge-tailed Shearwater (*Puffinus pacificus)*

Date	Trial Day	Carcass ID	Location	Status	Condition	Comments
11-Nov-08	1	A	25m W of WTG 09	P	Fr, I	
	1	B	30m SE of WTG 11	P	Fr, I	
	1	C	35m N of WTG 12	P	Fr, I	
	1	D	15m SW of WTG 05-pad edge	P	Fr, I	

Carcass Removal Trial - Nov 2008 (Cont.)						**Trial species**: Wedge-tailed Shearwater (*Puffinus pacificus)*
13-Nov-08	3	A	25m W of WTG 09	P	I, U, D	Ants.
	3	B	30m SE of WTG 11	P	I, U, D	
	3	C	35m N of WTG 12	P	I, U, D	Ants.
	3	D	15m SW of WTG 05-pad edge	P	I, U, D	Ants.
14-Nov-08	4	A	25m W of WTG 09	P	I, U, D	Ants.
	4	B	30m SE of WTG 11	P	I, U, D	Ants.
	4	C	35m N of WTG 12	P	I, U, D	Ants.
	4	D	15m SW of WTG 05-pad edge	P	I, U, D	Ants.
15-Nov-08	5	A	25m W of WTG 09	P	I, D	Ants
	5	B	30m SE of WTG 11	S, P	R, I	Carcass dragged 3 m N into 2' of grass, not consumed.
	5	C	35m N of WTG 12	P	I, D	Ants.
	5	D	15m SW of WTG 05-pad edge	P	I, D	Ants.
16-Nov-08	6	A	25m W of WTG 09	S, P	R, F	Carcass dragged 10m S into irowood, neck partialy consumed.
	6	B	30m SE of WTG 11	S, P	R, I, D	Ants and mostly intact remains.
	6	C	35m N of WTG 12	S, A	F, D, R	Carcass absent, right wing at trial site, ants still present.
	6	D	15m SW of WTG 05-pad edge	P	I, D	Ants.
17-Nov-08	7	A	25m W of WTG 09	S	R, F, D	Ants, partial remains.
	7	B	30m SE of WTG 11	S, P	R, I, D	Ants and partial remains.
	7	C	35m N of WTG 12	A	F, D	Carcass absent, ants, some feather and bone fragments.
	7	D	15m SW of WTG 05-pad edge	P	I, D	Ants, maggots.
20-Nov-08	10	A	25m W of WTG 09	S	F, D	Ants, some remains, bones and feathers.
	10	B	30m SE of WTG 11	S, P	R, I, D	Ants and partial remains.
	10	C	35m N of WTG 12	A	F, D	Ants, feathers nearly absent.
	10	D	15m SW of WTG 05-pad edge	P	I, D	Ants, maggots.
22-Nov-08	14	A	25m W of WTG 09	S	F, D	Ants, few feathers.
	14	B	30m SE of WTG 11	S, P	R, F, D	Ants and partial remains
	14	C	35m N of WTG 12	A	F, D	Ants, feathers nearly absent
	14	D	15m SW of WTG 5 pad edge	S	R, F	Carcass dragged 15 ft. downslope but visible at edge of grass.

Carcass Removal Trial - November 2008

	Results	
Status Codes	**Carcass**	**Retention Time (ti)**
S = Scavenged, P = Present, A = Absent	A	6
	B	14
Condition Codes	C	5
Fr = Fresh; I = Intact; U = Undisturbed; ; R = Remains discovered	D	14
D = Natural decomposition (insects usually visible)		Average Retention Time
F = Feathers and Bone fragments; Des = Dessication evident		**9.75**

Carcass Removal Trial - February 2009

Trial species: Wedge-tailed Shearwater (*Puffinus pacificus)*

Date	Trial Day	Carcass ID	Location	Status	Condition	Comments
18-Feb-09	0	A	North of WTG 1	P	Fr, I	
	0	B	West of WTG 3	P	Fr, I	
	0	C	West of WTG 7	P	Fr, I	
	0	D	SW of WTG 16	P	Fr, I	
	0	E	West of WTG 20	P	Fr, I	
19-Feb-09	1	A	North of WTG 1	P	Fr, U	
	1	B	West of WTG 3	P	Fr, U	
	1	C	West of WTG 7	P	Fr, U	
	1	D	SW of WTG 16	P	Fr, U	
	1	E	West of WTG 20	P	Fr, U	
20-Feb-09	2	A	North of WTG 1	P	I, U	
	2	B	West of WTG 3	P	I, U	
	2	C	West of WTG 7	P	I, U	
	2	D	SW of WTG 16	P	I, U	
	2	E	West of WTG 20	P	I, D	Carcass showing signs of bloating, ants present.

21-Feb-09	3	A	North of WTG 1	P	I, U	
	3	B	West of WTG 3	P	I, U	
	3	C	West of WTG 7	P	I, U	
	3	D	SW of WTG 16	P	I, U	
	3	E	West of WTG 20	S, P	R, F	Feathers and wings present, no nearby remains found.
22-Feb-09	4	A	North of WTG 1	S, P	R, F	Feathers and wings 3 m N, no other remains found.
	4	B	West of WTG 3	P	I, U	
	4	C	West of WTG 7	P	I, U	
	4	D	SW of WTG 16	P	I, U	
	4	E	West of WTG 20	S, P	F	Feathers and wings still present, no other remains
23-Feb-09	5	A	North of WTG 1	S	F	Removed remaining feathers and wings / removed from trial.
	5	B	West of WTG 3	P	I, U, D	Flies more numerous.
	5	C	West of WTG 7	P	I, U, D	Flies more numerous.
	5	D	SW of WTG 16	P	I, U, D	Flies more numerous.
	5	E	West of WTG 20	A	F	Removed remaining feathers and wings / removed from trial.
24-Feb-09	6	A	North of WTG 1	A		Removed from trial.
	6	B	West of WTG 3	P	I, U, D	Ants and general breakdown/decomp.
	6	C	West of WTG 7	P	I, U, D	Ants and general breakdown/decomp.
	6	D	SW of WTG 16	P	I, U, D	Ants and general breakdown/decomp.
	6	E	West of WTG 20	A		Removed from trial.
25-Feb-09	7	A	North of WTG 1			
	7	B	West of WTG 3	P	I, U, D	
	7	C	West of WTG 7	P	I, U, D	
	7	D	SW of WTG 16	P	I, U, Des	Strong winds blew the drying carcass 11m SSW.
	7	E	West of WTG 20			
28-Feb-09	10	A	North of WTG 1			
	10	B	West of WTG 3	P	I, U, D	Few ants.
	10	C	West of WTG 7	P	I, U, D	Few ants.
	10	D	SW of WTG 16	P	I, U, Des	Ants.
	10	E	West of WTG 20			

Carcass Removal Trial - March 2009

Trial species: Wedge-tailed Shearwater (*Puffinus pacificus)*

4-Mar-09	14	A	North of WTG 1			
	14	B	West of WTG 3	P	I, U, D	
	14	C	West of WTG 7	P	I, U, D	
	14	D	SW of WTG 16	P	I, U, Des	Ants.
	14	E	West of WTG 20			

Status Codes
S = Scavenged, P = Present, A = Absent

Condition Codes
Fr = Fresh; I = Intact; U = Undisturbed; ; R = Remains discovered
D = Natural decomposition (insects usually visible)
F = Feathers and Bone fragments; Des = Dessication evident

Results

Carcass	**Retention Time (ti)**
A	5
B	14
C	14
D	14
E	5
	Average Retention Time
	10.4

Carcass Removal Trial - May 2009

Trial species: Wedge-tailed Shearwater (*Puffinus pacificus)*

Date	**Trial Day**	**Carcass ID**	**Location**	**Status**	**Condition**	**Comments**
6-May-09	0	A	NW: WTG 3	P	Fr, I	
	0	B	South: WTG 06	P	Fr, I	
	0	C	NW: KWP II-MET 1	P	Fr, I	
	0	D	East: WTG 10	P	Fr, I	
	0	E	East: WTG 14	P	Fr, I	
	0	F	SE: WTG 19	P	Fr, I	
7-May-09	1	A	NW: WTG 3	P	Fr, I, U	
	1	B	South: WTG 6	P	Fr, I, U	
	1	C	NW: KWP II-MET 1	P	Fr, I, U	
	1	D	East: WTG 10	P	Fr, I, U	
	1	E	East: WTG 14	P	Fr, I, U	
	1	F	SE: WTG 19	S, P	Fr, I	Moved a few feet into nearby ironwoods.

Carcass Removal Trial - May 2009 (Cont.)						**Trial species**: Wedge-tailed Shearwater (*Puffinus pacificus)*
8-May-09	2	A	NW: WTG 3	P	I, D	Flies present.
	2	B	South: WTG 6	P	I, D	Flies present.
	2	C	NW: KWP II-MET 1	P	U, I	
	2	D	East: WTG 10	P	U, I	
	2	E	East: WTG 14	P	I, D	Flies present
	2	F	SE: WTG 19	S, P	I	No change.
9-May-09	3	A	NW: WTG 3	P	I, D	
	3	B	South: WTG 6	P	I, D	
	3	C	NW: KWP II-MET 1	P	I, Des	
	3	D	East: WTG 10	P	I, D	
	3	E	East: WTG 14	P	I, D, Des	Ants, flies.
	3	F	SE: WTG 19	S, P	I, D	No change.
10-May-09	4	A	NW: WTG 3	P	I, D	
	4	B	South: WTG 6	P	I, D	
	4	C	NW: KWP II-MET 1	P	I, D, Des	
	4	D	East: WTG 10	P	I, D	
	4	E	East: WTG 14	P	I, D, Des	
	4	F	SE: WTG 19	S, P	R	Moved deeper into ironwoods, lower abdomen scavenged, torso and wings intact.
11-May-09	5	A	NW: WTG 03	P	I, D	
	5	B	South: WTG 6	P	I, D, Des	
	5	C	NW: KWP II-MET 1	P	I, D, Des	
	5	D	East: WTG 10	P	I, D	
	5	E	East: WTG 14	P	I, D, Des	
	5	F	SE: WTG 19	S	R, F	Torso further consumed, remains still present.
12-May-09	6	A	NW: WTG 3	P	I, D, Des	
	6	B	South: WTG 6	P	I, D, Des	
	6	C	NW: KWP II-MET 1	P	I, D, Des	
	6	D	East: WTG 10	P	I, D, Des	
	6	E	East: WTG 14	P	I, D, Des	
	6	F	SE: WTG 19	S	R, F	Head and wings consumed; (Cat) scat was observed.

Carcass Removal Trial - May 2009 (Cont.)						**Trial species**: Wedge-tailed Shearwater (*Puffinus pacificus)*
13-May-09	7	A	NW: WTG 3	P	I, D, Des	
	7	B	South: WTG 6	S, P	R	Moved 2 ft W to shrub, no scavenging, few adj. feathers.
	7	C	NW: KWP II-MET 1	P	I, D, Des	
	7	D	East: WTG 10	P	I, D, Des	
	7	E	East: WTG 14	P	I, D, Des	
	7	F	SE: WTG 19	A	F	Removed remaining material.
16-May-09	10	A	NW: WTG 3	P	I, D, Des	
	10	B	South: WTG 6	S, P	R, F	Abdomen scavenged; small feather pile next to carcass.
	10	C	NW: KWP II-MET 1	P	I, D, Des	
	10	D	East: WTG 10	P	I, D, Des	
	10	E	East: WTG 14	S, P	R, F	Moved 5 ft E into rock pile; torso, head, and wings present.
	10	F	SE: WTG 19	A	F	
20-May-09	14	A	NW: WTG 3	P	I, D, Des	
	14	B	South: WTG 6	S, P	R, Des	Carcass still present, becoming mostly feathers and bone
	14	C	NW: KWP II-MET 1	P	I, D, Des	
	14	D	East: WTG 10	P	I, D, Des	
	14	E	East: WTG 14	S, P	R, F, Des	Remains still evident
	14	F	SE: WTG 19	A	F	

Status Codes
S = Scavenged, P = Present, A = Absent

Condition Codes
Fr = Fresh; I = Intact; U = Undisturbed; ; R = Remains discovered
D = Natural decomposition (insects usually visible)
F = Feathers and Bone fragments; Des = Dessication evident

Results

Carcass	**Retention Time (ti)**
A	14
B	14
C	14
D	14
E	14
F	6

Average Retention Time
12.67

Annual Average Retention Time
10.70

FY09

Nene

ODT	N	C	I	k	t	p	$e^{I/t}$	$e^{I/t} - 1$
1	20	1	3.6	20	12.67	0.83	1.3286133	0.328613

$$m = \left(\frac{N*I*C}{k*t*p}\right)\left(\frac{e^{I/t}-1+p}{e^{I/t}-1}\right)$$

72 1.158613
210.322 0.328613

m = 0.342332 * 3.52576739

m = 1.207 **Indirect Take** (m*0.5) = **0.00** **Adjusted Take = 1.207**

Hawaiian Hoary Bat

ODT	N	C	I	k	t	p	$e^{I/t}$	$e^{I/t} - 1$
1	20	1	7.6	20	10	0.58	2.1382762	1.138276

$$m = \left(\frac{N*I*C}{k*t*p}\right)\left(\frac{e^{I/t}-1+p}{e^{I/t}-1}\right)$$

152 1.718276
116 1.138276

m = 1.3103448 * 1.5095425

m = 1.978 **Indirect Take** (m*0.5) = **0.00** **Adjusted Take = 1.978**

Appendix 7. Calculations for Estimating Adjusted Take

Kaheawa Wind Power, Habitat Conservation Plan — Year 3 Annual Review

FY08

Nene

ODT	N	C	I	k	t	p	$e^{I/t}$	$e^{I/t} - 1$
1	20	1	6.05	20	11	0.83	1.733253	0.733253

$$m = \left(\frac{N*I*C}{k*t*p}\right)\left(\frac{e^{I/t}-1+p}{e^{I/t}-1}\right)$$

121	1.563253
182.6	0.733253

m = 0.6626506 * 2.13194218

m = 1.413 | **Indirect Take** (m*0.5) = **0.707** | **Adjusted Take = 2.120**

Nene

ODT	N	C	I	k	t	p	$e^{I/t}$	$e^{I/t} - 1$
1	20	1	8.55	20	11	0.83	2.1755309	1.175531

$$m = \left(\frac{N*I*C}{k*t*p}\right)\left(\frac{e^{I/t}-1+p}{e^{I/t}-1}\right)$$

171	2.005531
182.6	1.175531

m = 0.9364732 * 1.7060639

m = 1.597 | **Indirect Take** (m*0.5) = **0.799** | **Adjusted Take = 2.396**

Appendix 7. Calculations for Estimating Adjusted Take

Kaheawa Wind Power, Habitat Conservation Plan — Year 3 Annual Review

FY08

Hawaiian Petrel

ODT	N	C	I	k	t	p	$e^{I/t}$	$e^{I/t} - 1$
1	20	1	8.64	20	13	0.64	1.9437428	0.943743

$$m = \left(\frac{N * I * C}{k * t * p}\right)\left(\frac{e^{I/t} - 1 + p}{e^{I/t} - 1}\right)$$

172.8 1.583743

166.4 0.943743

m = 1.0384615 * 1.67815073

m = 1.743 | **Indirect Take** (m*0.5) = **0.87** | **Adjusted Take = 2.613**

This exercise represents an initial effort to consider life of project mitigation requirements for Nene by providing an assessment of capacity to meet this requirement through Year 5 as described in the Kaheawa Wind Power HCP. Cooperative evaluation and review of these methods and preliminary determinations between KWP, USFWS, and DOFAW are expected to result in concurrence on the adjustment parameters, process for acounting for these adjustments, and should include consideration of adaptive management options. This exercise is preliminary to the extent that further studies directed at fine-tuning adjustment parameters for large-bodied bird species will greatly enhance projections of mitigation capacity for Nene.

FY09 Species	Observed Take	Month and Year	Adjusted Take	Indirect Take	Loss of Productivity	FY09 Total Adjusted Take	Annual Take Limit*	FY09 Running Average [2]
Nene	1	Jun-09	1.21			1.21	3	1.64
Hawaiian Petrel	0						2	0.75
Newell's Shearwater	0						2	
Hawaiian Hoary Bat	1	Sep-08	1.98			1.98	1	0.57

FY08 Species	Observed Take	Month and Year	Adjusted Take	Indirect Take	Loss of Productivity	FY08 Total Adjusted Take	Annual Take Limit*	FY08 Running Average [1]
Nene	1	Dec-07	1.60	0.80		2.40	3	0.96
	1	Oct-07	1.41	0.71		2.12	3	0.85
Hawaiian Petrel	1	Aug-07	1.74	0.87		2.61	2	1.04
Newell's Shearwater	0						2	
Hawaiian Hoary Bat	0						1	

[1] The FY08 Adjusted Average is based on 30 months (2.5 years) since permit issuance in January, 2006.

[2] The FY09 Adjusted Average is based on 42 months (3.5 years) since permit issuance in January, 2006 inclusive of FY08 and FY09.

* Annual take limits represent the running average per fiscal year.

Preliminary projections for Nene propagation capacity if mitigation begins in Fall, 2009

Nene FY08	**For take of adults**: assume loss of 3 years productivity if replaced immediately; add 10% for each year not replaced.		
1.600	Adjusted take (FY08)		
0.740	4 years lag at 10% per year lost productivity (interest compounded)		
0.800	Indirect take (0.50)		
3.14	Total adjusted take FY09 (includes 4 years lost productivity and indirect take)		
1.410	Adjusted take (FY08)		
0.650	4 years lag at 10% per year lost productivity (interest compounded))		
0.705	Indirect take (0.50)		
2.77	Total adjusted take FY09 (includes 4 years lost productivity and indirect take)		
Nene FY09	**For take of adults**: assume loss of 3 years productivity if replaced immediately; add 10% for each year not replaced		
1.21	Adjusted take (FY09)		
0.40	3 years lag at 10% per year lost productivity (interest compounded)		
0.00	Indirect take		
1.61	Total adjusted take FY09 (includes 3 years lost productivity)		
7.52	Total adjusted take ending FY09 (includes 2 additional years lost productivity for FY08)		
If mitigation begins in Fall 2009 and continues annually at maximum potential (hypothetical)			
10.00	Number of goslings released in Fall 2010 (FY10)		
9.00	Survival rate of released goslings (0.90) in FY10	**1.49**	Mitigation Credit (FY10)
If ODT assesses 2 Nene in FY10 and mitigation occurs in Fall 2010, and adjustment parameters remain equal to FY09 (hypothetical)			
2.42	Total adjusted take FY10 .		
0.80	3 years lag at 10% per year lost productivity (interest compounded)		
0.00	Indirect take		
3.22	Total adjusted take FY10 (includes 3 years lost productivity)		
10.00	Number of goslings released in Fall, 2010 (FY11)		
9.00	Survival rate of released goslings (0.90) in FY11	**7.27**	Mitigation Credit (FY11)
1.48	Average adjusted take/year ending FY11 (hypothetical at 5.5 years)		

	Bare Ground (BG)	Shrub (S)	Grass (G)	Native Vegetation (*s*)	Gulch (*s*)	Transition (*s*)	Ironwood (*s*)	C-Berry (*s*)	Re-Veg (*s*)	Grass (*g*)	Transition (*g*)
WTG 01											
PAST	14%	86%	0%	49%	36%		0%		0%		
PRESENT	12%	88%	0%	50%	36%		0%		1%		
DIFFERENCE	-2%	2%	0%	1%	0%		0%		1%		
WTG 02											
PAST	14%	86%	0%	49%	36%		0%		0%		
PRESENT	12%	88%	0%	50%	36%		0%		1%		
DIFFERENCE	-2%	2%	0%	1%	0%		0%		1%		
WTG 03											
PAST	27%	50%	23%	1%	8%	38%	1%	1%	0%		23%
PRESENT	21%	55%	24%	4%	8%	39%	1%	1%	2%		24%
DIFFERENCE	-6%	5%	1%	3%	0%	0%	0%	0%	2%		1%
WTG 04											
PAST	32%	23%	45%	20%	2%		0%	1%	0%	24%	21%
PRESENT	24%	29%	46%	24%	2%		0%	1%	3%	24%	23%
DIFFERENCE	-7%	6%	1%	4%	0%		0%	0%	3%	0%	1%
WTG 05											
PAST	29%	3%	68%					3%	0%	50%	18%
PRESENT	25%	7%	68%					3%	4%	50%	18%
DIFFERENCE	-4%	4%	0%					0%	4%	0%	0%

PAST = April, 2007 PRESENT = June, 2009

Lower case cover codes (in italics) represent relative composition of Shrub and Grass classes.

	Bare Ground (BG)	Shrub (S)	Grass (G)	Native Vegetation (*s*)	Gulch (*s*)	Transition (*s*)	Ironwood (*s*)	C-Berry (*s*)	Re-Veg (*s*)	Grass (*g*)	Transition (*g*)
WTG 06											
PAST	29%	1%	70%					1%		70%	
PRESENT	24%	1%	74%					1%		74%	
DIFFERENCE	-4%	0%	4%					0%		4%	
WTG 07											
PAST	30%	0%	70%					0%	0%	70%	
PRESENT	26%	4%	70%					0%	4%	70%	
DIFFERENCE	-4%	4%	0%					0%	4%	0%	
WTG 08											
PAST	23%	5%	72%				4%	1%	0%	72%	
PRESENT	22%	6%	72%				4%	1%	1%	72%	
DIFFERENCE	-1%	1%	0%				0%	0%	1%	0%	
WTG 09											
PAST	21%	5%	73%				4%	1%	0%	73%	
PRESENT	19%	7%	74%				4%	1%	2%	74%	
DIFFERENCE	-3%	2%	1%				0%	0%	2%	1%	
WTG 10											
PAST	38%	19%	43%	17%		2%				43%	
PRESENT	38%	19%	43%	17%		2%				43%	
DIFFERENCE	0%	0%	0%	0%		0%				0%	

PAST = April, 2007 PRESENT = June, 2009

Lower case cover codes (in italics) represent relative composition of Shrub and Grass classes.

	Bare Ground (BG)	Shrub (S)	Grass (G)	Native Vegetation (*s*)	Gulch (*s*)	Transition (*s*)	Ironwood (*s*)	C-Berry (*s*)	Re-Veg (*s*)	Grass (*g*)	Transition (*g*)
WTG 11											
PAST	57%	4%	39%			4%				39%	
PRESENT	57%	4%	39%			4%				39%	
DIFFERENCE	0%	0%	0%			0%				0%	
WTG 12											
PAST	18%	5%	77%			0%	5%			77%	
PRESENT	17%	6%	77%			1%	5%			77%	
DIFFERENCE	-1%	1%	0%			1%	0%			0%	
WTG 13											
PAST	22%	0%	78%			0%			0%	78%	
PRESENT	20%	2%	78%			1%			1%	78%	
DIFFERENCE	-2%	2%	0%			1%			1%	0%	
WTG 14											
PAST	23%	0%	77%			0%				77%	
PRESENT	21%	1%	78%			1%				78%	
DIFFERENCE	-2%	1%	1%			1%				1%	
WTG 15											
PAST	25%	30%	45%	27%		0%	3%			45%	
PRESENT	24%	31%	45%	27%		1%	3%			45%	
DIFFERENCE	-1%	1%	0%	0%		1%	0%			0%	

PAST = April, 2007 PRESENT = June, 2009

Lower case cover codes (in italics) represent relative composition of Shrub and Grass classes.

	Bare Ground (BG)	Shrub (S)	Grass (G)	Native Vegetation (*s*)	Gulch (*s*)	Transition (*s*)	Ironwood (*s*)	C-Berry (*s*)	Re-Veg (*s*)	Grass (*g*)	Transition (*g*)
WTG 16											
PAST	32%	60%	7%	10%		50%	1%			7%	
PRESENT	31%	62%	7%	10%		51%	1%			7%	
DIFFERENCE	-1%	1%	0%	0%		1%	0%			0%	
WTG 17											
PAST	30%	56%	14%	14%		41%		1%		14%	
PRESENT	29%	57%	14%	14%		42%		1%		14%	
DIFFERENCE	-1%	1%	0%	0%		1%		0%		0%	
WTG 18											
PAST	25%	44%	31%	4%		39%		1%		31%	
PRESENT	25%	44%	31%	4%		39%		1%		31%	
DIFFERENCE	0%	0%	0%	0%		0%		0%		0%	
WTG 19											
PAST	28%	54%	19%	11%		39%	4%			19%	
PRESENT	28%	54%	19%	11%		39%	4%			19%	
DIFFERENCE	0%	0%	0%	0%		0%	0%			0%	
WTG 20											
PAST	16%	84%	0%	31%		50%	4%				
PRESENT	16%	84%	0%	31%		50%	4%				
DIFFERENCE	0%	0%	0%	0%		0%	0%				

PAST = April, 2007 PRESENT = June, 2009

Lower case cover codes (in italics) represent relative composition of Shrub and Grass classes.

Appendix 10
Proposed Revisions: Downed Wildlife Monitoring Protocol
Year 4 HCP Implementation

Kaheawa Wind Power
Habitat Conservation Plan

Sampling to estimate the mortality occurring at the Kaheawa Wind Power facility (KWP) must consider spatial and temporal factors at different scales. At the scale of the individual turbine, the area searched should encompass the majority of space where expected mortalities will fall; in addition, the search interval has to be of a frequency where most carcasses will be discovered before they are scavenged and removed. When spatial and temporal variation within a site are considered, individual turbines within a site should be sampled sufficiently to account for the spatial variation that exists among turbines, as well as across seasons of the year when species of interest are at the greatest risk of turbine collision.

The accuracy of a mortality estimate itself depends on several factors. The probability of finding a carcass depends on the search interval and scavenging rates at the site. Scavenging rates are estimated at KWP by conducting trials to yield representative carcass retention times enabling search intervals to be adjusted, if warranted. Another factor that determines the probability of finding a carcass is searcher efficiency (SEEF). Searcher efficiency accounts for individuals that may be killed by collision with project components but that are not found by searchers for various reasons, such as heavy vegetation cover and rugged terrain.

This plan outlines proposed adaptations in the design and implementation of the downed wildlife monitoring protocols at KWP following 3 years of steady monitoring that includes scavenger removal and searcher efficiency trials as well as systematic searches by trained technicians to locate carcasses of birds and bats impacted by the project according to the terms of the HCP.

EARLY POST-CONSTRUCTION MONITORING

KWP biologists and field technicians have been performing systematic monitoring to account for and document injuries or fatalities to wildlife at the wind facility since operations began in June 2006. The initial period of fatality monitoring at KWP, which has been the standard monitoring regime for 3 years, included performing carcass removal and SEEF trials, and systematic searches of the 180x200 m plot area beneath each of the 20 turbines, by trained technicians on a weekly basis. The HCP prescribes that intensive monitoring should proceed for a period of at least two full years, and will include increasing the search rate to two full searches of each plot weekly to coincide with peak fledging periods for seabirds and nēnē (October-November and May-June, respectively). Depending upon the results, and in coordination with DLNR and USFWS, intensive monitoring may be extended beyond this initial period, modified and extended, or replaced with a less intensive or more appropriate monitoring protocol that has been developed based on the results of the initial monitoring.

PROPOSED MODIFICATIONS TO MONITORING: OPERATIONAL PHASE

Search Plot Areas for Individual Turbines

Several studies of small-bodied animals (songbirds and bats), with adequate sample sizes (n = 69 – 466), have shown that the majority of carcasses are found within a search area of less than 50% of the maximum turbine height (Arnett 2005, Jain et al. 2007, Fiedler et al. 2007; see Fig. 1a, b, 2a, b, c, d, e). Most of the carcass distributions (% fatalities vs. distance from turbine) appear to be well described by 2nd degree polynomials, with most fatalities found at approximately 25% of the distance of turbine height, then decreasing with few fatalities occurring beyond 50% of the maximum turbine height (Fig 2a, b, c).

These data are also supported by the distribution of carcasses that have been found at the operating KWP facility since monitoring began in 2006. To date, after more than 3000 turbine plot searches conducted during three years at KWP, only seven carcasses have been found that are clearly attributable to collisions with the turbines. The carcasses consist of one Hawaiian hoary bat, one Hawaiian petrel, three nēnē, one barn owl and one ring-necked pheasant, with distances from the turbine ranging from 2 – 42 m (2 – 47 % of the 90 m maximum turbine height. Search plots for KWP presently encompass a 90 m or greater radius (equal to or greater than 100% of turbine height), although no carcasses have been found beyond a distance of 50% turbine height.

Most of these studies have concentrated on the fatality distributions of small birds and bats. However, these fatality distributions are also expected to apply to larger bodied birds, though it is expected that larger-bodied birds, because of their greater mass, will likely be found closer to the base of the turbines.

Given the considerations detailed above, it is proposed that search areas beneath individual turbines for KWP be modified from their present dimensions to consist of a single concentric sampling area with a radius encompassing 50% of the maximum turbine height (48 m) (Fig. 3).

The search area beneath the five temporary met towers and two permanent lattice met towers will extend 10 m beyond the supporting guy wires of each tower and remain square.

Spatial and Temporal Sampling Scheme: Year 4 of Operational Monitoring

Sampling at KWP will consist of weekly carcass searches of all 20 turbines within a search area radius of 50% maximum turbine height (Fig. 3). As the rate of mortality for all covered species at KWP is expected to remain low, sampling all turbines weekly at the 50% maximum turbine height will ensure a high probability that most if not all of the mortality will fall and be accounted for within the search areas and that any carcasses will be found before they are removed by scavengers. Designing search areas that encompass 50% maximum turbine height will also substantially reduce the amount of unsearchable area in the WTG 1-3 search plots adjacent to Papalaua and Manawainui Gulches.

Consultation with the Endangered Species Recovery Committee (ESRC) and DLNR has indicated a preference for search intervals that are equal to approximately 50% of the mean carcass removal rate. To date at KWP, mean carcass removal time is estimated to be 10.3 days (n=44, Kaheawa Wind Power 2009). Consistent with studies performed elsewhere, it appears scavenging rates may be somewhat higher in the winter and spring than in the summer and fall

and are likely to be higher overall for large birds. In order to account for this potential variability in removal rates, search intervals of 5 to 7 days were chosen. No increase in search frequency should be necessary during the fledging seasons for nēnē and seabirds (May-June and October-November, respectively) because the results of monitoring do not suggest a higher fatality level for juveniles of these species. Moreover, seabird juveniles are believed to pass through the KWP site less frequently than adults, while nēnē fledglings are nearly the same size and proportion of adult birds and therefore would not be expected to differ in their persistence or detection rate compared to adults.

Search intervals may be adjusted to more accurately reflect seasonal carcass removal rates as carcass removal trials are conducted and data indicate appropriateness of these sampling design modifications.

Factors Considered for Scavenger Removal and Searcher Efficiency (SEEF) Trials

Factors that may affect the results of scavenger and SEEF trials include seasonal differences, vegetation types, and carcass sizes.

Seasonal differences are presumed to affect the outcome of scavenger removal trials. The rate of carcass retention may vary due to seasonal changes in density of predators on site, or seasonal changes in predator behavior. For the proposed monitoring protocol at KWP, the year is divided into two seasons, the winter/spring season (November – April) and summer/fall (May – October). Scavenger removal trials already conducted at KWP suggest that scavenging rates do vary among seasons (Kaheawa Wind Power 2008, 2009). However, very little seasonal variation is evident in the results of SEEF trials at KWP.

Different vegetation and ground cover types appear to affect the outcome of both scavenger removal and SEEF trials. More complex vegetation structures usually result in lower searcher efficiency, especially for small and medium-sized birds. Vegetation complexity and ground cover type alone appears to have less affect on carcass retention, perhaps because scavengers are mobile and occur among various vegetation and ground cover types. The vegetation at KWP has been mapped within each search plot enabling ground cover classes (e.g. bare soil, grasses, and shrubs) to be established.

Carcass size also affects the outcome of both scavenger removal and SEEF trials. Three size classes reflect the size classes of the Covered Species: small (bat size), medium birds (seabirds) and large birds (nēnē). Based on studies conducted at KWP, small birds (e.g. House Sparrows) and medium-sized seabirds (Wedge-tailed Shearwaters) represent useful surrogates for trials that examine carcass retention time and searcher efficiency for bats and seabirds. Although it has been difficult to procure large avian species for use in assessing these parameters for nēnē, it is expected that as size increases, both carcass retention time and searcher efficiency will increase. Therefore, most scavenger removal and searcher efficiency trials will be performed to evaluate retention time and detection probability parameters for large birds and bats in Year 4.

Carcass Removal Trials

The objective of performing carcass removal studies at KWP is to determine the average amount of time an avian or bat carcass remains visible to searchers before being removed by scavengers or otherwise rendered undetectable. Carcass removal trials have been ongoing at the KWP facility

since November, 2005. Early post-construction trials using avian surrogates available at the time indicated that 65% of carcasses remained visible for ten days with 38% present for the entire 14 day trial duration (n = 26, mostly small passerines, Common myna, and doves). Since early 2007 a total of 15 trials have been conducted using mostly medium-sized seabirds, with carcass removal rates averaging 10.3 days. Similar trials will continue with the aim of increasing the number of large and small bird carcasses used in trials at different times of year and among different vegetation types and to detect changes in expected retention times for small and medium-sized carcasses. Six to eight carcass removal trials will be conducted during the monitoring year, designed to enable three to four trials within a corresponding season (summer/fall and winter/spring) and will be used to adjust the number of estimated direct takes of covered species observed by correcting for carcass removal bias.

Each carcass removal trial will consist of placing a pre-determined number of carcasses (up to a maximum of nine specimens) of varying size classes on the ground at random locations within representative vegetation classes. The carcass will be placed to approximate what would be expected if a bird/bat came to rest on the ground after having collided with an overhead structure. The intent will be to distribute trials along the length of the project area to represent a range of elevations, habitat conditions, vegetation cover types, and seasonal variability. Fresh carcasses will be used whenever available; when frozen carcasses are used, all carcasses will be thawed before being deployed.

All carcasses will be checked daily for up to 21 days or until all evidence of the carcass is absent. Each carcass will be evaluated for presence, absence, and evidence of scavenging or removal from the site and will be scored for overall condition on each trial day. Photos of carcasses are obtained throughout the trial to document scavenging, status, and condition of carcasses. On day 21, all remaining materials, feathers or parts will be retrieved and properly discarded. Results of trials provide a basis for determining the search frequency necessary to ensure that birds and bats are not scavenged before they can be detected by searchers (see Barrios and Rodriguez 2004 and Kaheawa Wind Power 2008). In some instances, carcasses may be monitored beyond the 21 day survey duration if the information being gathered substantially informs the conclusions of the monitoring exercise. Data will be analyzed by season, and according to vegetation and carcass size classifications.

Searcher Efficiency Trials (SEEF)

Searcher Efficiency (SEEF) Studies represent an important component of downed wildlife monitoring and provide an estimate of carcass detection probability. As with SEEF trials already underway at KWP, trials will be conducted in association with the regular search effort to estimate the percentage of avian/bat fatalities that are found by searchers. Searcher efficiency will be evaluated according to vegetation classification and differences in carcass detection rates for different sized birds and for bats. Estimates of searcher efficiency will be used to adjust estimates of direct take by accounting for carcass detection bias.

Personnel conducting carcass searches will not be told when or where trials will be conducted. Trials will be administered during the twice weekly monitoring period but dates will be chosen randomly, as far as practicable. Each trial will consist of 3 - 9 bird carcasses and/or bats or bat surrogates. Prior to a search commencing, each carcass will be placed within chosen vegetation zones, as described above, at randomly selected locations that will be searched on the same day. Each trial carcass will be discreetly marked and located by GPS so it can be relocated and identified when found. Since carcasses of the covered species are not readily available, in most

cases carcasses of surrogate species will be used. Data will be analyzed according to vegetation and carcass size classifications. More trials will be conducted if analyses indicate that more trials are needed to provide statistical confidence in the resultant values and enable mean searcher detection probabilities to be ascertained for the project site.

Searcher efficiency rates at KWP using Wedge-tailed Shearwaters as surrogates for the two Covered seabird species have ranged from 68% in shrubs (n=65), to 81% in grass (n=123) to 100% detection probability on bare ground (n=47). Increasing the overall number and size range of surrogate specimens used in SEEF trials will provide a better representation of variability among differing vegetation and terrain conditions for the different sized Covered Species, improve estimates of detection probability for nēnē, and result in greater confidence in this species-specific adjustment variable.

Procurement of Carcasses for Trials

If using state or federally protected species as surrogates for trials, all state and federal laws pertaining to transport, possession, and permitted use of these species along with appropriate animal use protocols will be followed. A scientific permit will be obtained for all species that may be used in trials. Carcasses used in the trials will be selected to best represent the size, mass, coloration, and if possible should be closely related to or roughly the same proportions as the four Covered Species. For example, Wedge-tailed shearwaters, a close taxonomic relative of the Hawaiian Petrel and Newell's Shearwater exhibit a close resemblance to both these covered seabird species, are available seasonally, and have been used successfully at KWP and elsewhere in carcass removal trials. Carcasses used for the trials should be fresh or freshly thawed. Dark colored mammals (e.g., small rats, mice) and small passerines (e.g. house finch, house sparrow) may be used as surrogates for bats. Other types of avian carcasses that may prove useful for trials include locally-obtained road kills, downed seabirds, owls, and waterbirds, or species not protected under the MBTA such as pheasant (*Phasianus colchicus*) and rock dove (*Columba livia*). Nēnē mortalities that occur elsewhere but render the carcasses available for these studies, including non-listed migratory waterfowl, would provide important opportunities to learn how long nēnē and closely-proportioned surrogate bird species remain visible to searchers at KWP. Use of species protected under ESA or MBTA will require permission from DLNR and USFWS.

Determining Spatial and Temporal Variation on Site

The weekly search frequency is anticipated to accurately describe variation in mortality rates at different turbines within the site, as well as identify periods when Covered Species that potentially occur year round on site (nēnē and Hawaiian hoary bat) are at greater risk of collision. Each turbine will be sampled 54 times a year, resulting in a total of 1080 turbine searches per year for the entire facility.

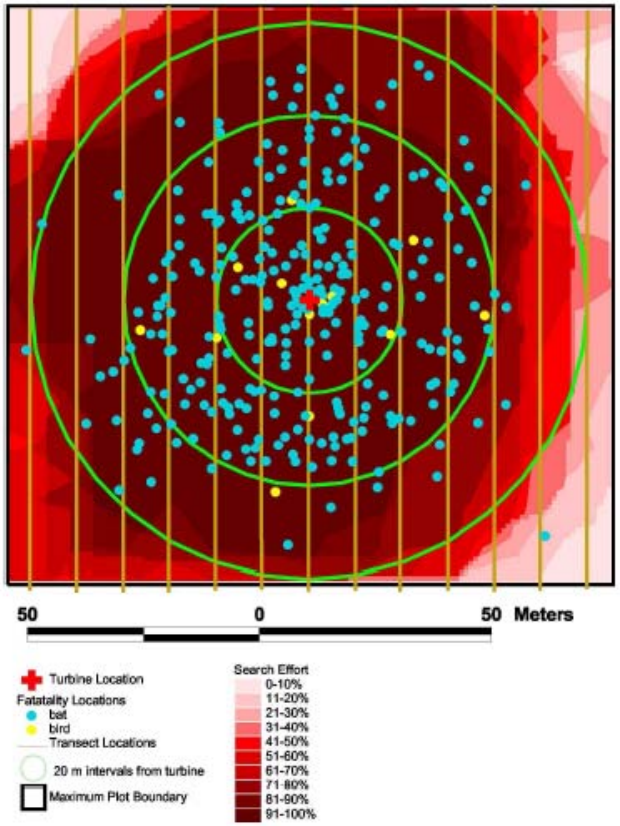


Figure 1a. Bat and bird fatalities (n=466 bats) at all turbines combined at Meyersdale Wind Energy Center in Pennsylvania
2 August to 13 September 2004 (Arnett 2005).
The maximum turbine height was 115 m.

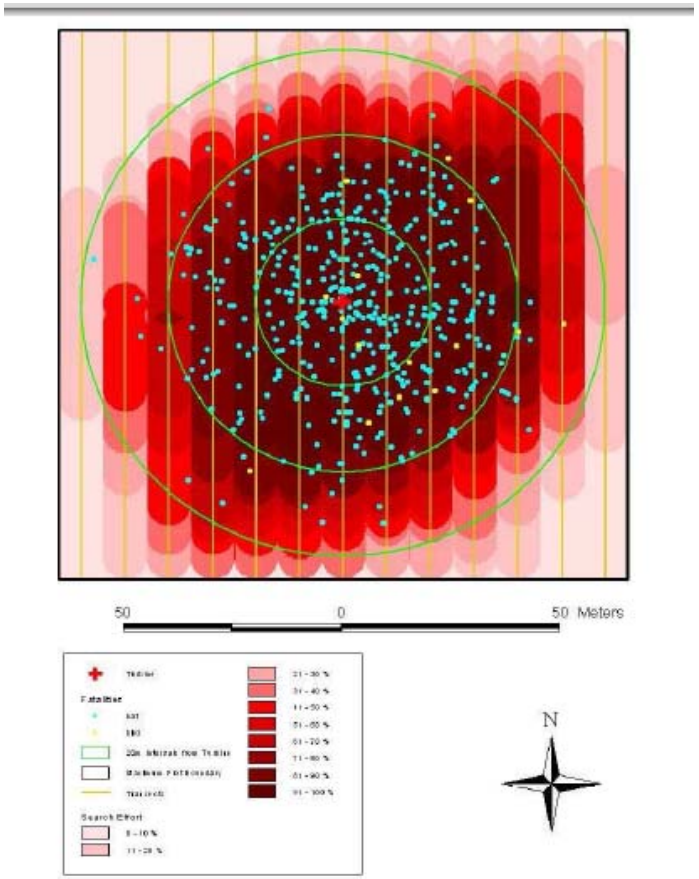
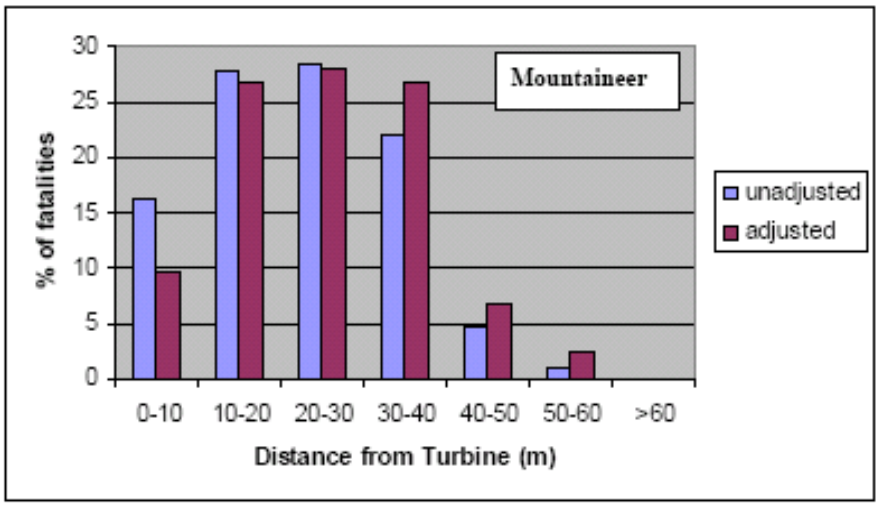


Figure1b.Bat and bird fatalities (n=499 bats) at all turbines combined at Mountaineer Wind Energy Center in West Virginia, 31 August to 11 September 2004 (Arnett 2005).
The maximum turbine height was 104.5 m.



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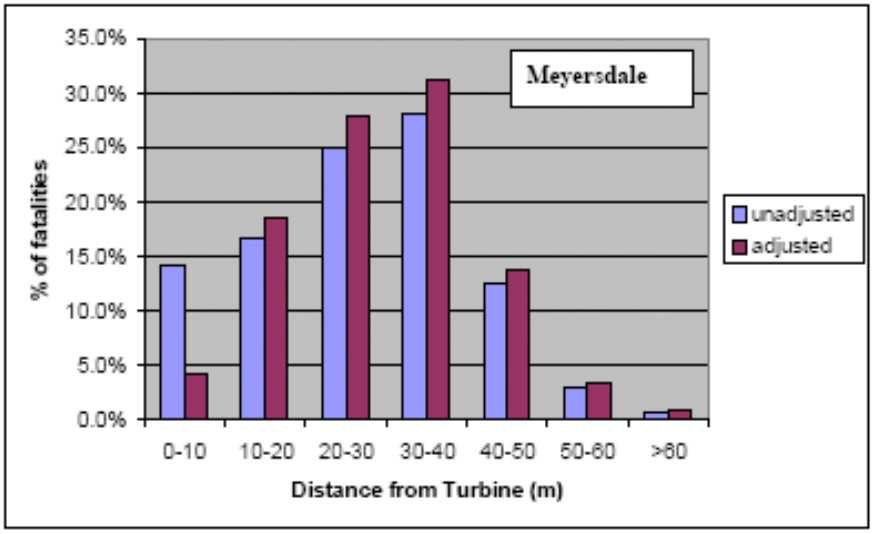
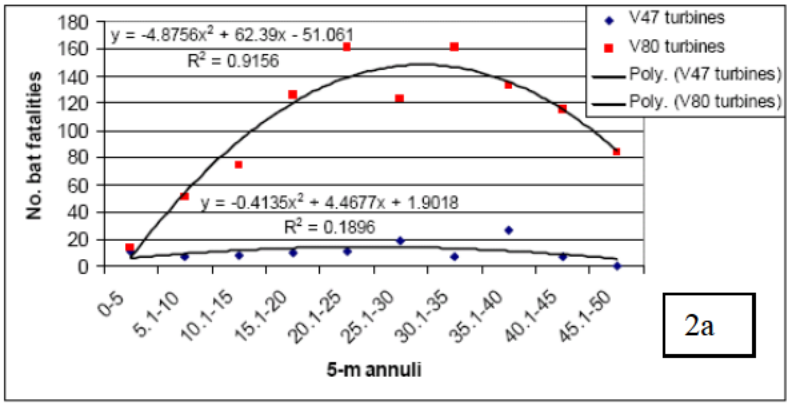
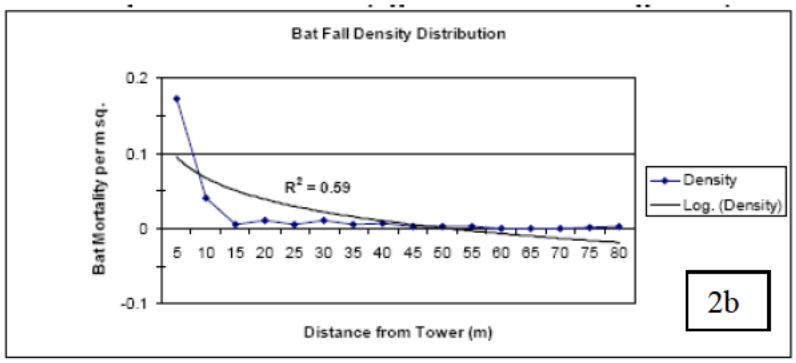


b

Figure 2a, b. Distribution of fatalities (birds and bats) as a function of distance from a turbine for Mountaineer and Meyersdale sites based on unadjusted counts, and counts adjusted for searcher detection and sampling effort (figures from Arnett 2005). The maximum turbine height was 104.5 m.





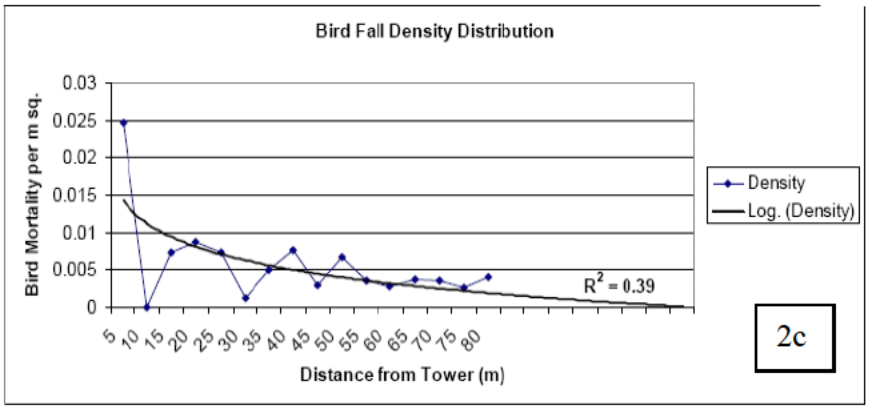


Figure 2a. Number of bats found within 5m annuli around V47 turbines (n = 20) and V80 turbine (n=243) from 5 April to 20 December 2005 and associated trend line for Buffalo Mountain, Tennessee (figure from Fielder et al 2007). The trend line for the V80 predicts that bat fatalities would reach zero at 59.6 m from the turbine (maximum turbine height is 120m). Data from the V47 is not considered in this report due to small sample sizes.

Figure 2b,c. Maple Ridge Wind Power, New York bat and bird fatality density distributions from September 1 to November 15, 2006, in relation to distance from towers with associated trend lines. The maximum turbine heights were 122 m (figures from Jain et al 2007). The trend lines predict that bird carcass densities approximate zero at 110m and at 45m for bats. The maximum turbine height was 122 m.

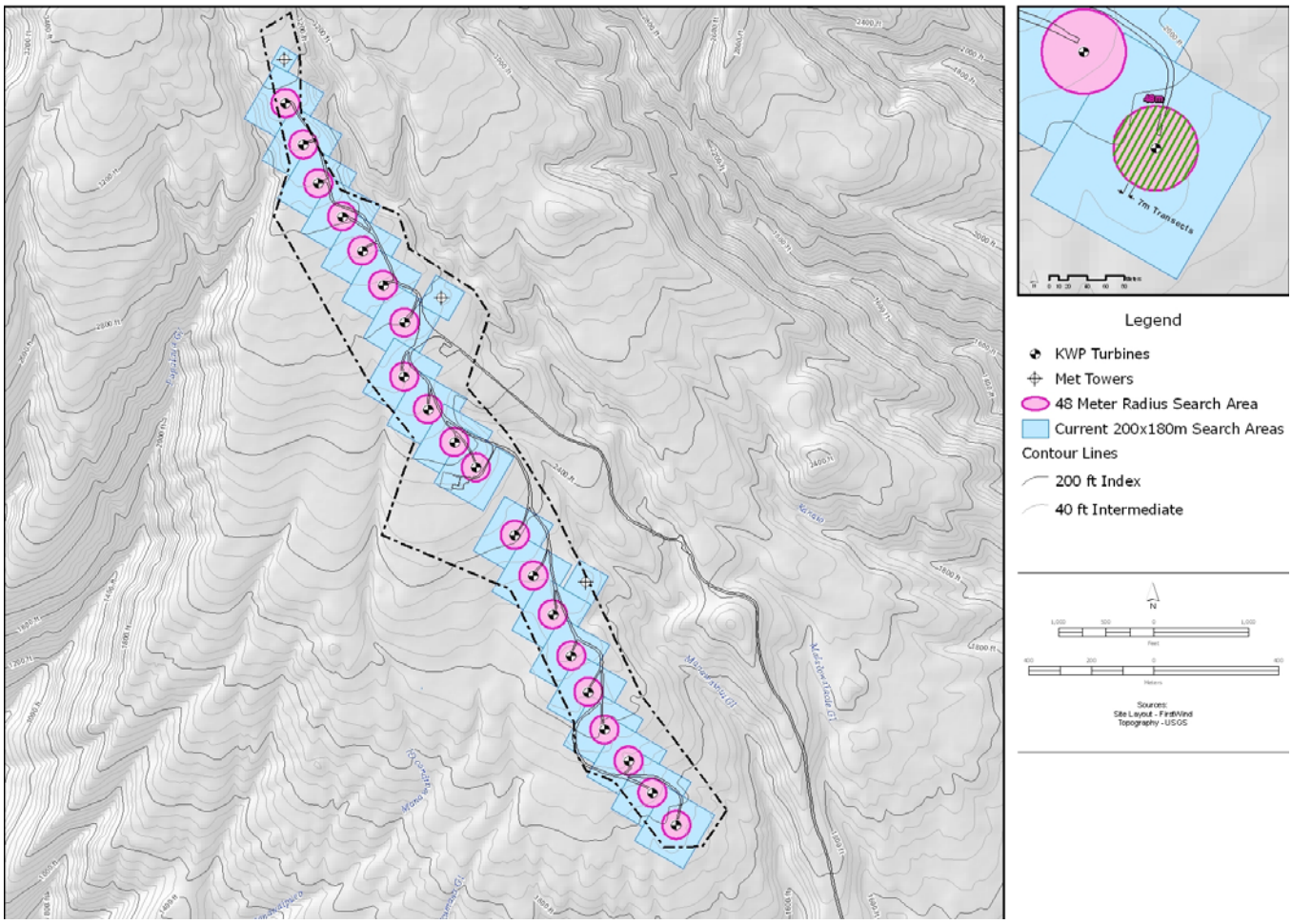


Figure 3. Proposed 48 m (50% maximum turbine height) circular monitoring plots are shown over the existing 20 180x200 m rectangular wind turbine plots at KWP.

SUBSEQUENT OPERATIONAL PHASE MONITORING

Sampling intervals after the first year of this modified sampling regime may be adjusted further depending on carcass retention rates and detection probability measured by the scavenger removal and SEEF trials. The change in sampling design will be determined by KWP in consultation with DLNR, USFWS and members of the ESRC. Thus, the sampling regime outlined in this protocol may be continued beyond Year 4 or modified further if data provide adequate confidence in the survey and monitoring design and findings indicate adequate accounting of impact to Covered Species resulting from project operations.

Spatial and temporal trends on site should also be better understood by implementing the first year of this monitoring plan, enabling correction factors to be appropriately applied if necessary, and long-term monitoring options to be considered. Depending on findings, correction factors may enable a decrease in or modification of sampling effort (e.g. increase in search intervals or decrease in the number and/or size of turbine areas searched), identify specific turbines or times of the year when sampling effort should be concentrated, and inform adaptive management considerations. The long-term sampling regime will be developed by KWP in consultation with the DLNR, USFWS, ESRC, statisticians and wind energy experts.

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October 6, 2008

DOWNED WILDLIFE INCIDENT REPORT

On the evening of Friday, September 26, 2008 a Hawaiian hoary bat (*Lasiurus cinereus semotus*) carcass was reported to the Senior Wildlife Biologist (Gregory Spencer) in charge of managing implementation and affairs related to the Habitat Conservation Plan (HCP) for the Kaheawa Pastures Wind Energy Generation Facility (KWP) in West Maui, Hawaii. The contractor responsible for reporting the observation followed protocols outlined in the Wildlife Observation and Education Program for reporting downed wildlife. Documentation and reporting was initiated immediately by the Senior Wildlife Biologist as prescribed in the HCP.

Condition of specimen and description of circumstances: The specimen was located on bare ground beneath and approximately 20 meters SE of WTG-8 (Figure 1) at about 20:30 h on Friday, September 26, 2008. Dominant ground cover in the immediate area outside the turbine pad is composed of mostly non-native grasses and a few shrubs. The pad itself is level and bare. The condition of the carcass can be described as mostly intact, though the left wind appears to have been severed (Figures 2 and 3). The entire area was searched intensively in an effort to locate any remaining portions of the specimen. No additional specimen material or evidence of scavenging was observed. The bat specimen appeared fresh (Day 1 post-mortem) based on its apparent condition and there was no indication that predation or scavenging had occurred.

Weather conditions in the 24 hours prior to and at the time of discovery consisted of light (10-15 mph) and variable winds associated with a broad-scale shift in the prevailing trades as a weakening cold front approached the Hawaiian Islands from the north.

Probable cause of injuries and supportive evidence: Collision with the turbine structure appears possible based on the condition and location of the specimen. Final conclusions concerning the specific cause of mortality await the results of veterinary and forensic examinations and a subsequent Necropsy Report.

Action taken: Official response procedures were performed according to guidelines outlined in the HCP under the Wildlife Casualty Monitoring Protocol. Project biologists responded to the report and arrived

to begin documentation and specimen recovery at 22:00 h on September 26. The area was thoroughly searched that night in an effort to locate the severed wing or any other carcasses and the specimen was collected and placed in a labeled specimen containment bag and placed in a specimen freezer at the Kaheawa Wind Power (KWP) facility. The area was searched again on Saturday morning, September 27, 2008. Bill Standley (USFWS, Pacific Islands Fish and Wildlife Office, Honolulu) was contacted verbally by phone on Monday afternoon, September 29, 2008 at which time the incident was officially reported.

Documentation and recovery actions included a direct line measurement from the base of the turbine tower base to the specimen, GPS coordinates of the location where the specimen was discovered (20^{o} 49' 00.64"N, 156^{o} 33" 09.01"W) photographs of various aspects of the specimen and surrounding conditions, and observations of prevailing weather conditions and environmental circumstances. The specimen was carefully collected and placed in double-plastic specimen bags along with a label containing relevant information and frozen at the KWP facility.

Follow-up Actions: First Wind was instructed by the USFWS Office of Law Enforcement to send the specimen to the attention of the regional Special Enforcement Agent (Keith Swindle) in Honolulu for subsequent handling and disposition. The Hawaii DLNR requested that any future bat carcasses be placed on ice rather than frozen to facilitate subsequent analyses.

This report, submitted to USFWS and DLNR/DOFAW officials in Honolulu, Hawaii, on October 2, 2008 is intended to represent an official record and documentation of this downed wildlife incident.

For additional information or clarification, please contact:
Gregory Spencer, Senior Wildlife Biologist
First Wind – Kaheawa Wind Power, Environmental Affairs Division
[redacted]

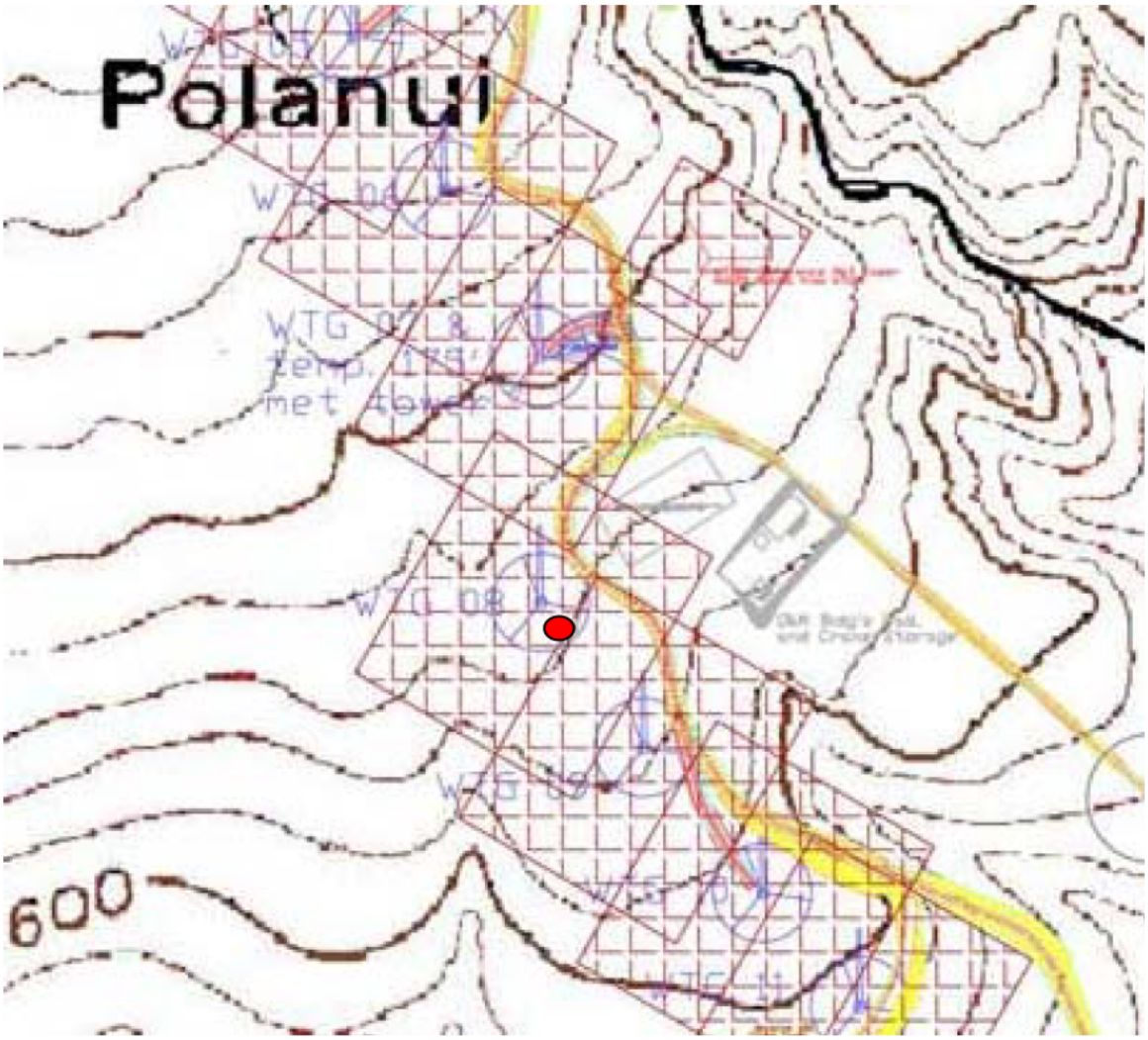

Figure 1. The red dot indicates the location 20 m SE of WTG-8 where a Hawaiian Hoary Bat carcass was discovered on September 27, 2008 at the Kaheawa Wind Power site, West Maui, Hawaii.

Figure 2. Hawaiian Hoary Bat carcass discovered on bare ground near WTG-8 at the Kaheawa Wind Power site in West Maui; the specimen is resting ventral side down and the severed portion at the base of the left wing is clearly visible.

Figure 3. Hawaiian Hoary Bat carcass discovered near 2800-ft elevation at the Kaheawa Wind Power site in West Maui, September 27, 2008.

KAHEAWA WIND POWER, LLC

June 13, 2009

DOWNED WILDLIFE INCIDENT REPORT

On Wednesday, June 10, 2009 the carcass of a Nene was discovered by technicians performing routine searches at the Kaheawa Wind Power (KWP) facility on Maui in accordance with post-construction monitoring provisions of the project's Habitat Conservation Plan (HCP). The incident was observed near wind turbine generator (WTG) 7. The US Fish and Wildlife Service (USFWS) and Division of Forestry and Wildlife (DOFAW) were notified of the incident immediately and DOFAW staff collected the carcass the same day. This report provides a summary and documentation of the incident that includes the time the carcass was detected by observers, prevailing conditions at the incident site, immediate and subsequent response actions taken, physical circumstances of the incident scene, pertinent observations, and collection and disposition of the specimen..

Prevailing winds during the last 4-5 weeks coinciding with the end of the molting season for Nene have been characterized as *kona*, ranging mostly between light and variable westerlies to calm. Some of the first short episodes of east and northeast trade winds that enabled consistent turbine rotation to resume occurred in the period approximately 48 hours prior to carcass detection.

Description of the Incident Site

At 13:05 HST on Wednesday, June 10, 2009, downed wildlife monitoring technicians detected the carcass and partial wing segments of a Nene (*Branta sandvicensis*) that appeared to be a mature adult based on size, proportions, and plumage characteristics. At the time the carcass was detected, searchers were traveling on foot, west-bound on a portion of the search transect that borders the northern edge of the WTG 7 pad (Figure 1). One of the wing segments (1st wing segment, Figure 2) was initially detected from a distance of approximately 25 meters while the other portion of wing (2nd wing segment, Figure 3) and the carcass (Figures 4 and 5) were identified immediately thereafter. The ground cover where the wing segments were detected is bare/gravel while the carcass deposition site is bare/gravel bordered by a transition into sparse grass and mixed weeds. Carcass materials were distributed among three specific locations ranging between 9 and 23 meters from the base of the WTG. No evidence of scavenging was observed and ants were present.

Actions Taken

Field personnel promptly reported the detection to the Senior Wildlife Biologist (Gregory Spencer) according to protocols for reporting and documenting downed wildlife incidents. The physical circumstances of the incident are summarized below (Table 1). Upon an initial inspection of the scene, the Senior Wildlife Biologist immediately contacted John Medeiros at Maui DOFAW (13:30 HST) and verbally coordinated agency response measures, and then contacted the USFWS Pacific Islands Fish and Wildlife Office and reported the incident verbally to James Kwon at 13:40 HST.

Maui DOFAW personnel (Sasha Smith) arrived at 14:50 HST, collected the specimen, and departed by 15:30 HST. Each wing segment was placed in a zip-lock bag containing a specimen label and the carcass was placed in double plastic bags and labeled according to protocols for handling and collecting downed wildlife.

Table 1. Field measurements documented at downed wildlife incident, Kaheawa Pastures, Maui, Hawaii, June 10, 2009.

Species	Nene
Date	Wednesday, June 10, 2009
Time (HST)	13:05
Location	S of WTG 7
Date last surveyed	Friday, June 5, 2009
Ground Cover	Bare gravel, low grass/weeds
Linear distance (m)/direction (cardinal) from base of WTG and GPS coordinates (UTM, WGS-1984)	
Carcass	23/SW N 7558979.39 E 2476037.09
1st wind segment	9/SW N 7558980.06 E 2476107.73
2nd wing segment	14/SE N 7558977.40 E 2476151.38
Wind Speed (mph)	2.7
Wind Direction	Variable/West
Cloud Cover (%)	90
Cloud Deck (magl)	>500
Precipitation	None
Temperature (F°)	70.8

Information gathered during the documentation of downed wildlife incidents are essential for thoroughly documenting the incidental take of an HCP-covered species and assessing this observed take according to the terms of the HCP. The standard procedure for handling downed HCP-covered species at KWP calls for them to be collected by DOFAW personnel, who place them in cold storage until they can be delivered to the USGS National Wildlife Health Center, Honolulu Field Station where they are examined by a forensic expert. An official necropsy report is usually generated by the USGS.

<u>For additional information or clarification on this incident, please contact</u>:
Gregory Spencer, *Senior Wildlife Biologist* – Kaheawa Wind Power, LLC, Maui, Hawaii

(808) 298-5097 gspencer@firstwind.com

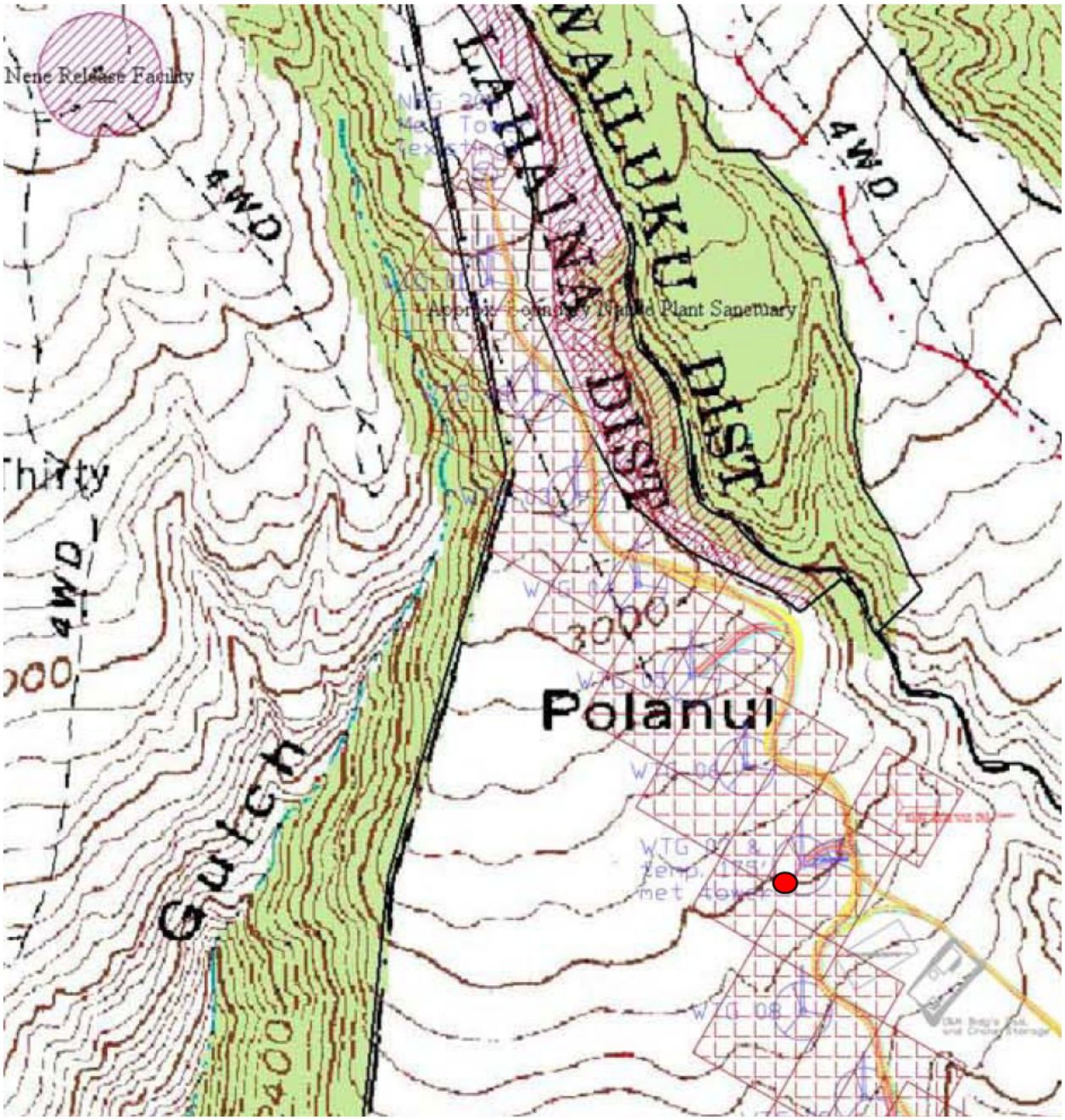

Figure 1. The red oval adjacent to WTG 7 indicates the location where a Nene carcass was discovered during routine downed wildlife monitoring at the Kaheawa Wind Power facility on June 10, 2009.

Figure 2. First of two partial wing segments associated with a Nene incident at the Kaheawa Wind Power facility on Maui, June 10, 2009.

Figure 3. Second segment of wing identified 34 meters from the carcass of a Nene discovered at the Kaheawa Wind Power facility on Maui, June 10, 2009.

Figure 4. Carcass of a full grown Nene discovered during routine downed wildlife monitoring at the Kaheawa Wind Power facility on the island of Maui on June 10, 2009.

Figure 5. Nene carcass discovered at the edge of a WTG pad at the Kaheawa Wind Power facility on Maui, June 10, 2009.

Appendix 8. Annual Expenditures and Budget Structure, Kaheawa Wind Power

Habitat Conservation Plan, Year 3 (July 2008-June 2009)

Baseline Scenario assumes actual take is as expected	Year 1			Year 2		Year 3		Years 1-3 Totals		Notes
	HCP Budget	Expenditures Aug, 2005 – Dec, 2006 (Previously Reported)	Expenditures January – June, 2007 (Previously Reported)	HCP Budget	Expenditures July 2007 – June 2008 (Previously Reported)	HCP Budget	Expenditures	HCP Budgeted Amounts	Actual Expenditures	
General Measures										
Annual vegetation management, mowing around turbines to facilitate searches	$ 500.00			$ 500.00		$ 500.00		$ 1,500.00	$ -	
Wildlife Education and Observation Program (WEOP) and Downed Wildlife Protocol	$ 3,000.00			$ 500.00		$ 500.00		$ 4,000.00	$ -	
KWP Biologist (Greg Spencer)		$ 5,000.00	$ 1,000.00		$ 2,000.00		$ 1,000.00	$ -	$ 9,000.00	Developing and conducting on-site outreach programs and wildlife orientations
Consultant (Eric Nishibayashi)		$ 1,000.00						$ -	$ 1,000.00	Pre-construction outreach

Baseline Scenario assumes actual take is as expected	Year 1			Year 2		Year 3		Years 1-3 Totals		Notes
	Budget	Expenditures Aug, 2005 – Dec, 2006 (Previously	Expenditures January – June, 2007	Budget	Expenditures July 2007 – June 2008 (Previously	Budget	Expenditures	HCP Budgeted Amounts	Actual Expenditures	
KWP Staff (Ian Bordenave)			$ 800.00		$ 1,000.00		$ 500.00	$ -	$ 2,300.00	Assisting in the presentation of orientation materials
Wildlife Conservation signage		$ 300.00	$ 300.00		$ 300.00			$ -	$ 900.00	Posted cautionary and wildlife conservation awareness signage as necessary throughout site
General Subtotal	**$ 3,500.00**	**$ 6,300.00**	**$ 2,100.00**	**$ 1,000.00**	**$ 3,300.00**	**$ 1,000.00**	**$ 1,500.00**	**$ 5,500.00**	**$ 13,200.00**	

Appendix 8. Annual Expenditures and Budget Structure, Kaheawa Wind Power

Nene: Potential take of 3 per year										
Pre-construction surveys	$ 8,000.00							$ 8,000.00	$ -	Combined with next item
On-site full-time/on-call environmental inspector during construction	$ 25,000.00							$ 25,000.00	$ -	
KWP Biologist(s)		$ 15,000.00						$ -	$ 15,000.00	
Eric Nishibayashi (Consultant)		$ 24,000.00						$ -	$ 24,000.00	Construction-phase consultation
Spotting Scope and Accessories		$ 200.00						$ -	$ 200.00	
Regular on-site observations of nene response to turbines - staff biologist/intern	$ 10,000.00							$ 10,000.00	$ -	
KWP Staff (Greg Spencer)		$ 3,500.00	$ 4,000.00					$ -	$ 7,500.00	
KWP Staff (Ian Bordenave)		$ 1,500.00	$ 3,000.00					$ -	$ 4,500.00	
Baseline Scenario assumes actual take is as expected	Year 1			Year 2		Year 3		Years 1-3 Totals		**Notes**
	Budget	**Expenditures Aug, 2005 – Dec, 2006 (Previously**	**Expenditures January – June, 2007**	**Budget**	**Expenditures July 2007 – June 2008 (Previously**	**Budget**	**Expenditures**	**HCP Budgeted Amounts**	**Actual Expenditures**	
Construction of new release pen (DOFAW)	$ 50,000.00				$ 50,000.00			$ 50,000.00	$ 50,000.00	
New DOFAW truck	$ 9,000.00				$ 9,000.00			$ 9,000.00	$ 9,000.00	
Labor for maintenance and predator control plus $1000 for helicopter logistics	$ 16,000.00			16,000.00	$ 16,000.00	16,000.00	$ 16,000.00	$ 48,000.00	$ 32,000.00	
Cost of propagating 10 chicks/yr yrs 1-5, 4 chicks every 2 years thereafter	$ 25,000.00			$ 25,000.00	$ 25,000.00	$ 25,000.00	$ 25,000.00	$ 75,000.00	$ 50,000.00	
SHA Prep Support							$ 5,000.00	$ -	$ 5,000.00	KWP hired consultant to prepare Draft SHA for Haleakala Ranch, provided to DOFAW
Nene Subtotal	**$ 143,000.00**	**$ 44,200.00**	**$ 7,000.00**	**$ 41,000.00**	**$ 100,000.00**	**$ 41,000.00**	**$ 41,000.00**	**$ 225,000.00**	**$ 192,200.00**	

Seabirds: Potential take of 1.5 per year of each species										
Vehicle, radar, night-vision and related survey equipment, including training	$ 50,000.00							$ 50,000.00	$ -	
2001 Ford F-150 incl. licensing, taxes, maint., and fees		$ 23,530.00			$ 10,000.00		$ 5,000.00	$ -	$ 38,530.00	
Furuno Radar (cost-share 50%)		$ 8,100.00						$ -	$ 8,100.00	
IR Night-vision goggles		$ 3,500.00						$ -	$ 3,500.00	Additional night vision equipment
Miscellaneous support equip + supplies		$ 500.00						$ -	$ 500.00	Additional IR and thermal equipment in FY10
	Year 1			Year 2		Year 3		Years 1-3 Totals		
Baseline Scenario assumes actual take is as expected	**Budget**	**Expenditures Aug, 2005 – Dec, 2006 (Previously Reported)**	**Expenditures January – June, 2007 (Previously Reported)**	**Budget**	**Expenditures July 2007 – June 2008 (Previously Reported)**	**Budget**	**Expenditures**	**HCP Budgeted Amounts**	**Actual Expenditures**	**Notes**
Conduct on-site radar and night-vision/thermal surveys to document sea bird interaction and response to turbines; 2 surveys in June and October using staff biologist and assistant	$ 16,000.00							$ 16,000.00	$ -	
KWP Biologist (Greg Spencer)		$ 8,000.00						$ -	$ 8,000.00	Expenditures reflect personnel time on surveys, set-up, and logistics (2 surveys)
KWP Staff (Ian Bordenave)		$ 4,000.00						$ -	$ 4,000.00	Expenditures reflect personnel time on surveys, set-up, and logistics (2 surveys)
Conduct searches to identify West Maui colonies in need of	$ 60,000.00			$ 60,000.00		$ 15,000.00		$ 135,000.00	$ -	
KWP Biologist (Greg Spencer)		$ 10,000.00	$ 10,000.00		$ 20,000.00		$ 10,000.00	$ -	$ 50,000.00	Includes coordination, logistics, and field studies, reporting

Appendix 8. Annual Expenditures and Budget Structure, Kaheawa Wind Power

Baseline Scenario assumes actual take is as expected	Year 1			Year 2		Year 3		Years 1-3 Totals		Notes
	Budget	Expenditures Aug, 2005 – Dec, 2006 (Previously	Expenditures January – June, 2007	Budget	Expenditures July 2007 – June 2008 (Previously	Budget	Expenditures	HCP Budgeted Amounts	Actual Expenditures	
KWP Staff (Ian Bordenave)		$ 4,000.00	$ 4,000.00		$ 15,000.00		$ 5,000.00	$ -	$ 28,000.00	Includes coordination, logistics, and field studies
KWP Staff (Hank Oppenheimer)		$ 4,500.00						$ -	$ 4,500.00	Preliminary field studies and historical reference material assemblage
Camping and Field Equipment		$ 4,000.00	$ 1,000.00		$ 200.00			$ -	$ 5,200.00	Includes costs for equipment, supplies, and food
Flight Equipment		$ 400.00	$ 500.00		$ 500.00			$ -	$ 1,400.00	Flight suits, gloves, boots, Personal Protective/Safety Equipment
Helicopter flights		$ 4,000.00	$ 6,000.00		$ 2,000.00			$ -	$ 12,000.00	This cost does not include cooperating agencies' cost-share
Outreach and Cooperative Conservation Exchange		$ 3,000.00	$ 1,500.00				$ 3,000.00	$ -	$ 7,500.00	This expense applies to Senior Widlife Biologist's time developing collaborations, land access agreements, mitigation plan
Predator traps, fence marking supplies							$ 1,500.00	$ -	$ 1,500.00	Live traps for predator removal, fence visibility enhancement
Seabird Subtotal	**$ 126,000.00**	**$ 77,530.00**	**$ 23,000.00**	**$ 60,000.00**	**$ 47,700.00**	**$ 15,000.00**	**$ 24,500.00**	**$ 201,000.00**	**$ 172,730.00**	

Baseline Scenario assumes actual take is as expected	Year 1			Year 2		Year 3		Years 1-3 Totals		Notes
	Budget	Expenditures Aug, 2005 – Dec, 2006 (Previously Reported)	Expenditures January – June, 2007 (Previously	Budget	Expenditures July 2007 – June 2008 (Previously Reported)	Budget	Expenditures	HCP Budgeted Amounts	Actual Expenditures	
Conduct monthly 2-night surveys - staff biologists	$ 10,000.00							$ 10,000.00	$ -	
KWP Biologist (Greg Spencer)		$ 4,000.00	$ 3,000.00					$ -	$ 7,000.00	Actual cost of survey effort, logistics, etc.
KWP Staff (Ian Bordenave)		$ 2,000.00	$ 3,000.00					$ -	$ 5,000.00	Actual cost of survey effort, logistics, etc.
Up-front contribution to bat research cooperative	$ 20,000.00	$ 20,000.00						$ 20,000.00	$ 20,000.00	
Bat Subtotal	**$ 30,000.00**	**$ 26,000.00**	**$ 6,000.00**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 30,000.00**	**$ 32,000.00**	

Appendix 8. Annual Expenditures and Budget Structure, Kaheawa Wind Power

Fatality Monitoring										
Systematic Downed Wildlife Searches, Searcher Efficiency and Carcass Removal Studies	$ 65,000.00			$ 60,000.00		$ 15,000.00		$ 140,000.00	$ -	
KWP Biologist (Greg Spencer)		$ 20,000.00	$ 14,000.00		$ 18,000.00		$ 5,000.00	$ -	$ 57,000.00	Actual cost of personnel performing searches, coordinating trials, and reporting
Baseline Scenario assumes actual take is as expected	Year 1			Year 2		Year 3		Years 1-3 Totals		**Notes**
	Budget	**Expenditures Aug, 2005 – Dec, 2006 (Previously Reported)**	**Expenditures January – June, 2007 (Previously**	**Budget**	**Expenditures July 2007 – June 2008 (Previously Reported)**	**Budget**	**Expenditures**	**HCP Budgeted Amounts**	**Actual Expenditures**	
KWP Staff (Ian Bordenave)		$ 12,000.00	$ 8,000.00		$ 20,000.00		$ 15,000.00	$ -	$ 55,000.00	Actual cost of personnel performing routine searches and coordinating trials
KWP Staff (David Medrano)					$ 15,500.00		$ 20,000.00	$ -	$ 35,500.00	Wildlife monitoring Technician
KWP Staff (Karl Mokross)					$ 15,500.00		$ 10,000.00	$ -	$ 25,500.00	Wildlife monitoring Technician
Support equipment and supplies		$ 2,000.00	$ 3,000.00		$ 1,000.00		$ 300.00	$ -	$ 6,300.00	Transect markers, Personal Protective Equipment, etc.
Northwest Wildlife Consultants (Training)		$ 3,200.00						$ -	$ 3,200.00	Initial training and orientation to standard protocols and techniques
Fatality Monitoring Subtotal	**$ 65,000.00**	**$ 37,200.00**	**$ 25,000.00**	**$ 60,000.00**	**$ 70,000.00**	**$ 15,000.00**	**$ 50,300.00**	**$ 140,000.00**	**$ 182,500.00**	
Annual Subtotals	**$ 367,500.00**	**$ 191,230.00**	**$ 63,100.00**	**$ 162,000.00**	**$ 221,000.00**	**$ 72,000.00**	**$ 117,300.00**	**$ 601,500.00**	**$ 592,630.00**	

Cumulative Budgeted	$ 601,500.00
Cumulative Expended	$ 592,630.00

Appendix 8. Annual Expenditures and Budget Structure, Kaheawa Wind Power

Contingency Funds										
	Year 1			Year 2		Year 3		Years 1-3 Totals		
Contingency Funds	**Budget**	**Expenditures Aug, 2005 – Dec, 2006 (Previously Reported)**	**Expenditures January – June, 2007 (Previously Reported)**	**Budget**	**Expenditures July 2007 – June 2008 (Previously Reported)**	**Budget**	**Expenditures**	**HCP Budgeted Amounts**	**Actual Expenditures**	**Notes**
Nene Contingency Fund	$ 264,000.00			$ 6,600.00		$ 6,765.00		$ 277,365.00	$ -	Included in Contingency Letter of Credit
Seabird Contingency Fund	$ 100,000.00			$ 2,500.00		$ 2,562.50		$ 105,062.50	$ -	Included in Contingency Letter of Credit
Bat Contingency Fund	$ 20,000.00			$ 500.00		$ 512.50		$ 21,012.50	$ -	Included in Contingency Letter of Credit
Supplemental In-House Expenditures (Non-HCP Budgeted)										
Native vegetation reestablsihment efforts										
Nursery propagation					$ 20,000.00		$ 45,000.00		$ 65,000.00	
Contract outplanting					$ 15,000.00		$ 35,000.00		$ 50,000.00	
Project Management (KWP Staff)					$ 10,000.00		$ 20,000.00		$ 30,000.00	
Subtotal					**$ 45,000.00**		**$ 100,000.00**		**$ 145,000.00**	
On-site acoustic bat detection surveys									$ -	
Anabat acoustic data loggers							$ 15,000.00		$ 15,000.00	
System monitoring and data analysis (KWP Staff)							$ 8,000.00		$ 8,000.00	
Summarizng results (KWP Staff)							$ 2,000.00		$ 2,000.00	
Subtotal							**$ 25,000.00**		$ 25,000.00	
Annual Subtotals					**$ 45,000.00**		**$ 125,000.00**		**$ 170,000.00**	