

Kaheawa Wind Project II Habitat Conservation Plan FY 2024 Annual Report



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Incidental Take License ITL-15 / Incidental Take Permit TE27260A-1

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Executive Summary

This report summarizes work performed by Kaheawa Wind Power II, LLC (KWP II), owner of the Kaheawa Wind Project II (Project), during the State of Hawai'i fiscal year 2024 (FY 2024; July 1, 2023– June 30, 2024) under the terms of the approved Habitat Conservation Plan (HCP). The original HCP was dated December 2011 and described KWP II's compliance obligations under the Project's state Incidental Take License ITL-15 and federal Incidental Take Permit ITP-TE27260A-1. In 2019, the HCP was amended to address higher than expected take of two species ('ōpe'ape'a [Hawaiian hoary bat] and nēnē [Hawaiian goose]) at the Project; the Project operates under the resulting and updated versions of the ITL and ITP, as amended. Species covered under the amended HCP (hereafter HCP; Covered Species) include four federally and state-listed threatened and endangered species. The 14-turbine Project was constructed in 2011– 2012 and has been operating since July 2, 2012.

Fatality monitoring at the Project in FY 2024 continued within search plots limited to cleared areas within 70 meters of each Wind Turbine Generator. Canine teams searched each of the fatality monitoring plots once per week year-round. Bias correction trials were conducted quarterly at the Project to measure the probability that a carcass would persist until the next search and the probability that an available carcass would be found. In FY 2024, probabilities of a carcass persisting until the next search were 0.82 (bat surrogates), 1.00 (nēnē surrogates), and 1.00 (seabird surrogates). Searcher efficiency was 1.00 for surrogates of all three groups (bat, nēnē, seabirds).

No fatalities of Covered Species were found at KWP II during FY 2024. Through FY 2024 and excluding incidental detections, the Project's total observed direct take of Covered Species has been three 'ōpe'ape'a and nine nēnē. No Covered seabird Species ('ua'u [Hawaiian petrel] and 'a'o [Newell's shearwater]) have been detected as fatalities at the Project to date. The fatality estimates using the Evidence of Absence estimator at the upper 80 percent credibility level is 11 for the 'ōpe'ape'a and 26 for the nēnē (plus one gosling fatality attributable to Project infrastructure, but not related to the effects of wind turbine operation analyzed using the Evidence of Absence estimator). Indirect take estimates for the Covered Species are one adult equivalent for the 'ōpe'ape'a and one adult equivalent for the nēnē. Combining direct and indirect take estimate values, there is an approximately 80 percent chance that cumulative take of Covered Species at the Project from the start of operations through FY 2024 was less than or equal to 12 'ōpe'ape'a and 28 nēnē (including one gosling attributable to non-turbine collision Project risk).

The bat acoustic monitoring program data captured bat activity across the Project at five detector locations throughout FY 2024. The 'ōpe'ape'a were detected on 161 of 1,781 detector-nights (9.0 percent of detector-nights). A significant increasing trend in the annual detection rates continues. The seasonal pattern of detection rates was similar to previous years, but different than that observed at the adjacent Kaheawa I Wind Project (KWP I) in FY 2024.

Mitigation commitments to offset the take of Covered Species are ongoing. Current estimated take for the 'ōpe'ape'a is within the Tier 3 limit of the HCP. Tier 3 mitigation has been fully funded and began in FY 2018 through a contract with the U.S. Geological Survey's Hawaiian Hoary Bat Research Group to conduct bat ecological research on Hawai'i Island. Current estimated take for the nēnē is within the Tier 2 limit of the HCP. Kaheawa I Wind Project (KWP I) and KWP II jointly assumed management of the mitigation program at the Haleakalā Ranch release pen in mid-December 2022. In FY 2024, a total of six nēnē offspring fledged from the Haleakalā Ranch release pen. Mitigation for nēnē is ongoing as propagation efforts at the Haleakalā Ranch nēnē release pen, with additional mitigation efforts currently under discussion with DOFAW and USFWS.

No observed take has occurred for Covered Seabird Species; therefore, both species are within the Tier 1 limit of the HCP. Tier 1 mitigation was completed prior to FY 2024 through the implementation of a comprehensive plan for seabird colony management at the Makamaka'ole Seabird Mitigation Site as well as implementation of predator control and burrow monitoring at a 'ua'u breeding colony on Lāna'i.

KWP II communicated actively with USFWS and DOFAW throughout FY 2024. Communication was conducted through conference calls, site visits, in-person meetings, quarterly reports, and emails related to the Project's HCP. Communications largely focused on nēnē mitigation in FY 2024.

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1.0 Introduction

The Hawai'i Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) and U.S. Fish and Wildlife Service (USFWS) approved the Kaheawa Wind Project II (Project) Habitat Conservation Plan (HCP) in 2012. In January 2012, the Project received a federal incidental take permit (ITP; ITP-TE27260A-0) from the USFWS and a state incidental take license (ITL; ITL-15) from DOFAW. In 2019, DOFAW and USFWS approved an HCP Amendment to (hereafter HCP; SWCA 2019) to address the higher-than-expected take of two species, and the ITP and ITL were reissued (ITP-TE27260A-1; September 2019 and amended ITL-15; November 2019). The ITP and ITL cover the incidental take of four federally and state-listed, threatened and endangered species (the Covered Species) over a 20-year permit term.

The Covered Species include:

- 'Ōpe'ape'a (Hawaiian hoary bat, *Lasiurus cinereus semotus*)¹;
- Nēnē (Hawaiian goose, *Branta sandvicensis*)¹;
- 'Ua'u (Hawaiian petrel, *Pterodroma sandwichensis*); and
- 'A'o (Newell's shearwater, *Puffinus newelli*).

The Project was constructed in 2011 and 2012 and was commissioned on July 2, 2012. The Project continues to be operated by Kaheawa Wind Power II, LLC (KWP II).

KWP II and Tetra Tech, Inc. (Tetra Tech) have collaborated to prepare this progress report to describe the work performed for the Project during the State of Hawai'i 2024 fiscal year (FY 2024; July 1, 2023–June 30, 2024) pursuant to the terms and obligations of the approved HCP, ITL, and ITP. The Project has previously submitted annual HCP progress reports to DOFAW and USFWS for FY 2013 through FY 2023 (KWP II 2013, KWP II 2014, KWP II 2015, KWP II 2016, KWP II 2017, KWP II 2018, Tetra Tech 2019, Tetra Tech 2020, Tetra Tech 2022a, Tetra Tech 2022b, Tetra Tech 2023).

2.0 Fatality Monitoring

Since operations began in July 2012, the Project has implemented a year-round intensive monitoring program to document downed (i.e., injured or dead) wildlife incidents involving Covered Species and other species. In consultation with USFWS, DOFAW, and the Endangered Species Recovery Committee (ESRC), fatality search areas have evolved over time from the start of operations through the initiation of the current approach in 2015. The last modifications were in response to the March 31, 2015 ESRC meeting wherein members agreed to “encourage the

¹ Among other modifications, increased take and mitigation for impacts to the nēnē and 'ōpe'ape'a were addressed in the 2019 approved HCP Amendment.

applicant to work with the statistical experts and researchers to develop an alternative more efficient and focused monitoring strategy which still meets the committee's expressed preference for continuation of annual monitoring." Initially, monitoring occurred within the entirety of 70-meter radius circular plots centered on each wind turbine generator (WTG). Beginning in July 2015, with agreement from the agencies, the search area was reduced to the WTG graded pads and access roads cleared of vegetation that fall within a 70-meter radius circle centered on each of the Project's 14 WTGs (Figure 1). This search area continued to be used for monitoring in FY 2024.

In FY 2024, all 14 WTGs were searched for fatalities once per week. The FY 2024 mean search interval for all WTGs was 7 days (Standard Deviation = 0.5 days); no search dates were missed. All search plots were inspected by a canine search team which included a trained detector dog accompanied by a handler; should search conditions prevent the use of dogs (e.g., weather, injury, availability of canine search team, etc.), search plots would be visually surveyed by Project staff. No visual-only searches occurred in FY 2024.

Additionally, KWP I tracks observations of live nēnē on site when they overlap with the timing of fatality searches. A total of 27 observations of 71 (non-distinct) individual nēnē were made over 22 days between September 2023 and April 2023 with observations made in every month of this timeframe.

Precautions have been taken to eliminate any potential canine interactions with wildlife, with a focus on the nēnē. If nēnē were present nearby, the canine handler immediately retrieved and restrained the dog to avoid disturbing the birds, and either postponed searching in the vicinity of the birds, worked on leash away from any geese, or temporarily skipped canine searches in the vicinity. No canine-wildlife interactions occurred in FY 2024.

3.0 Carcass Persistence Trials

One 28-day carcass persistence trial was conducted in each quarter, for a total of four trials in FY 2024. Each trial tested a minimum of five black rats (*Rattus rattus*) for 'ōpe'ape'a surrogates, two large chickens (*Gallus gallus*) for nēnē surrogates (i.e., large birds), and two wedge-tailed shearwater (*Ardenna pacifica*) carcasses as surrogates for the 'ua'u and 'a'o (i.e., medium birds; Covered Seabird Species).

In FY 2024, the probability that a carcass persisted until the next search was 0.82 for all bat surrogates (95 percent Confidence Interval [CI] = 0.71, 0.91; N=23), 1.00 for large birds (95 percent CI = 0.97, 1.00; N=9), and 1.00 for medium-sized birds (95 percent CI = 0.97, 1.00; N=11).

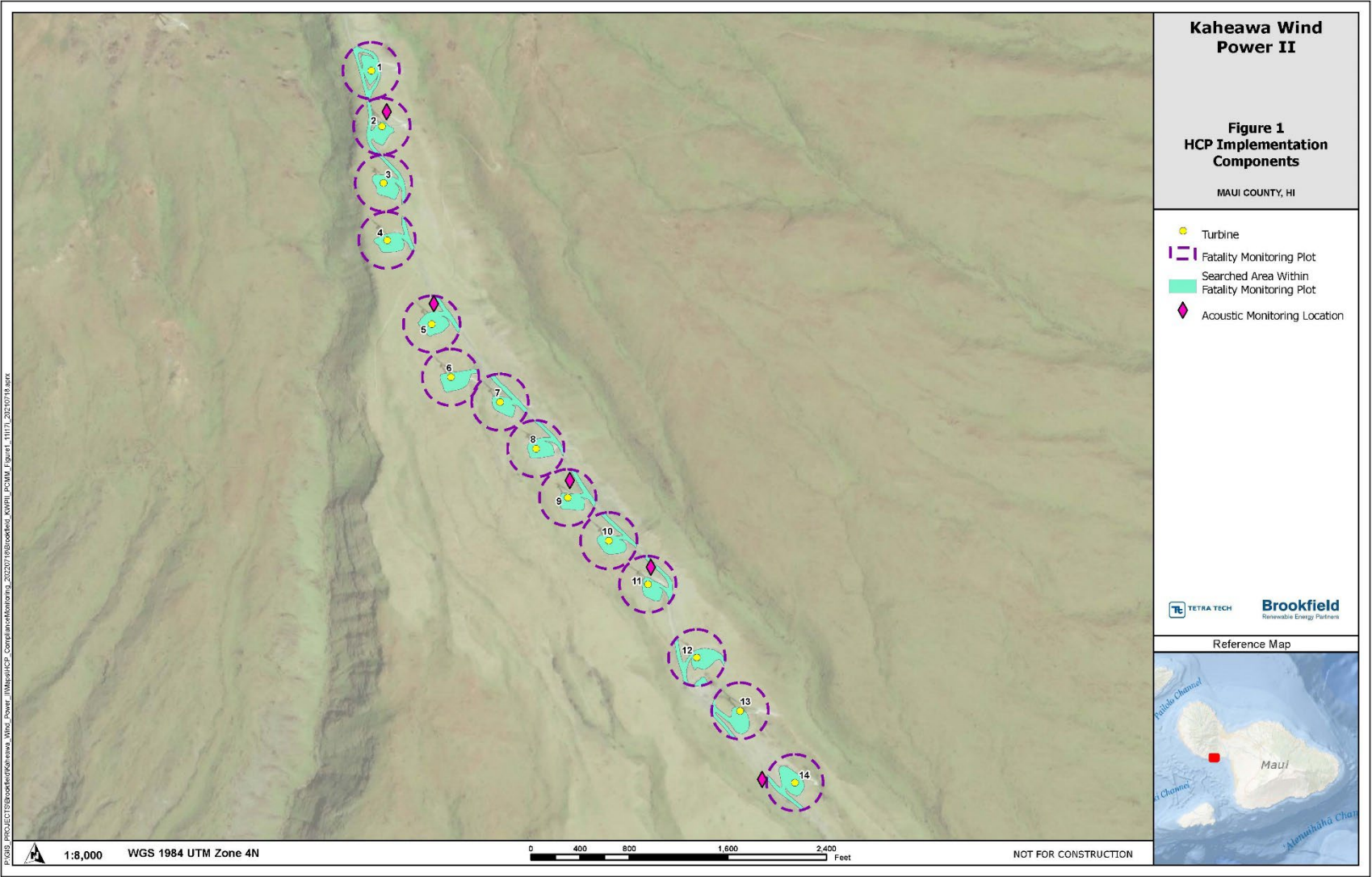


Figure 1. HCP Implementation Components

4.0 Searcher Efficiency Trials

A total of 66 individual searcher efficiency carcasses (trial carcasses) over 19 trial dates were administered during FY 2024. Similar to the carcass persistence trials, black rats were used as surrogates for bats and large chickens were used as surrogates for nēnē. Surveyors used wedge-tailed shearwaters and other medium-sized birds collected or procured under the Project's Special Purpose Utility Permit (MBPER0055564-0 valid through 03-31-2025) and Protected Wildlife Permits (WL21-18 and 231228115819-WILD) as surrogates for Covered Seabird Species. Searcher efficiency trials occurred approximately twice monthly throughout the year; all trials tested canine search teams in FY 2024 (no visual only searches occurred in FY 2024). Of the 66 trial carcasses placed, five bat surrogates were not available for detection (e.g., scavenged prior to the search).

For FY 2024, the probability that a canine search team would find a carcass was 1.00 for bat surrogates (95 percent CI = 0.94, 1.00; N=41), 1.00 for large birds (95 percent CI = 0.78, 1.00; N=10), and 1.00 for medium-sized birds (95 percent CI = 0.78, 1.00; N=10).

5.0 Vegetation Management

In order to maximize fatality monitoring efficiency and minimize impacts to native plants without compromising soil stability, KWP II performs vegetation management at the Project. Vegetation management activities have evolved over time, and account for management activity restrictions during the nēnē nesting season. The evolution of vegetation management includes:

- Initial vegetation management activities within the search plots were limited to between April 1 and October 31 to minimize risk during the nēnē nesting season.
- In November 2016, Stephanie Franklin (DOFAW-Maui) verbally approved using hand management tools (spray packs and weed whackers) during the nēnē nesting season if the activity was within the current search area and did not disturb wildlife.
- In March 2017, Stephanie Franklin verbally approved the removal of Christmas berry (*Schinus terebinthifolius*) within 70 meters of the WTGs to reduce potential nēnē nesting habitat in the vicinity.
- In September 2021, Stephanie Franklin verbally approved the continuation of the quarterly management program and woody vegetation removal using hand and power tools, and manual application of herbicide on cut stumps as necessary, in proximity to select turbines. Verbal approval was also given for additional woody vegetation removal within a 1-meter buffer of select turbine access roads noting that all woody vegetation removal work must be completed between April 1 and October 31 and in conjunction with a biological monitor.

The vegetation management program currently being implemented at the Project consists of twice annual herbicide treatments and an as-needed weed-whacking program. Herbicides are applied to

the cleared areas within each search plot outside of the nēnē breeding season, as wind and weather conditions allow. Remaining vegetation is trimmed by weed whacking to maintain annual consistency of the cleared area extent within 70 meters of each turbine. In FY 2024, vegetation management occurred in October 2023 (Q2), and April-May, 2024 (Q4).

6.0 Scavenger Trapping

KWP II implements periodic scavenger trapping at the Project to extend carcass persistence times and contribute to a high probability of a carcass persisting until the next search. The program includes a once-quarterly intensive trapping effort followed by ongoing biweekly (every other week) trapping effort. In FY 2024, the number of traps in use for each effort was 17 DOC250 and 14 cage traps. Trap distribution has remained consistent through the implementation of the program, and represents the increased level of effort established in FY 2022 to address reduced probabilities of carcasses persisting the next search and provide additional protections to the nēnē. In FY 2024, there were an average of 30 trap nights per quarter for cage traps, and 91 trap nights per quarter for the DOC250s. This level of effort removed 25 mongooses (*Herpestes auropunctatus*) and two feral cats (*Felis catus*). No non-target animals were trapped. This program also benefits the resident wildlife, including the nēnē, by reducing the potential for predation.

7.0 Documented Fatalities and Take Estimates

One fatality of a Covered Species was detected in FY 2024, a nēnē (Section 7.2.1). All observed downed wildlife were handled and reported in accordance with the Downed Wildlife Protocol provided by USFWS and DOFAW (USFWS and DOFAW 2020). No injured (live) downed wildlife was observed at the Project in FY 2024.

To calculate take estimates, the number of observed fatalities is scaled to account for fatalities that are not detected (unobserved). Unobserved fatalities are the result of three primary factors:

- Carcasses may be scavenged before searchers can find them;
- Carcasses may be present, but not detected by searchers; and
- Carcasses may fall outside of the searched area.

Carcass persistence and searcher efficiency (bias correction; see Sections 3.0 and 4.0) measure the effect of the first two factors. The third factor, the number of carcasses that fall outside of the searched area, is dependent upon the proportion of the carcass distribution that is searched. The search area for fatalities at the Project has evolved over time (Section 2.0); therefore, the proportion of the carcass distribution searched has varied historically. However, no change to the search plots has been made since FY 2016 (Section 2.0). Thus, the estimate of the proportion of the carcass distribution searched (DWP; Appendix 1) has remained the same as described in the FY 2017 annual report (KWP II 2017).

Cumulative take at an upper credible limit (UCL) of 80 percent was calculated for each Covered Species for which documented fatalities have occurred, per request of USFWS and DOFAW. The UCL is estimated from three components:

1. Observed direct take (ODT) during protocol (standardized) fatality monitoring;
2. Unobserved direct take (UDT); and
3. Indirect take.

The Evidence of Absence software program (EoA; Dalthorp et al. 2017), the agency-approved analysis tool for analyzing direct take, uses results from bias correction trials and ODT to generate a UCL of direct take (i.e., ODT + UDT). Direct take values from this analysis can be interpreted as an 80 percent probability that actual direct take at the Project over the analysis period was less than or equal to the 80 percent UCL. Indirect take calculations are based on the HCP and agency guidance. Indirect take is estimated based on factors such as the breeding season in which fatalities are observed, sex, and age characteristics of Covered Species fatalities found at the Project, their associated life history characteristics as described in the Project's approved HCP, and current agency guidance (e.g., USFWS 2016 for the 'ōpe'ape'a).

Additionally, EoA includes a module that allows users to project future estimates of mortality based on results of past fatality monitoring. Due to the inherent uncertainty of these projections (including the potential future contribution of indirect take) and the amplification of this uncertainty resulting from the use of the 80 percent UCL as the estimate of take for regulatory compliance, it is important to note that long-term projections have limited utility. Nevertheless, they do help gauge the likelihood of permitted take exceedance and may help operators in their mitigation planning, assuming future management and monitoring conditions can be reasonably estimated.

7.1 'Ōpe'ape'a

7.1.1 *Estimated Take*

A total of four 'ōpe'ape'a fatalities have been observed at the Project since operation began in July 2012, with no take observed in FY 2024. Three observed bat fatalities have been found within the search area and are used to estimate direct take. One of the fatalities was classified as an incidental observation. All bat carcasses were transferred to the U.S. Geological Survey for genetic sexing (Pinzari and Bonaccorso 2018). The 'ōpe'ape'a fatalities by fiscal year are listed in Table 1.

Table 1. Observed ‘Ōpe‘ape‘a Fatalities at KWP II through FY 2024

Fiscal Year	‘Ōpe‘ape‘a Observed Direct Take	‘Ōpe‘ape‘a Incidental Fatality Observations	Total
2013	1	0	1
2014	2	0	2
2015	0	0	0
2016	0	0	0
2017	0	0	0
2018	0	0	0
2019	0	1	1
2020	0	0	0
2021	0	0	0
2022	0	0	0
2023	0	0	0
2024	0	0	0
Total	3	1	4

The estimated direct take (ODT + UDT) for the four ‘ōpe‘ape‘a fatalities found between the start of operation (July 2012) and end of FY 2024 (June 30, 2024) is less than or equal to 11 bats (80 percent UCL; Appendix 1a).

Indirect take is estimated to account for the potential loss of individuals that may occur indirectly as the result of the loss of an adult female through direct take during the period that females may be pregnant or supporting dependent young. The timing and sex of all observed fatalities (those observed in fatality monitoring as well as incidental to fatality monitoring) is used in the calculation of indirect take. Cumulative indirect take through FY 2024 remained the same as in FY 2023 at 0.47 adults (Appendix 2a).

The UCL for Project take of the ‘ōpe‘ape‘a at the 80 percent credibility level is 12 adult bats (11 estimated direct take + one estimated indirect take, rounded up from 0.47). That is, there is an approximately 80 percent probability that actual take at the Project at the end of FY 2024 is less than or equal to 12 bats (Appendix 1a). The estimated take value is the same as reported in FY 2023.

7.1.2 Projected Take

KWP II has projected ‘ōpe‘ape‘a take through the end of the permit term using the fatality monitoring data collected through FY 2024 to evaluate the potential for the Project to exceed the permitted take limit at the 80 percent UCL prior to the end of the permit term (Appendix 3a). For this analysis, the detection probability for future years is assumed to match the detection probability of FY 2024 (0.453; 95 percent CI 0.398, 0.509), and the fatality rate is unaltered for all

future years ($\rho=1$). Future indirect take is unknown and will potentially vary based on the timing of any ODT. Therefore, based on historical Project data, Tetra Tech assumed a total indirect take for the Project over the permit term would be a maximum of two adult equivalents (approximately six juveniles based on assumed 'ōpe'ape'a survival rates; or 5.3 percent of the permitted take; USFWS 2016). Currently, the proportion of total take that is attributable to indirect take is 4.1 percent (0.47 [adult bat equivalents estimated from indirect take] / 11.47 bats [bats estimated combining the direct and indirect take]), making the assumption of indirect take of two adult bats conservative. Assuming two adult bat equivalents are attributed to the Project as indirect take, direct take allowable under the HCP would be 36 bats (38 bats [permitted take] minus 2 bats [estimated as attributed to indirect take] = 36 bats [estimated direct take maximum]).

Based on the analysis described above and presented in Appendix 3a, there is a 99.17 percent chance that the 80 percent UCL of cumulative take *will not* be exceeded during the permit term. In addition, the median years of operations without exceeding this direct take threshold is 20, suggesting that even with an indirect take contribution of two adult equivalents, the Project is unlikely to exceed a cumulative take estimate of 38 bats (permitted take). Appendix 3a also indicates that the Tier 3 threshold of 30 bats is unlikely to be exceeded during permit term. Therefore, the Project is likely to remain below both Tier 3 of 'ōpe'ape'a take threshold of 30 bats *and* the permitted take limit of 38 bats for the permit term.

7.2 Nēnē

7.2.1 Estimated Take

A total of 14 adult nēnē fatalities and 1 gosling fatality have been observed at the Project since the beginning of operation, with no observed take in FY 2024. Nine of the 15 observed adult fatalities have been found within the search area and are used to estimate UDT. Five of the 15 observed fatalities were classified as incidental observations. One gosling was detected in FY 2018; as the gosling was not capable of flight, it is accounted for independently of the analysis of take associated with collision risk. The observed nēnē fatalities by fiscal year are listed in Table 2.

Table 2. Observed Nēnē Fatalities at KWP II through FY 2024

Fiscal Year	Nēnē Observed Direct Take	Nēnē Incidental Fatality Observations	Total
2013	1	0	1
2014	0	0	0
2015	2	0	2
2016	1	0	1
2017	0	0	0
2018	1	3 ¹	4 ¹
2019	0	1	1
2020	3	0	3

Fiscal Year	Nēnē Observed Direct Take	Nēnē Incidental Fatality Observations	Total
2021	0	0	0
2022	1	1	2
2023	0	0	0
2024	0	0	0
Total	9	5¹	14¹
1. Excludes one gosling detected in FY 2018 attributable to wind farm operations other than turbines.			

A single nēnē was found during a standardized search in February 2024, however, no signs of trauma or predation could be found, and the carcass was found less than a meter from a bullet egg with an aggressive male next to the carcass. A necropsy was conducted on the carcass, and after review with DOFAW and USFWS, it was determined that the fatality was not attributed to the wind farm. Therefore, this nēnē is not included in the observed direct take or incidental fatality observations.

The estimated direct take (ODT + UDT) for the 14 nēnē fatalities found between the start of operation (July 2012) and end of FY 2024 is less than or equal to 26 geese (80 percent UCL; Appendix 1b).

The gosling was then added as a single additional juvenile fatality, adjusted to an adult based on estimated survival rates (1×0.8^3); the gosling fatality translates to 0.512 adult equivalents. The gosling was added to the estimate of 26 geese at the 80 percent UCL that resulted from the EoA analysis for a total estimated direct take of 26.512.

Indirect take is estimated to account for the potential loss of individuals that may occur as the result of the loss of their parents. Both parents for the nēnē care for young post-fledging (Banko et al. 2020). The point during the breeding season when an adult is taken determines to what extent offspring may be affected (SWCA 2011). Cumulative indirect take through FY 2024 was 1.66 fledglings (0.85 adult equivalents, assuming a 0.8 annual survival rate and 3 years from fledging to adult; Appendix 2b).

Thus, the UCL for cumulative Project take of the nēnē at the 80 percent credibility level is 28 geese (26 [estimated direct take from EoA] + 1 observed gosling fatality \times 0.512 adults/gosling + 0.85 [estimated adult equivalent indirect take], rounded up). That is, there is an approximately 80 percent probability that actual take at the Project at the end of FY 2024 is less than or equal to 28 adult geese.

In FY 2024 KWP II worked closely with USFWS and DOFAW to reach consensus on mitigation credit through FY 2023. The total mitigation credits assigned through 2024 are distributed annually as indicated in rows K and L of Appendix 2b, as agreed to in FY 2022 and FY 2024.

Per the HCP, the Project may cause a net loss in productivity in the event that take outpaces the number of individuals produced from mitigation efforts. The lag between production of geese

through mitigation efforts and the take of geese at the Project drive the estimate of lost productivity. Accrued lost productivity at a given point in time is calculated as the cumulative take less the number of individuals generated from mitigation efforts to date, and then adjusted by a factor of 0.1 to account for the probability that those unmitigated birds would have produced young (SWCA 2011). Accrued lost productivity is currently estimated at 8.78 adult equivalents (Appendix 2b).

7.2.2 Projected Take

KWP II has projected nēnē take through the end of the permit term using the fatality monitoring data collected through FY 2024 to evaluate the potential for the Project to exceed the permitted take limit at the 80 percent UCL prior to the end of the permit term (Appendix 3b). For this analysis, the detection probability for future years is conservatively assumed to match the detection probability of FY 2024 (0.367; 95 percent CI 0.354, 0.380), and the fatality rate is unaltered for all future years ($\rho=1$). Future indirect take is unknown and will potentially vary based on the timing of any ODT. Based on historical Project data, we assumed total indirect take for the Project over the permit term would be a maximum of two adult equivalents (approximately four juveniles based on an assumed nēnē survival rate from juvenile to adult of 0.512; SWCA 2011), or 4.54 percent of the permitted take limit in the HCP. Currently, the proportion of total take that is attributable to indirect take is 3.11 percent (0.85 adult geese equivalents estimated from indirect take / 27.362 geese estimated combining the direct and indirect take) making the assumption of two adult indirect take conservative.

The permitted take limit for the nēnē is 44. Future indirect take is unknown and will potentially vary based on the timing of ODT. Assuming two adult nēnē equivalents are attributed to the Project as indirect take, the permitted direct take under the HCP would be 42 nēnē (44 geese [permitted take] minus 2 geese [estimated indirect take = 42 geese [estimated direct take maximum]]).

Based on the analysis, there is approximately 57.53 percent probability that the 80 percent UCL of cumulative take at the Project *will not* exceed the permitted amount during the permit term (Appendix 3); EoA calculated a median estimate of 20 years of Project operation without a direct take estimate exceeding 42 geese.

Estimated take at the 80 percent UCL at the Project has surpassed 75 percent of allowable take in the current tier take. KWP II has taken actions to minimize the threats to the nēnē at the Project and continues to work with USFWS, DOFAW, and technical experts to address mitigation and further reduce risk (Section 10.0).

7.3 Non-listed Species

Two non-listed bird species were documented as WTG-related fatalities at the Project site in FY 2024: black francolin (*Francolinus francolinus*; five individuals) and Eurasian skylark (*Alauda arvensis*; one individual). Black francolin and Eurasian skylark are both non-native, introduced birds which are not protected under the Migratory Bird Treaty Act (MBTA). For details of these fatalities for FY 2024, see Appendix 4.

8.0 Wildlife Education and Observation Program

The wildlife education and observation program (WEOP) helps to ensure the safety and well-being of native wildlife in work areas and along site access roadways. The training provides useful information to assist staff, contractors, and visitors to be able to conduct their business in a manner consistent with the requirements of the HCP, the Conditional Use Permit, land use agreements and applicable laws. Personnel are trained to identify Covered Species and other species of wildlife that may be found on-site and what protocol to follow, as determined in the HCP and through relevant agency guidance (e.g., USFWS and DOFAW 2020), when downed wildlife is found. The trainees are also made aware of driving conditions and receive instruction on how to drive and act around wildlife. Records of wildlife observations by WEOP-trained staff are also used by the HCP program to identify the patterns of wildlife use of the site.

During FY 2024 101 people received WEOP training. WEOP trainings will continue to be conducted on an as-needed basis to provide on-site personnel with the information required to respond appropriately in the event they observe a Covered Species or encounter downed wildlife while on-site.

9.0 Mitigation

The Project's mitigation requirements are described in Section 6.0 of the HCP (SWCA 2011, SWCA 2019).

9.1 'Ōpe'ape'a

9.1.1 Mitigation

Mitigation for Tier 1 and Tier 2 estimated bat take has been completely funded at Kahikinui State Forest Reserve (KWP II 2018). The habitat management program founded through Project mitigation funding continues under DOFAW management (DOFAW 2021). Mitigation for Tier 3 estimated take (19 bats within Tier 3) was contracted to the U.S. Geological Survey (USGS) Hawaiian Hoary Bat Research Group. Bat ecological research on Hawai'i Island began in FY 2018 and is intended to better inform future bat habitat restoration and conservation. KWP II's contract with USGS was completely funded in FY 2021 (Tetra Tech 2022a). The funding obligation was completed in FY 2022; the funded research was published in FY 2024 (available online at <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0288280>). The Project in combination with Brookfield's Kaheawa I Wind Project (KWP I) had a total funding obligation of \$1.7M to allocate to portions of each Project's mitigation requirement. KWP II, in combination with KWP I, exceeded its funding obligation by \$131,500 over the original cost, for a total combined expenditure of \$1,831,500.

Assuming the current take rate and search conditions remain unchanged through the remainder of the permit term, Tier 4 mitigation will not be necessary.

9.2 *Acoustic Monitoring at the Project*

The HCP commits KWP II to performing acoustic monitoring for bat activity throughout the 20-year permit period. Acoustic monitoring for bat activity has been conducted continuously beginning in 2012. In October 2013 (FY 2014) eight Song Meter SM2BAT+ ultrasonic recorders (SM2) were deployed, replacing Anabat SD2 bat detectors. Each SM2 unit is equipped with one SMX-U1 ultrasonic microphone (Wildlife Acoustics, Maynard, MA, USA) positioned horizontally, facing southwest (away from the prevailing NE trade winds), 6.5 meters above ground level. In October 2019 (FY 2020) the Pali brush fires burned across most of the Project destroying six SM2 units. For the remainder of the FY 2020 (October 2019 to June 2020) only two sites (WTGs 9 and 11) were monitored for acoustic bat activity. In order to continue with the objectives of the monitoring program and address gaps in the spatial coverage of SM2 units resulting from the brush fire, the monitoring regime was redesigned in July 2020 with the deployment of five SM2 units (WTGs 2, 5, 9, 11, and 14; Figure 1). Additionally, because of differences in the equipment used prior to FY 2014, data collected in FY 2024 is only comparable to data collected between FY 2014 and FY 2023.

The objective of bat acoustic monitoring is to better understand the annual and seasonal variation in bat activity at the Project. Analysis of variance (ANOVA) and a Tukey's Honest Significant Difference (HSD) were used to test for interannual differences in detection rates between sampling years. A linear model (LM) was constructed to test for a change in detection rates across all sampling years. FY 2014 was removed from the analysis because it did not represent a full sampling year and excluded months known to have high detection rates (July, August, and September). All data were normalized with an Ordered Quantile Normalization transformation using the 'bestNormalize' package in R (Peterson 2021). The distribution of residuals from the LM were examined to check for violations of model assumptions. All tests were two-tailed, employed an alpha value of 0.05, and were conducted in R version 4.3.1 (R Core Team 2023). The characterization of Hawaiian hoary bat seasons corresponds approximately to Gorresen et al. (2013).

In FY 2024, Hawaiian hoary bats were detected on 161 nights out of 1,781 detector-nights sampled (9 percent; Table 3). Detection rates increased during the lactation and post-lactation reproductive periods, reaching a peak in October (0.28) and then declined in November (Figure 2). Detection rates remained low, fluctuating monthly (between 0.08 and 0.06) throughout the remainder of the post-lactation, pre-pregnancy, and early pregnancy reproductive periods (November – April). A second peak in detection rates occurred (0.21) in May followed by a decline in June (Figure 2). The annual trend in detection rates observed in FY 2024 is similar to the trends observed in previous monitoring years (Figure 3). This, however is different that what was observed at the adjacent KWP I wind project for which the peak period of annual activity occurred during the pregnancy reproductive period.

Table 3. Number of Nights Sampled, Number of Nights with Detections and Proportion of Nights with Bat Detections Between FY 2014 and FY 2024

Dates¹	No. of Nights Sampled	No. of Nights with Detections	Proportion of Nights with Detections
FY 2014 (October 2013 - June 2014)	2,138	85	0.040
FY 2015 (July 2014 - June 2015)	2,864	204	0.071
FY 2016 (July 2015 - June 2016)	2,038	110	0.054
FY 2017 (July 2016 - June 2017)	2,217	166	0.075
FY 2018 (July 2017 - June 2018)	2,103	161	0.077
FY 2019 (July 2018 - June 2019)	2,549	211	0.083
FY 2020 (July 2019 - June 2020)	1,146	117	0.102
FY 2021 (July 2020 - June 2021)	1,671	232	0.139
FY 2022 (July 2021 - June 2022)	1,780	163	0.092
FY 2023 (July 2022 - June 2023)	1,727	197	0.114
FY 2024 (July 2023 - June 2024)	1,781	161	0.090
1. Number of monitoring sites: FY 2014 - 2019 ($n = 8$), FY 2020 ($n = 2$) beginning in October 2019, FY 2021 - 2024 ($n = 5$).			

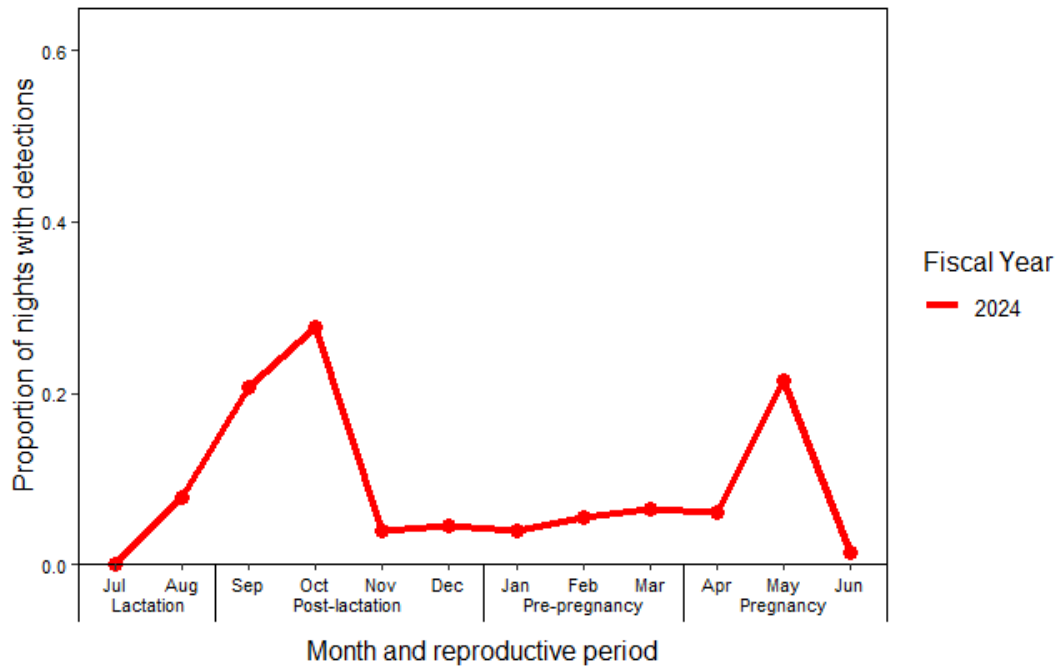


Figure 2. Monthly Detection Rates at the Project in FY 2024 with Corresponding Reproductive Periods

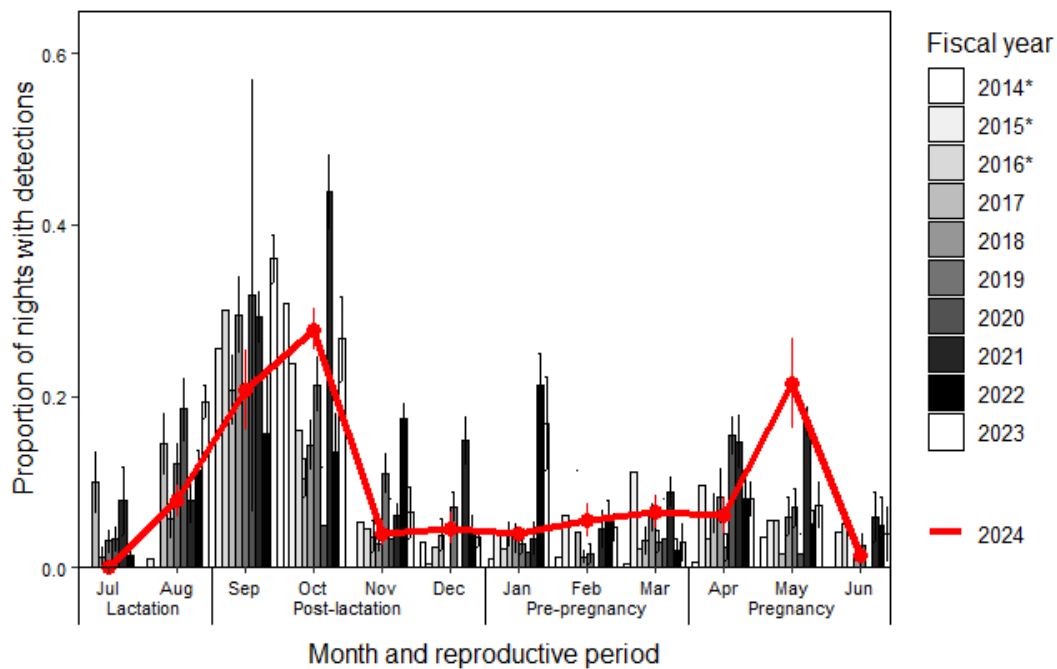


Figure 3. Monthly Bat Detection Rates at the Project for FY 2014 to FY 2024 with Corresponding Reproductive Periods

*Note: Error bars (SE) not available for fiscal years 2014, 2015, and 2016

The annual detection rate in FY 2024 (9.0 percent) was marginally lower than the annual detection rate in FY 2023 (11.4 percent). Annual detection rates varied between all monitoring years (Table 3) but were not significantly different (ANOVA: $F_{9,110} = 1.49$, $P > 0.159$). Across all monitoring years (FY 2015 to FY 2024) there is a significant increasing trend in the annual detection rate (LM: $R^2 = 3.74$ percent; $F_{1,118} = 4.59$, $P < 0.034$; Figure 4).

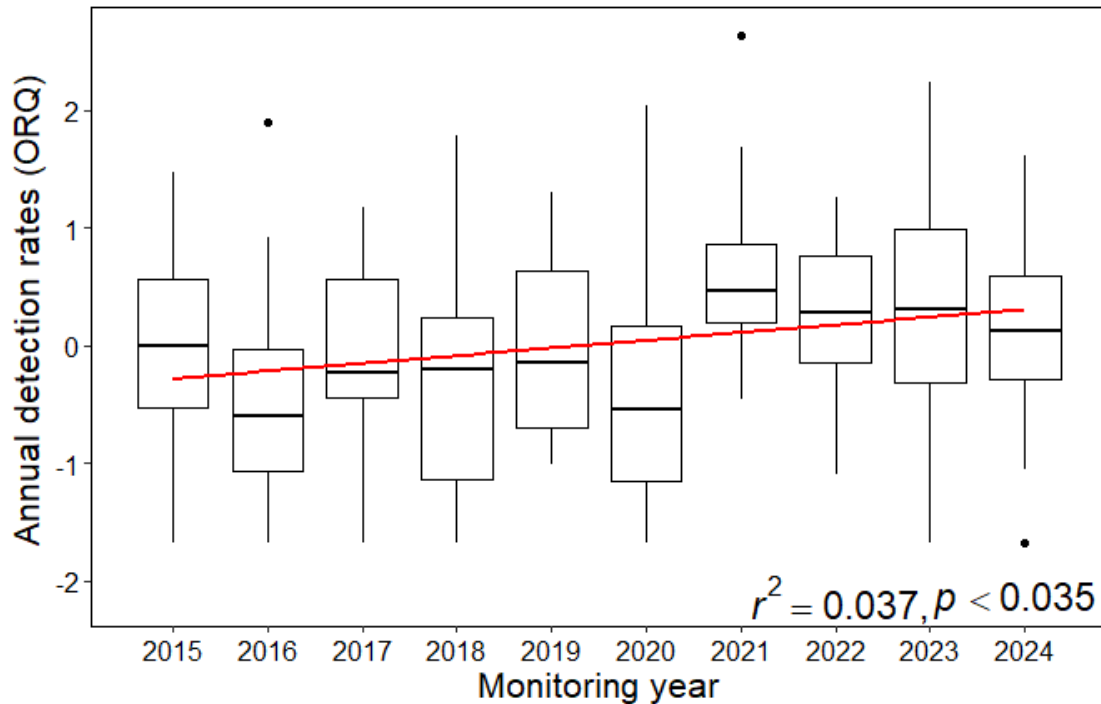


Figure 4. Box-plot with Linear Regression Showing the Increasing Trend in the Annual Detection Rate at the Project Between FY 2015 and FY 2024

*Note: Ordered Quantile normalization transformation (ORQ). All data were normalized using this transformation.

9.3 Nēnē

The Project provided funds to DOFAW in FY 2017 for management of Maui-based nēnē release pens with significant activity or nesting. Specifically, the funding supported predator control, fence maintenance, vegetation management and monitoring of a nēnē release pen at Pi‘iholo Ranch in FY 2017, FY 2018, and part of FY 2019. The Project also provided funding for a technician at the Haleakalā Ranch release pen from October 2018 through February 2019. In May 2020, the Project provided \$112,682 to fund nēnē mitigation activities performed by DOFAW at the Pi‘iholo Ranch release pen. DOFAW was unable to process these funds in May 2020 when they were received due to internal limitations (pers. comm., A. Siddiqi, DOFAW, June 16, 2021). During FY 2024, KWP II worked closely with DOFAW to allocate \$107,316 of the unspent funding to mitigation work that

was previously completed: at Pi'iholo Ranch in FY 2021 and at Haleakalā Ranch in FY 2023. In 2021, the Pi'iholo Ranch was sold and the release pen was no longer available for mitigation opportunities. Nēnē credit allocation through FY 2024 is summarized in Appendix 2b.

It is important to note that the cumulative increases in adult and juvenile survival and productivity achieved by KWP II's mitigation projects have not been sufficient to fully offset the mitigation obligations of Tier 1 or Tier 2. KWP II is currently working on pen habitat and infrastructure improvements at the Haleakalā Ranch release pen for the FY 2025 breeding season in an attempt to increase productivity, in addition to other proposals for nēnē mitigation. Additionally, KWP II is coordinating with DOFAW and Haleakalā Ranch to plan a potential expansion of the existing pen. KWP II is actively working with agencies to address the nēnē mitigation deficit and Tier 2 mitigation planning, including initiation of an additional mitigation project on Moloka'i.

9.4 Seabirds

KWP II is committed to seabird protection and recovery on Maui and within Maui Nui. KWP II completed its mitigation obligation for both the 'a'o and 'ua'u prior to FY 2024, and to date, no take of either 'a'o or 'ua'u has been documented at the Project.

9.4.1 'A'o Survey – East Maui

KWP II funded surveys for potential mitigation sites on east Maui, which were completed in September 2015 (KWP II 2016). These surveys identified potential colony locations, estimated the numbers of birds present, assessed predator activity, and evaluated management feasibility at the colony locations.

9.4.2 'A'o – Makamaka'ole

Mitigation efforts at Makamaka'ole began with the construction of the two predator exclosures completed in September 2013. Mitigation efforts at Makamaka'ole involved predator monitoring and trapping, artificial burrow checks and monitoring using game cameras, seabird social attraction using decoys and sound systems, and ongoing maintenance, including vegetation management, of both enclosures through January 31, 2023.

On December 5, 2022, DOFAW provided a letter assessing that after the 2022 breeding season at Makamaka'ole, credit for 148 adults and two fledglings translated into 8.53 'a'o mitigation credits for KWP II (in conjunction with KWP I), and that KWP II had completed its mitigation obligation for the 'a'o. On December 8, 2022, USFWS provided a letter assessing credit for 149 adults and two fledglings, translating to an 'a'o mitigation credit of 8.54, and that the mitigation obligation for KWP II (in conjunction with KWP I) had been met. Although Makamaka'ole had been managed to benefit the 'ua'u, as well as the 'a'o, no 'ua'u activity has been detected at burrows within the enclosures since 2017, and mitigation for the 'ua'u was adaptively managed to Lāna'i (Section 9.3.3).

In September 2024 KWP II signed a Memorandum of Agreement (MOA) with DOFAW (in conjunction with KWP I) to provide \$750,000 in funding for a fence replacement at Makamaka'ole

and to resume specified management and monitoring activities at the site starting in FY 2025 and throughout the term of the current ITL.

9.4.3 ‘Ua‘u – Lāna‘i ‘Ua‘u Protection Project

The ‘ua‘u have not been observed occupying the Makamaka‘ole mitigation site since 2017. Therefore, both KWP projects worked with USFWS and DOFAW to adaptively manage mitigation efforts for this species to ensure that their mitigation obligations are met.

Beginning in the 2018 ‘ua‘u breeding season, both KWP projects worked with USFWS and DOFAW to adaptively manage ‘ua‘u mitigation efforts in an interim fashion. As a result of this adaptive management, KWP I provided funding to Pūlama Lāna‘i to supplement ‘ua‘u breeding colony protection efforts on Lāna‘i in 2018. The success of this program and difficulties in attracting petrels to Makamaka‘ole suggested that both KWP projects could benefit the ‘ua‘u and make progress on mitigation obligations by continuing support for the Lāna‘i petrel breeding program.

From FY 2021 to FY 2023 (two breeding seasons), the two KWP projects adaptively managed their seabird mitigation programs by providing funding to Pūlama Lāna‘i.

On March 27, 2023, USFWS provided a letter assessing that after the 2022 breeding season, the total estimated benefit provided for the ‘ua‘u from ‘ua‘u breeding colony protection efforts on Lāna‘i was 89.20 credits based on a previously agreed upon assessment framework (pers. comm. E. Gosliner, USFWS, October 31, 2022 and P. Radley, DOFAW, November 16, 2022). Additionally, based on ‘ua‘u activity at Makamaka‘ole in 2016 and 2017, in their March 27th letter, USFWS approved an estimated benefit for the ‘ua‘u of 0.56. Thus, the total mitigation benefit achieved across mitigation projects is 89.72 adult ‘ua‘u for both KWP II and KWP I. KWP II’s ‘ua‘u mitigation obligation per the ITP is 43 ‘ua‘u (including adults, subadults, fledglings, nestlings, and eggs). In the March 27 letter, USFWS acknowledges that KWP II has met its ‘ua‘u mitigation obligation. DOFAW has not provided similar documentation.

10.0 Adaptive Management

In accordance with the HCP, low wind speed curtailment (LWSC) was implemented from the start of Project operations at wind speeds of up to 5 meters per second at all WTGs for the months of April through November. LWSC is expected to reduce bat take, as explained in the HCP. This curtailment period was extended to begin mid-February and continue through December 15 in response to bat fatalities documented at the Project on March 13, 2013 and February 26, 2014, and a fatality at the KWP I Project on December 14, 2013. On June 6, 2014, the Project proposed an additional adaptive management measure to the USFWS and DOFAW, increasing the LWSC cut-in speed. On July 29, 2014 the LWSC was raised to 5.5 m/s between February 15 and December 15 from sunset to sunrise. The Project continues its site-wide bat activity assessment as committed to in the approved HCP Amendment.

The Project has previously implemented a variety of actions to minimize risk to the nēnē, which continued in FY 2024. Scavenger trapping efforts implemented at the Project to improve persistence of carcasses during fatality monitoring have likely reduced the risk of predation of the resident nēnē and safety measures to avoid interactions between nēnē and canine search teams have been identified and are implemented as needed. In response to the current projections of potential take of the nēnē at the Project, KWP II has taken practicable actions to minimize the threats to the nēnē. In FY 2023, KWP II implemented a vegetation management plan developed with concurrence from the agencies reducing the amount of woody vegetation on site. The goal was to minimize the attractiveness of onsite habitat to the nēnē. Because nēnē have a continued breeding presence at the site, KWP II will continue to reduce the amount of woody vegetation on site in FY 2025 in conjunction with agency approval. Additionally, KWP II will continue to monitor nēnē activity on site to inform vegetation management successes and needs, and continue to work with USFWS, DOFAW, and technical experts to further reduce risk to the species.

11.0 Agency Meetings, Consultations, and Visits

KWP II communicated actively with USFWS and DOFAW throughout FY 2024 through conference calls, site visits, in-person meetings, submittal of quarterly reports, and email communications related to the Project's HCP. The purpose of these communications included the required annual and semi-annual HCP implementation meetings, focused discussions regarding mitigation projects, mitigation credits for the nēnē and seabird mitigation programs, and ESRC review of the annual report. A summary of agency coordination is presented in Table 4.

Table 4. Summary of Agency Coordination and Communication in FY 2024

Date	Communication	Participants
July 12, 2023	Email regarding unspent funding provided by KWP II to DOFAW for management of Haleakala Ranch release pen starting in February 2022	Email from DOFAW to KWP II
July 25, 2023	Moloka'i Translocation Proposal for Nēnē Mitigation	Submitted to DOFAW, USFWS by Tetra Tech on behalf of KWP II
August 1, 2023	Annual report submission	Submitted by Tetra Tech to DOFAW, USFWS on behalf of KWP II
August 9, 2023	Email requesting DOFAW retain funds already provided for Haleakala Ranch and apply this funding to past management efforts	Email from KWP II to DOFAW
September 6, 2023	Cancelled site visit due to Maui wildfires	KWP II, Tetra Tech, DOFAW, USFWS
September 11, 2023	USFWS-provided comments on annual report	USFWS, KWP, Tetra Tech, DOFAW

Date	Communication	Participants
September 20, 2023	Email response to July 25 proposal requiring long-term management plan	Email from USFWS to KWP II
September 21, 2023	Teleconference to discuss Makamaka'ole fencing	KWP, Tetra Tech, DOFAW, DOFAW Maui, Maui Forest Reserve, MNSRP, USFWS
September 25, 2023	Email response to July 25 proposal rejecting mitigation credit calculations	Email from DOFAW to KWP II
September 25, 2023	DOFAW proposal for allocation of unspent mitigation funds for nēnē	Submitted to KWP II by DOFAW
September 26, 2023	DOFAW-provided comments on annual report	DOFAW, KWP, Tetra Tech
October 25, 2023	Submission of Final Annual Report	DOFAW, USFWS, Tetra Tech on behalf of KWP II
October 30, 2023	Q1 report	Submitted to DOFAW, USFWS by Tetra Tech
November 2, 2023	Annual Implementation Meeting (teleconference)	KWP II, Tetra Tech, DOFAW, USFWS
November 28, 2023	Email requesting additional details on DOFAW's proposal to apply unspent nēnē mitigation funds	Submitted to DOFAW by KWP II
December 7, 2023	Teleconference discussing nēnē take and mitigation	KWP II, Tetra Tech, DOFAW, USFWS
December 19, 2023	Notification of nēnē gosling fatality within the Haleakala Ranch release pen	Submitted to DOFAW, USFWS by Tetra Tech
December 21, 2023	Revised proposal for allocation of unspent funding for nēnē mitigation	Submitted to KWP II by DOFAW
January 31, 2024	Q2 report	Submitted to DOFAW, USFWS by KWP II
February 9, 2024	Downed wildlife report for February 7 fatality	Submitted to DOFAW, USFWS by Tetra Tech
February 21, 2024	Rescheduled site visit to KWP II	KWP II, Tetra Tech, DOFAW, USFWS, Hawai'i Attorney General's (AG) Office
February 26, 2024	In-person meeting related to HCP implementation	KWP II, DOFAW, USFWS
February 27, 2024	Email requesting update on KWP II response to DOFAW December nēnē proposal	Email from DOFAW to KWP II
April 5, 2024	Letter regarding mitigation compliance for KWP II ¹	Sent by Hawai'i Attorney General's Office on behalf of DLNR to KWP II

Date	Communication	Participants
April 19, 2024	Memorandum outlining 8 potential nēnē mitigation options for discussion	Sent by KWP II to DOFAW, USFWS
April 24, 2024	Draft MOU for fence replacement payment to DOFAW for Makamaka'ole Seabird Enclosure	Sent by KWP II legal counsel to AG
April 23, 2024	Updated downed wildlife report submitted for February 7 nēnē fatality clarifying take was not incidental; request for necropsy	Submitted to DOFAW, USFWS by Tetra Tech
April 26, 2024	Email received from AG regarding MOU	Sent by AG to KWP II legal counsel
April 29, 2024	Email received from AG regarding HCP amendments and Makamaka'ole management	Sent by AG to KWP II legal counsel
May 1, 2024	Q3 Report	Submitted by KWP II to DOFAW, USFWS
May 2, 2024	Call with Haleakala Ranch and DOFAW-Maui (did not attend) related to potential pen expansion	KWP II, Tetra Tech, Haleakala Ranch
May 2, 2024	Presentation and discussion of 8 nēnē mitigation options from the April 19 memo	KWP II, Tetra Tech, DOFAW, USFWS
May 3, 2024	Proposal sent accepting DOFAW December 2023 allocation of unspent nēnē funds	Submitted to DOFAW, USFWS by KWP II
May 9, 2024	Email received from AG clarifying requests for Makamaka'ole	Sent by AG to KWP II legal counsel
May 10, 2024	Draft MOU for management of Haleakala Release Pen	Submitted to DOFAW, USFWS by KWP II
May 17, 2024	Haleakala Ranch Statement of Work	Submitted to DOFAW, USFWS by KWP II
May 22, 2024	Nēnē Mitigation Proposal – Payment for Historic Funding Shortages	Submitted to DOFAW, USFWS by KWP II
May 23, 2024	Newly established bi-weekly check in call with agencies	KWP II, Tetra Tech, DOFAW, USFWS
May 23, 2024	Revised Nēnē Mitigation Proposal – Payment for Historic Funding Shortages	Submitted to DOFAW, USFWS by KWP II

Date	Communication	Participants
May 24, 2024	Email clarifying calculations from Nēnē Mitigation Proposal – Payment for Historic Funding Shortages	Email from KWP II to DOFAW, USFWS
May 28, 2024	Further clarifications regarding calculations from Nēnē Mitigation Proposal – Payment for Historic Funding Shortages	Email from KWP II to DOFAW, USFWS
June 7, 2024	Semi-annual meeting (in person in Honolulu)	KWP II, Tetra Tech, DOFAW, USFWS
June 12, 2024	Call with DOFAW-Maui regarding Maui Nui nēnē mitigation proposals (expansion of Haleakala Release Pen and translocation of birds to Moloka'i)	KWP II, Tetra Tech, DOFAW
June 14, 2024	Second Revised Nēnē Mitigation Proposal – Payment for Historic Funding Shortages	Submitted to DOFAW, USFWS by KWP II
June 17, 2024	Draft Makamaka'ole MOU	Sent by AG to KWP II legal counsel
June 27, 2024	Bi-weekly check in call	KWP II, Tetra Tech, DOFAW (USFWS provided an update via email due to schedule conflict)
June 27, 2024	Third Revised Nēnē Mitigation Proposal – Payment for Historic Funding Shortages	Submitted to DOFAW, USFWS by KWP II
1. Additional legal correspondence outside of the purview of HCP implementation has occurred regarding this issue and is not included in this table.		

12.0 Expenditures

Total HCP-related expenditures for the Project in FY 2024 were \$156,100 (Table 5).

Table 5. HCP-related Expenditures at the Project in FY 2024

Category ¹	Amount
Permit Compliance	\$33,100
Fatality Monitoring	\$67,000
Acoustic Monitoring for Bats	\$14,100
Vegetation Management and Scavenger Trapping	\$32,800
Equipment and Supplies	\$5,000
Haleakalā Ranch Release Pen Project ²	\$4,100
Total Cost for FY 2024	\$156,100
1. Staff labor costs are included in the overall costs for each category.	
2. This total is co-funded with KWP I and was primarily paid for by KWP I in FY 2024.	

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Appendix 1. Dalthorp et al. (2017) Fatality Estimation for the ‘Ōpe‘ape‘a and Nēnē at the Project through FY 2024

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Appendix 1a. Dalthorp et al. (2017) Fatality Estimation for the 'Ōpe'ape'a at the Project through FY 2024

Modelling Parameter		Modelling Period											
		1	2	3	4	5	6	7	8	9	10	11	12 (current)
FY		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
LWSC		5.0 m/s	5.0 m/s	5.5 m/s	5.5 m/s	5.5 m/s	5.5 m/s	5.5 m/s	5.5 m/s	5.5 m/s	5.5 m/s	5.5 m/s	5.5 m/s
Date Range	Begin	7/1/2012	7/1/2013	7/1/2014	7/1/2015	7/1/2016	7/1/2017	7/1/2018	7/1/2019	7/1/2020	7/1/2021	7/1/2022	7/1/2023
	End	6/30/2013	6/30/2014	6/30/2015	6/30/2016	6/30/2017	6/30/2018	6/30/2019	6/30/2020	6/30/2021	6/30/2022	6/30/2023	6/30/2024
Period length (span)		364	364	364	364	364	364	364	362	364	364	364	364
% of Year (rho)		1	1	1	1	1	1	1	1	1	1	1	1
Search Interval (days)		7	7	7	7	7	7	7	7.1	7	7	7	7
Number of Searches in Modelling period		52	52	52	52	52	52	52	51	52	52	52	52
Observed fatality (X)		1	2	0	0	0	0	0	0	0	0	0	0
K		0.7	0.7	0.7	1 ¹	1 ¹	1 ¹	1 ¹	1 ¹	1 ¹	1 ¹	1 ¹	1 ¹
DWP		1	1	1	0.562	0.562	0.562	0.56	0.56	0.56	0.56	0.56	0.56
ĝ	ĝ	0.443	0.359	0.336	0.362	0.442	0.375	0.372	0.476	0.409	0.354	0.517	0.453
	min	0.241	0.235	0.187	0.27	0.374	0.287	0.304	0.437	0.333	0.271	0.481	0.398
	max	0.656	0.493	0.503	0.46	0.511	0.467	0.440	0.516	0.486	0.441	0.553	0.509
B	Ba	9.08	18.5	10.95	35.09	87.96	41.22	74.23	289.1	63.53	42.51	383.0	139.4
	Bb	11.41	33.02	21.68	61.84	111.1	68.77	125.3	318.1	92.00	77.67	358.0	168.5
M*3		5	12	12	12	11	12	12	11	11	11	11	11
1. Searches performed by canine teams increases the probability that a missed carcass will be detected on the next search. 2. Search area reduced to graded and cleared portions of and roads within 70-meter radius from turbine. 3. Cumulative value representing estimate of total direct take from the start of operations through the identified monitoring period at the 80 percent UCL.													

Appendix 1b. Dalthorp et al. (2017) Fatality Estimation for Nēnē at the Project through FY 2024

Modelling parameter		Modelling Period											
		1	2	3	4	5	6	7	8	9	10	11	12 (current)
FY		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Date Range	Begin	7/1/2012	7/1/2013	7/1/2014	7/1/2015	7/1/2016	7/1/2017	7/1/2018	7/1/2019	7/1/2020	7/1/2021	7/1/2022	7/1/2023
	End	6/30/2013	6/30/2014	6/30/2015	6/30/2016	6/30/2017	6/30/2018	6/30/2019	6/30/2020	6/30/2021	6/30/2022	6/30/2023	6/30/2024
Period length (days)		364	364	364	365	364	364	364	362	364	364	364	364
% of Year		1	1	1	1	1	1	1	1	1	1	1	1
Search Interval (days)		7	7	7	7	7	7	7	7.1	7	7	7	7
Number of Searches in Modelling period		52	52	52	52	52	52	52	51	52	52	52	52
Observed fatality (X)		1	0	2	1	0	1	0	3	0	1	1	0
K		1	1	1	1	1	1	1	1	1	1	1	1
DWP		0.7	0.7	0.7	0.372	0.372	0.372	0.372	0.372	0.372	0.372	0.372	0.372
ĝ	ĝ	0.654	0.653	0.681	0.358	0.361	0.36	0.361	0.347	0.361	0.368	0.367	0.367
	min	0.503	0.474	0.583	0.288	0.294	0.285	0.295	0.319	0.338	0.355	0.343	0.354
	max	0.791	0.812	0.771	0.431	0.43	0.437	0.429	0.375	0.384	0.381	0.391	0.380
B	Ba	26.32	18.94	62.8	61.66	68.06	54.62	70.09	380.2	633.1	1811	567.7	1847
	Bb	13.91	10.05	29.46	110.5	120.7	97.27	124.2	717	1120	3110	980.2	3187
M*2		3	3	6	9	10	13	13	21	22	25	25	26
1. Search area reduced to graded and cleared portions of and roads within 70-meter radius from turbine. 2. Cumulative value representing estimate of total direct take from the start of operations through the identified monitoring period at the 80 percent UCL.													

Appendix 2. Indirect Take for the ‘Ōpe‘ape‘a and Nēnē at the Project in FY 2024

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Appendix 2a. Indirect Take for the ‘Ōpe‘ape‘a at the Project in FY 2024

Parameter	Description	Fiscal Year												
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
A	Observed Breeding Female Take	0	0	0	0	0	0	0	0	0	0	0	0	0
B	Indirect Take from Observed Breeding Female Take	0	0	0	0	0	0	0	0	0	0	0	0	0
	(A x 1.8)													
C	Observed Breeding Unknown Sex Take	0	0	0	0	0	0	0	0	0	0	0	0	0
D	Indirect Take from Observed Breeding Unknown Sex Take	0	0	0	0	0	0	0	0	0	0	0	0	0
	(C * 0.5 * 1.8)													
E	All Observed Take (Search and Incidental)	1	2	0	0	0	0	1	0	0	0	0	0	4
F	Estimated Take Multiplier (11/4=2.75)	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	-
G	Estimated Direct Take	2.75	5.5	0	0	0	0	2.75	0	0	0	0	0	11
	(E x F)													
H	Unobserved Direct Take (G - E)	1.75	3.5	0	0	0	0	1.75	0	0	0	0	0	7
I	Indirect Take Calculated from Unobserved Take	0.39	0.79	0	0	0	0	0.39	0	0	0	0	0	1.58
	(H * 0.5 * 0.25 * 1.8)													
Total Indirect Take (B + D + I; juveniles)														1.58
Total Indirect Take (B + D + I)*0.3 (adults)														0.47

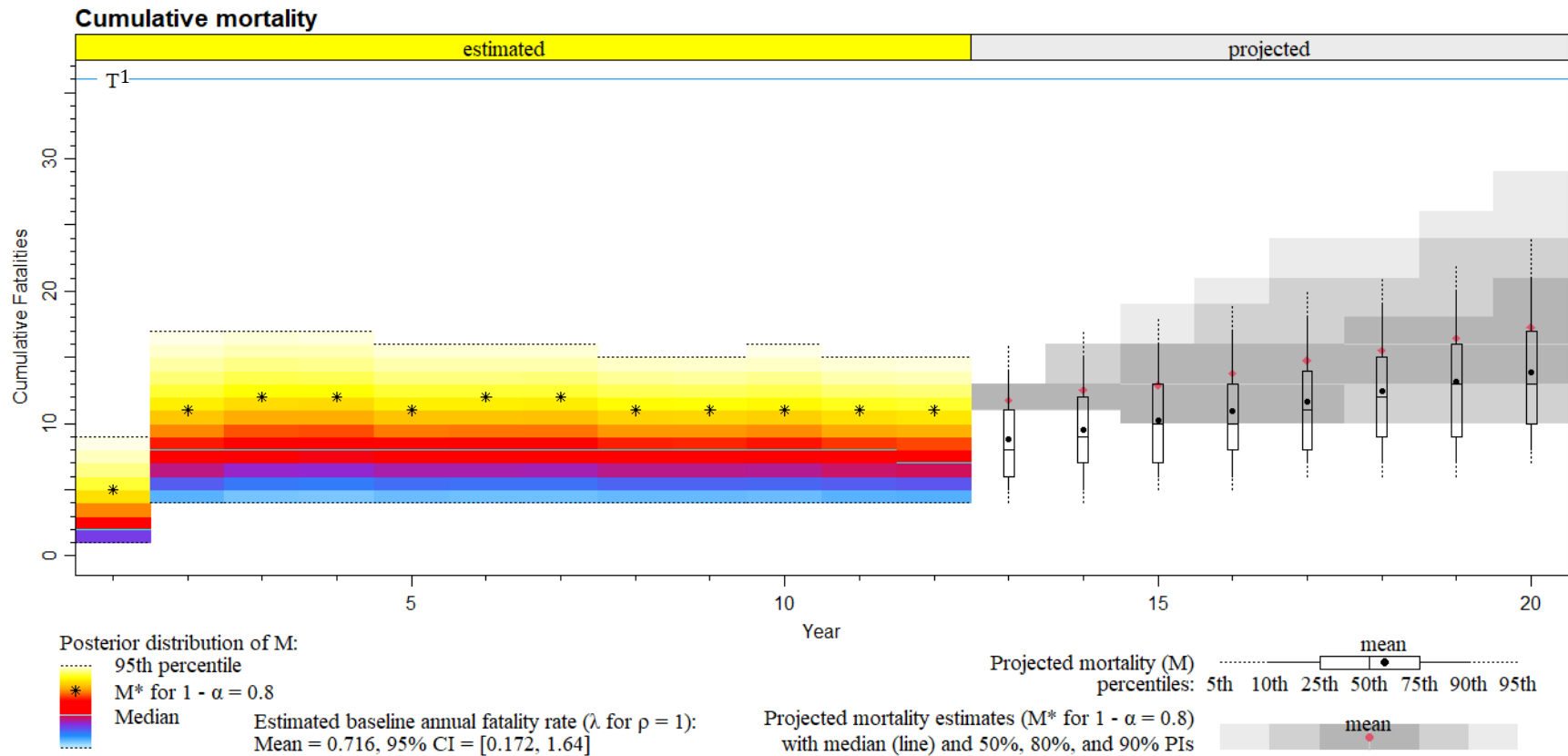
Appendix 2b. Indirect Take and Lost Productivity for the Nēnē at the Project in FY 2024

Parameter	Description	Fiscal Year														
		2013	2014	2015	2016	2017	2018		2019	2020	2021	2022		2023	2024	Total
A	Observed Take	1	0	2	1	0	2	2	1	3	0	1	1	0	0	14
A1	Observed Take (Goslings) Not Attributable to Wind Farm Operation	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
B	Estimated Take Multiplier (26/14=1.86)	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	-
C	Estimated Direct Take (A x B)	1.86	0.00	3.71	1.86	0.00	3.71	3.71	1.86	5.57	0.00	1.86	1.86	0.00	0.00	26
D	Observed Indirect Take Multiplier (Season Defined)	0.04	0	0.09	0.09	0	0	0.09	0.09	0.09	0	0.04	0.09	0	0.09	-
E	Observed Indirect Take (A x D)	0.04	0	0.18	0.09	0	0	0.18	0.09	0.27	0	0.04	0.09	0	0.09	0.98
F	Unobserved Direct Take (C - A)	0.86	0.00	1.71	0.86	0.00	1.71	1.71	0.86	2.57	0.00	0.86	0.86	0.00	0.86	12
G	Unobserved Indirect Take (F x 0.3*0.375*0.5)	0.048	0.000	0.096	0.048	0.000	0.096	0.096	0.048	0.145	0.000	0.048	0.048	0.000	0.00	0.675
H	Accrued Adult Take (Previous Year's Accrued C + J2 - L -N)	0.00	1.86	1.93	5.84	7.84	7.98		15.81	19.83	25.96	22.87		29.80	31.83	-
I	Lost Productivity from accrued adult take (Current year's H x 0.1) (fledglings)	0.00	0.19	0.19	0.58	0.78	0.80		1.58	1.98	2.60	2.29		2.98	3.18	17.15
J	Indirect Take + Lost Productivity (E + G + I + A1)(fledglings)	0.09	0.19	0.47	0.72	0.78	2.17		1.72	2.40	2.60	2.51		2.98	3.18	-
J2	Indirect Take + Lost Productivity as Adult (2 year's previous J x 0.9^2) (annual survival rate is 0.9)	-	-	0.07	0.15	0.38	0.58		0.63	1.76	1.39	1.94		2.10	2.04	-
K	Mitigation fledglings produced (fledglings)	0.00	0.00	0.00	0.00	0.00	3.00		11.55	0.00	2.60	0.00		3.24	0.00	20.39
L	Mitigation adult survival (adults)	0.00	0.00	0.00	0.00	0.33	0.68		0.61	0.00	0.40	0.00		0.12	0.00	2.14
M	Net fledglings remain (Current Year K - J)	-0.09	-0.19	-0.47	-0.72	-0.78	0.83		9.83	-2.40	0.01	-2.51		0.26	-3.18	0.58
N	Net adults 3 yrs. later (Three year's previous M x 0.512)	---	---	---	-0.05	-0.10	-0.24		-0.37	-0.40	0.42	5.03		-1.23	0.00	3.08
Total Direct Take from Collisions with WTGs (adults; C)																26
Total Direct Take from Non-Collision Causes (adults; A1 x 0.512)																0.51
Total Indirect Take (fledglings; E + G)																1.66
Total Indirect Take (adults; [E + G] x 0.512)																0.85
Total Lost Productivity (fledglings; I)																17.15
Total Lost Productivity (adults; I x 0.512)																8.78

Appendix 3. FY 2024 ‘Ōpe‘ape‘a and Nēnē 20-year Projected Cumulative Mortality at the Project

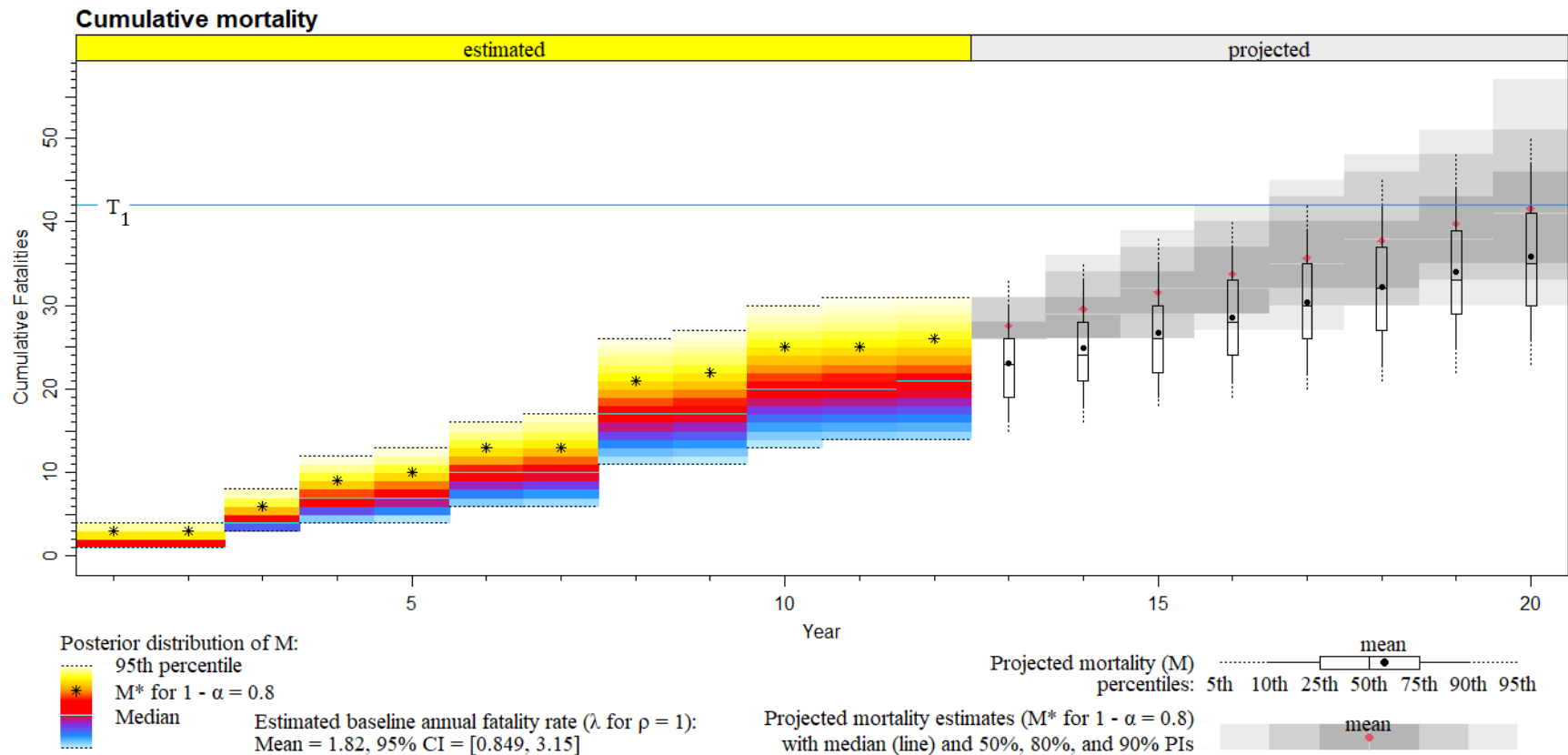
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Appendix 3a. Projected Cumulative Mortality for the 'Ōpe'ape'a at the Project



1. Permitted take for the 'ōpe'ape'a at the Project is 38 in the HCP. Take, however, as calculated from EoA only includes direct take. To account for indirect take in this figure, an approximate take threshold (T) of 36 is shown, representing permitted bat take (38) minus 2 adult equivalents of indirect take (5.3 percent of the requested authorized limit). Currently, the proportion of total take that is attributable to indirect take is 4.1 percent.

Appendix 3b. Projected Cumulative Mortality for the Nēnē at the Project



1. Permitted take for the nēnē at the Project is 44; however, take as calculated from EoA only includes direct take. To account for indirect take in this figure, an approximate take threshold (T) of 42 is shown, representing requested authorized nēnē take (44) minus 2 adult equivalents of indirect take (4.5 percent of the requested authorized limit). Currently, the proportion of total take that is attributable to indirect take is 3.11 percent.

Appendix 4. Documented Fatalities at the Project during FY 2024

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Species	Date Documented	WTG	Distance to WTG (meters)	Bearing from WTG (degrees)
<i>Francolinus francolinus</i> (black francolin)	8/30/2023	14	1	16
<i>Francolinus francolinus</i> (black francolin)	8/30/2023	12	5	233
<i>Francolinus francolinus</i> (black francolin)	9/27/2023	6	4	270
<i>Francolinus francolinus</i> (black francolin)	10/25/2023	13	1	60
<i>Alauda arvensis</i> (Eurasian skylark)	1/4/2024	7	40	130
<i>Branta sandvicensis</i> (nēnē, Hawaiian goose) ^{1,2}	2/7/2024	12	20	12
<i>Francolinus francolinus</i> (black francolin)	5/15/2024	6	1	31
1. Covered Species				
2. Currently included in take estimation pending necropsy results to determine cause of death				

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**Appendix 5. Nēnē Monitoring and Predator Control
Management at Haleakalā Ranch, Maui Annual Report, FY 2024**

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Haleakalā Ranch
Maui
DOFAW FY 2024 Report

July 1, 2023 – June 30, 2024

Sighting:

Management of the Haleakala Ranch pen was turned over to KWP/TetraTech, as is completed by a local contractor as of January 2023. This includes mowing, weed control, fence maintenance, water maintenance, predator control trapping, and road maintenance. DOFAW conducts monthly nēnē monitoring surveys, tracks nesting success, and banding.

During this period a total of twenty (25) banded adult birds were observed at the pen with additional six (6) unbanded adults.

Nesting:

A total of nine (9) nests were found with four (4) being abandoned and five (5) successful nests. A total of thirteen (13) eggs hatched and six (6) were fledged and banded.

Banding:

A total of fourteen (14) individuals were banded at the Haleakala Ranch pen this past season, eight (8) adults and six (6) fledglings.

Pen Maintenance:

Maintenance conducted by the contractor, AES, year-round. The one-acre pen was mowed 33 times this past year.

Habitat Management:

Approximately 1 acre of alien vegetation were mechanically removed including lantana, strawberry guava, Bocconia, fireweed, and bur.

Trapping:

Predator control conducted by AES maintained sixteen (16) live cage traps, ten (10) DOC200s, and five (5) A24s. Of these traps a total of twenty (20) mongoose, two (2) rats were removed. Multiple observations of pueo in person and on game cameras were noted throughout the nesting season. No aerial predator control was conducted.

Deaths: Five (5) goslings were predated by either aerial predators or possibly mongoose, no carcasses were found in the area. Two (2) goslings died of natural causes and bodies were salvaged and placed in DOFAW freezer.

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**Appendix 6. Haleakalā Ranch Nēnē Release Pen Program
Annual Report FY 2024**

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INTRODUCTION OF NĒNĒ TO HALEAKALĀ RANCH, MAUI

ANNUAL REPORT

FY 2024 (JULY 1, 2023, through JUNE 30, 2024)

1.0 Introduction

In May 2011, the Hawai‘i Department of Land and Natural Resources—Division of Forestry and Wildlife (DOFAW), with funding from the Kaheawa Wind Power I (KWP I) project, established a Nēnē Introduction Program (Program) at Haleakalā Ranch (Ranch), Maui. The purpose of this Program was to establish a population of the endangered nēnē, or Hawaiian goose (*Branta sandvicensis*), at the Ranch. The Program included construction of a release pen, where ongoing management includes efforts to keep predators excluded from the approximately one acre pen.

The Program contributes to the mitigation requirements for the nēnē as identified in the KWP I and Kaheawa Wind Power II (KWP II; collectively, the Projects) Habitat Conservation Plans (KWP I 2006, SWCA 2019). As part of the Program, Haleakalā Ranch, LLC committed to maintaining or improving the Ranch premises, which are considered to provide a significant amount of habitat that may be suitable for nēnē, for renewable periods of 10 years over the 50-year term of the Haleakalā Ranch Safe Harbor Agreement (SHA; USFWS et al. 2019). The Program has successfully produced fledglings at the Ranch since 2012. Efforts are focused on the open-top release pen that was constructed in 2011, though nēnē observed outside this pen are also recorded.

From 2012 through 2022, KWP I (sometimes in conjunction with KWP II) provided DOFAW with funding to maintain and manage the release pen at the Ranch. In 2021, DOFAW requested that the Projects assume direct management of the release pen. Both parties agreed that the Projects would assume management activities on December 8, 2022, while the Parties work to finalize a Memorandum of Understanding (MOU). The Projects contracted Aloha Environmental Services (AES) to conduct the work as laid out in the Statement of Work (SOW), to be appended to the MOU. Key needs for establishing a population of nēnē at the Ranch were identified in the SHA as nest monitoring, pen maintenance, habitat management, and predator control. This report and the activities described herein are in compliance with the Ranch’s SHA (USFWS et al. 2019). This report provides details of the 2023 – 2024 breeding season at the Ranch through the end of Fiscal Year (FY) 2024 (June 30, 2024).

2.0 Funding

Table 1 shows the expenditures during FY 2024.

Table 1. Expenditures During July 1, 2023 – June 30, 2024 for the Nēnē Release Pen Mitigation Program at Haleakalā Ranch, Maui

Category	KWP I Funded Amount	KWP II Funded Amount	Other Funding/Source
Road Improvement	\$5,900	\$4,100	n/a
Nēnē Monitoring	\$12,400	\$0	
Banding	\$0	\$0	
Pen Maintenance	\$7,000	\$0	
Habitat Management	\$18,040	\$0	
Predator Control	\$14,806	\$0	
Reporting	\$8,000	\$0	
Adaptive Management Actions	\$3,000	\$0	n/a
Total Cost for FY 24	\$69,146	\$4,100	

3.0 Mitigation Actions

3.1 Road Improvement

The road to the pen was maintained periodically by AES staff, as needed, by moving rocks and backfilling holes with dirt and rocks. Per Right of Entry agreement with Haleakala Ranch, LLC, the Projects provided \$10,000 to the ranch for road repair activities in May 2024 (see Table 1).

3.2 Nēnē Monitoring

3.2.1 Sightings

AES personnel at the Ranch began biweekly observations (every 2 weeks) in July 2023 and transitioned to weekly observations and monitoring from August 1, 2023 to April 30, 2024. All visits were weather dependent and required Ranch personnel approval. AES personnel transitioned back to biweekly observations and monitoring from May 1 to June 30, 2024. A biweekly frequency is used during the non-breeding season to minimize impacts to the road to the release pen.

Observations of banded and unbanded birds were recorded at the Ranch to monitor movements, distribution, and survival of nēnē using both visual, binocular surveys, as well as footage from three strategically placed game cameras within the pen. In FY 2024, 25 distinct banded adults and, at minimum, six unique un-banded adults were observed at the Ranch.

3.2.2 Nesting

During nesting season, records were kept on mated pairs and the breeding status of females found at the Ranch. Nests found at the Ranch were marked using GPS and checked weekly to determine their status. Nesting activities, nest outcomes, hatching, and fledgling success were recorded for the nesting season. Survey methods for nesting activity/success included both weekly visual (binocular) surveys, as well as daily data collection by on site game cameras.

Nine nests or nesting attempts were located within the Ranch open-top release pen this year (Table 2/Map 1. Appendix A). Five of these nests successfully hatched goslings and four nesting pairs were able to raise goslings to fledgling success. A total of 13 nēnē hatched between the five successful nests, and six juvenile nēnē successfully fledged from the Ranch open-top release pen this season. AES personnel confirmed the fledging of all six goslings by compiling data from both visual observations, as well as by daily photo documentation taken by game cameras between January 1 and June 30, 2024 (Appendix A). No nests were observed outside of the nēnē pen in the 2023 – 2024 breeding season.

Table 2. Nēnē Nesting Summary for 2023-2024 Breeding Season at Haleakalā Ranch, Maui

Total Number of Nests	
Located in open-top pen	9
Successful	5
Abandoned	4
Depredated	0
Failed (other reason)	0
Renests	0
Total Number of Eggs	
Known	14
Destroyed naturally	1
Depredated	0
Salvaged	0
Hatched	13
Total Number of Goslings/Fledglings	
Known goslings	13
Goslings depredated	5 ¹
Goslings died (other reason)	2
Fledglings fledged from pen (credited for mitigation)	6
¹ Suspected depredation by aerial predators, but unconfirmed by direct evidence. See section 3.6.	

3.3 Banding

This year DOFAW staff banded a total of 14 nēnē at the open-top release pen. This included six fledglings and eight adults. Of the eight adults that were banded, six were re-bands, and two were newly banded individuals. Banding took place on 3/12/24, and data were compiled and sent to AES on 4/1/24.

3.4 Pen Maintenance

The open-top pen's fence line was continuously monitored and maintained by AES throughout the fiscal year. The fence line was weed-whacked and mowed for weed control, and trees were trimmed along the exterior boundary to prevent bridge entry by predators. The large pond was cleaned and flushed twice a month, and smaller baths were cleaned and maintained weekly. The water system's shutoff valve was replaced for a second time after it was found to be leaking. The electric fence insulators, solar batteries, and grounding stakes/wires were maintained and operational throughout the nēnē nesting period.

3.5 Habitat Management

Short grass habitat was maintained at the open-top release pen. The 1-acre pen was mowed 33 times this year to maintain nēnē short grass habitat. During the pre-breeding and breeding season

(August 1st – May 1st), the 1-acre open-top pen was mowed up to once a week and the area around the outside of the pen was maintained as needed. During the non-breeding season (May 1st – June 30th), the open-top pen and the surrounding perimeter was mowed approximately every other week and non-native/overgrown vegetation was cleared around potential nesting areas as needed. Approximately 1 acre of alien vegetation was mechanically removed, including lantana (*Lantana camara*), strawberry guava (*Psidium cattleianum*), Bocconia (*Bocconia frutescens*), fireweed (*Senecio madagascariensis*), and bur from both open top pens and covered secondary enclosures.

3.6 Predator Control

Predator traps are used to control rats (*Rattus rattus*), mongoose (*Herpestes javanicus*), and feral cats (*Felis catus*) that may pose a threat to nēnē and their nesting sites. Traplines were baited and checked weekly at the Ranch during the breeding season, and biweekly during non-breeding season using 16 Tomahawk live traps, 10 DOC 200 traps, and 5 A24s.

In FY 2024 at the Ranch, 20 mongoose and two rats were removed through predator trapping. Of the 20 mongoose removed, 18 were trapped by Doc 200s outside of the nēnē pen, one mongoose was caught in a cage trap outside of pen, and one was caught inside nēnē pen in a Doc 200 trap while nēnē were actively sitting on nests between the months of December and February (Table 3). No avian predators were controlled this season at the Ranch, and no cats were caught.

Multiple observations were made of pueo (Hawaiian short-eared owl, *Asio flammeus sandwichensis*) pairs hunting above and around the nēnē pen during nesting season. Game camera traps were able to catch a still photo of a pueo inside of pen on December 27th, 2023. Between the months of December and January, five hatched goslings disappeared from the site. No gosling carcass or remains of any kind were recovered after extensive searching, indicating cause of predation may be avian. There is currently no formal program in place for the removal of avian predators; pueo is a culturally significant species.

Table 3. Traps Deployed and Predators Removed during 2023 – 2024 Breeding Season

Location	Trap Type	Trap nights per trap	Mongoose	Cat	Rat
Outside Pen	DOC200 (5)	365	18	0	0
	Cage (16)	228 ¹	1	0	0
Inside Pen	DOC200 (5)	365	1	0	2
	A24 (5)	365	0	0	0
1. Live traps were closed and moved inside after all goslings were confirmed fledged. Traps were moved to avoid damage by cattle moved to the area for grazing.					

3.7 Relocations

No nēnē were reported to be relocated by DOFAW personnel throughout the 2023-2024 breeding season (FY 2024).

3.8 Injury, Fatalities, Disease

The only documentable nēnē deaths that occurred this season at the Ranch were those of two goslings due to failed/unsuccesful nests. A total of two gosling deaths were attributed to abandonment and inclement weather factors. The first documented gosling fatality was discovered on December 15th, 2023 by AES staff, one meter from where the first hatched nest was documented that same day (Map 1, Appendix A). A detailed fatality report of the incident was supplied to DOFAW on December 19th, 2023. The carcass was not predated and looked to be less than 1 week old. The second carcass was found and collected by DOFAW during a site visit on January 29th, 2024. Reporting stated that this carcass did not look to be predated and looked to be age G2. In addition to these two documented gosling deaths, there were also a total of five hatched goslings that seemingly disappeared with no trace of predation left behind. Suspected depredation by aerial predators is a hypothesized cause for this but is still unconfirmed by direct evidence.

3.9 Adaptive Management Actions

During the breeding season, Biologists on site witnessed numerous occurrences of competition/aggressive behavior between nesting pairs within close proximity to each other. Attempts were made to expand the short grass habitat as well as to create new short vegetation corridors leading to favorable nesting locations inside of the pen. After time, nēnē were seen regularly utilizing these new areas, helping to alleviate some of the pressures of other breeding pairs within close proximity. Mechanical issues with the riding lawn mower arose early in the fiscal year. Onsite technicians were able to trouble shoot a faulty starter solenoid and complete all maintenance work onsite.

4.0 Results

4.1 Calculation of Nēnē Produced (Mitigation Credit)

Six nēnē were produced and successfully fledged at the pen during the 2023 – 2024 breeding season. These fledglings, and the increased adult survival for the five breeding pairs at the pen will contribute to mitigation credits for the Projects. Mitigation credits accrued with the 2023 – 2024 breeding year will be allocated to KWP I for this year.

5.0 Literature Cited

KWP I (Kaheawa Wind Power, LLC). 2006. Kaheawa Pastures Wind Energy Generation Facility Habitat Conservation Plan. January 2006.

SWCA (SWCA Environmental Consultants). 2011. Kaheawa Wind Power II Wind Energy Generation Facility Habitat Conservation Plan. Prepared for Kaheawa Wind Power II, LLC. December 2011.

USFWS (U.S. Fish and Wildlife Service), Haleakala Ranch, and Department of Land and Natural Resources (DLNR). 2019. Safe Harbor Agreement for Nēnē at Haleakala Ranch, Island of Maui.

Appendix A

Haleakalā Ranch Nēnē Release Pen Mitigation Program
Annual Report
[KWP LLC and KWP II LLC]



Photo 1. Bulldozer conducting access road maintenance in September 2023.



Photo 2. On going weed-eating and hauling out overgrown grass to create more usable habitat

Haleakalā Ranch Nēnē Release Pen Mitigation Program
Annual Report
[KWP LLC and KWP II LLC]

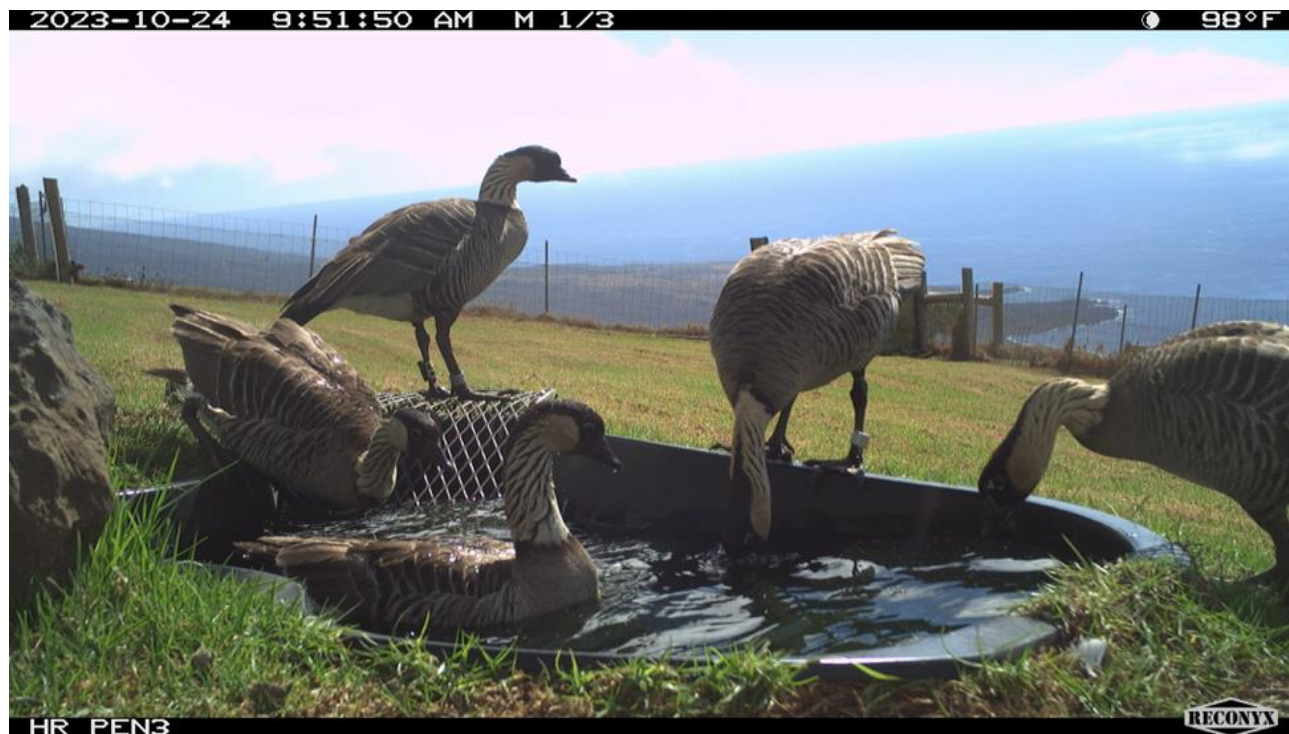


Photo 3. ACJ/AL(female), AL/--(male) and three un-banded individuals on 10/24



Map 1. Nēnē nests/gosling fatality locations detected in 2023-2024 breeding season.

Haleakalā Ranch Nēnē Release Pen Mitigation Program
Annual Report
[KWP LLC and KWP II LLC]



Photo 4. Group of nēnē inside pen enjoying a freshly mowed lawn.



Photo 5. Freshly mowed fence perimeter



Photo 6. Fresh water and fresh mowing



Photo 7. Pueo owl caught on game camera footage inside pen.



Photo 8. ACJ/AL(female), AL/--(male) with their four goslings before two disappeared.



Photo 9. AL/-, -/AL Pair with their two goslings, practicing take offs.



Photo 10. Fourteen newly banded individuals observed on March 15, 2024