[Cover Page of BiOp]

Biological Opinion Addressing Fish and Wildlife Service Approval of the Kaua‘i Island Seabird Habitat Conservation Plan and Qualifying Incidental Take Permit Applications Subject to Site-specific Participant-Inclusion-Plans

May 17, 2020
(01EPIF00-2020-F-0180)

TABLE OF CONTENTS

CONSULTATION HISTORY 2
BIOLOGICAL OPINION 5
DESCRIPTION OF THE PROPOSED ACTION 5
Artificial Lighting at Facilities 7
Conservation Measures at Applicant Facilities 8
Recovery and Release of Downed Seabirds 9
Implementation of Outreach and Training 10
Predator Control at Applicant Facilities 11
Conservation Activities in Kalalau Valley 11
Conservation Activities at the Kahuama'a Seabird Preserve 16
Adaptive Management 22
Best Management Practices and Avoidance and Minimization Measures at Mitigation Sites 23
Action Area 23
Analytical Framework for the Jeopardy and Adverse Modification Analyses 25
Jeopardy Analysis 25
STATUS OF THE SPECIES 26
ENVIRONMENTAL BASELINE 50
EFFECTS OF THE ACTION 56
CUMULATIVE EFFECTS 82
CONCLUSION 83
INCIDENTAL TAKE STATEMENT 87
Amount or Extent of Take Anticipated 87
Effect of Take 88
Reasonable and Prudent Measures and Terms and Conditions 88
CONSERVATION RECOMMENDATIONS 88
REINITIATION-CLOSING STATEMENT 88
LITERATURE CITED 90
APPENDIX A: Informal Consultation Findings for the Proposed KSHCP and Associated PIPs. 104

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai‘i 96850

In Reply Refer To:
01EPIF00-2020-F-0180

May 17, 2020

Memorandum

To: Assistant Regional Director-Ecological Services
Portland, Oregon

From: Field Supervisor, Pacific Islands Fish and Wildlife Office
Honolulu, Hawai‘i MICHELLE BOGARDUS Digitally signed by MICHELLE BOGARDUS Date: 2020.05.17 22:36:44 -10'00'

Subject: Biological Opinion Addressing U.S. Fish and Wildlife Service (Service) Approval of the Kaua‘i Island Seabird Habitat Conservation Plan (KSHCP) and Qualifying Applications for Endangered Species Act (ESA) Incidental Take Permits (ITPs) for Site-specific Participant-Inclusion-Plans (PIPs)

This document transmits the Service's biological opinion (BiOp) regarding the subject actions. At issue are the effects of the KSHCP and the PIPs on the threatened Newell's shearwater (*Puffinus auricularis newelli*), the endangered Hawaiian petrel (*Pterodroma sandwichensis*), and the endangered Hawai‘i population distinct population segment (DPS) of the band-rumped storm-petrel (*Oceanodroma castro*) (hereafter band-rumped storm-petrel), collectively referred to as the Covered Species. This BiOp was prepared in accordance with section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.).

The Service has determined that the issuance of ITPs and implementation of the KSHCP at Applicant facilities is not likely to adversely affect (NLAA) the federally threatened Central North Pacific distinct population segment (DPS) of the green sea turtle (*Chelonia mydas*) (hereafter green sea turtle).

We have also determined that the proposed KSHCP at the Kahuama‘a Seabird Preserve may affect but is not likely to adversely affect the following listed species: endangered ‘akeke‘e (*Loxops caeruleirostris*), threatened ‘i‘iwi (*Drepanis coccinea*) (collectively referred to as Hawaiian forest birds); endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*); and the following endangered plants: *Chamaesyce eleanoriae*, *Chamaesyce remyi* var. *remyi*, *Dubautia kalalauensis*, *Euphorbia haeleeleana*, *Exocarpos luteolus*, *Euphorbia remyi* var. *remyi*, *Gouania meyenii*, *Hibiscadelphus woodii*, *Labordia helleri*, *Lysimachia scopulensis*, *Melicope pallida*, *Melicope puberula*, *Myrsine knudsenii*, *Myrsine linearifolia*, *Nothocestrum peltatum*, *Plantago princeps*, *Platydesma rostrata*, *Poa mannii*, *Poa siphonoglossa*, *Polyscias flynnii*, *Psychotria grandiflora*, *Pteralyxia kauaiensis*, *Remya kauaiensis*, *Remya montgomeryi*, *Schiedea attenuata*, *Schiedea kauaiensis*, *Schiedea membranacea*, *Solanum sandwicense*, *Stenogyne campanulata*, *Stenogyne kealiae*, and *Tetraplasandra flynii* (collectively referred to as Hawaiian plants).

Lastly, we have determined that the proposed KSHCP at the Kahuama‘a Seabird Preserve may affect, but is not likely to adversely affect the above listed species and the following designated critical habitat units that occur within or adjacent to the action area: Kaua‘i 11—*Euphorbia haeleeleana*—b, Kaua‘i 11—*Exocarpos luteolus*—c, Kaua‘i 11—*Exocarpos luteolus*—e, Kaua‘i 11—*Flueggea neowawraea*—a, Kaua‘i 11—*Gouania meyenii*—b, Kaua‘i 11—*Melicope pallida*—b, Kaua‘i 11—*Myrsine linearifolia*—e, Kaua‘i 11—*Nothocestrum peltatum*—c, Kaua‘i 11—*Plantago princeps*—b, Kaua‘i 11—*Poa mannii*—d, Kaua‘i 11—*Poa siphonoglossa*—a, Kaua‘i 11—*Pteralyxia Kauaiensis*—e, Kaua‘i 11—*Remya Kauaiensis*—b, Kaua‘i 11—*Remya montgomeryi*—c, Kaua‘i 11—*Schiedea Kauaiensis*—b, Kaua‘i 11—*Schiedea membranacea*—b, Kaua‘i 11—*Solanum sandwicense*—a, Kaua‘i 11—*Stenogyne campanulata*—a, Kaua‘i Ecosystem—Dry Cliff—Unit 1, and Kaua‘i Ecosystem—Montane Wet—Unit 2, *Loxops caeruleirostris* Unit 5—Montane Wet, *Oreomystis bairdi* Unit 5—Montane Wet, and *Drosophila sharpi* Unit 5—Montane Wet (collectively referred to as designated critical habitats).

The above NLAA determinations are presented in Appendix A.

This BiOp is based on information provided in: (1) the KSHCP and associated Appendices; (2) the PIPs submitted by applicants in support of ITP applications; (3) the Environmental Assessment (EA) addressing the subject actions; and (4) other sources of information cited herein. A complete decision for this consultation is on file in our office. Our log number for this consultation is 01EPIF00-2020-F-0180.

CONSULTATION HISTORY

The Service has been working with prospective ITP applicants regarding the subject HCP for over a decade to facilitate the conservation and management, in part, of Kaua‘i seabirds. A chronology of these efforts is presented below.

June 4, 2019 – The Service and the State of Hawai‘i Department of Land and Natural Resources (DLNR) received a PIP and ITP application from the County of Kaua‘i.

June 7, 2019 – The Service emailed prospective ITP applicants a reference document to rely on when completing the Federal permit application.

June 19, 2019 – The Service sent an email to the group of prospective Applicants requesting submittal of outstanding PIPs, Federal ITP application forms, and a revised Appendix G of the KSHCP expressing their commitments to participate in the KSHCP.

July 2, 2019 – The Service received an email from the attorney representing Alexander & Baldwin indicating it would be at least 30 days before their submittal of an ITP application and PIP.

July 11, 2019 – The State of Hawai‘i Department of Transportation (HDOT) submitted their Federal ITP application and PIP.

July 12, 2019 – The Service sent an email to prospective applicants updating the Service's anticipated timeline for the Federal public review process. In that email, the Service requested updates from the prospective applicants on their likely submission dates for ITP applications and PIPs.

July 18, 2019 – The Service and DLNR received a signed, electronic copy of the Kaua‘i Coffee Company PIP and Federal ITP application form. On July 22, the Service received a hard copy of these documents and a fee check.

July 22, 2019 – The Service and DLNR received an unsigned, electronic copy of the draft Federal ITP Application form from Norwegian Cruise Lines (NCL, Bahamas Ltd.) along with an updated PIP.

July 23, 2019 – The Service and DLNR received an unsigned, electronic copy of the Federal ITP applicant form and an updated PIP from the Princeville Resort Kaua‘i.

July 24, 2019 – The Service and DLNR received an unsigned, electronic copy of the Federal ITP application form and a draft PIP from the Kaua‘i Marriott Resort. The Agencies were advised that the draft was still subject to revision by the applicant.

August 19, 2019 – The Service and DLNR received an updated PIP with appendices from Princeville Kaua‘i.

August 26, 2019 – Alexander & Baldwin submitted their draft PIP and an unsigned draft of the Federal ITP application form to the Service and DLNR.

September 8, 2019 – The Service's Pacific Islands Fish and Wildlife Office (PIFWO) forwarded all ITP applications and PIPs received to date to the Service's Regional Office in Portland, Oregon.

September 11, 2019 – The Service emailed comments on the applicants' draft PIPs, including tables presenting non-lethal take calculations for covered species listed on their ITP application forms.

September 13, 2019 – The Service received updated PIPs with requested non-lethal take numbers from Kaua'i Coffee, County of Kaua'i, and the HDOT. As of this date, the draft PIPs from Alexander & Baldwin, NCL, Kaua'i Marriott Resort, Princeville Resort Kaua'i, and the Sheraton Kaua'i Resort did not include requested non-lethal take numbers.

September 17, 2019 – A Memorandum of Understanding (MOU) between the Service and the County of Kaua'i addressing a specific schedule for stadium lighting at County-operated football game facilities was signed. An EA, the MOU, a BiOp and a NEPA Finding of No Significant Impact on this action were made available on the Service's PIFWO website. 2019 is the third and final year of this interim measure while the KSHCP was under development.

October 15, 2019 – The Service received a fee check from the Kaua'i Blue, Inc. (doing business as Sheraton Kaua'i). The check was then forwarded to the Service's Regional Office in Portland, Oregon.

October 17, 2019 – As of this date, eight applicants had submitted Federal ITP applications and fee checks (as applicable) for participation in the KSHCP.

February 3, 2020 – The County of Kaua'i sent an email advising the Service, DLNR, and the KSHCP applicant group that the County's Fiscal Year closes on June 30, 2020, at which time, if an ITP and a State Incidental Take License were not issued to encumber the appropriation, County funding for participation in the KSHCP would lapse.

February 26, 2020 – Lisa Bail and Lisa Munger (attorneys representing four of the applicants for participation in the KSHCP), Mahealani Krafft (Council for the County of Kaua'i), Linda Chow (Deputy Attorney General for the State of Hawai'i), David Smith (Administrator for DLNR's Division of Forestry and Wildlife), Lydia Grimm (U.S. Department of the Interior Solicitor), and Mary Abrams, Kasia Mullett, and Jiny Kim of the Service met to discuss applicant concerns regarding the status of the KSHCP and a path forward for this program.

March 9, 2020 – The Service and DLNR met with the applicants to discuss the anticipated timeline for public review and comment on the KSHCP, EA, ITP applications and the PIPs as well as other concerns the Applicants had with the comments received during the State public review process.

March 12, 2020 – The Service published a Notice of Availability (NOA) of the draft EA, Applications, and PIPs in the *Federal Register* (85 FR 14497-14499). Public comments were accepted during the 30-day public comment period that ended on April 13, 2020.

April 13, 2020 – The Service received a total of eleven public comments during the public comment period on the NOA. On this date, the Service also received updated PIPs from eight applicants for ITPs.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action addressed in this BiOp is the Service's approval of the KSHCP and PIPs, and issuance of ITPs to qualifying non-Federal applicants for take of the Newell's shearwater, Hawaiian petrel, and band-rumped storm-petrel caused by Covered Activities as defined in site-specific PIPs developed in accordance with the requirements of the KSHCP. This action is predicated on the proposed KSHCP meeting ESA section 10(a)(1)(B) permit issuance criteria at 16 U.S.C. §1539(a)(2), including a finding that the anticipated take impacts authorized under each ITPs are not likely to appreciably reduce the likelihood of survival and recovery of the affected listed species in the wild. The Service will document its assessment of the KSHCP and the issuance of ITPs in an ESA section 10 findings document, which will include a determination of consistency with the statutory issuance criteria referenced above. If the Service makes the requisite findings, the Service will issue the requested ITP and approve the Applicant's PIP. In all cases, the Service will decide whether to issue an ITP conditioned on implementation of the proposed KSHCP as submitted, or as amended to include other measures the Service determines are necessary or appropriate. If the Service finds that the requisite criteria are not satisfied, the permit request will be denied.

The KSHCP is an island-wide conservation program under which individual non-Federal entities (Applicants) may apply to receive an ITP from the Service and an Incidental Take License (ITL) from the State. These permits would authorize the incidental take of Covered Species (i.e., listed seabirds) caused by the effects of light attraction. Because nighttime lighting is an essential activity in most homes, businesses, and industry centers, the KSHCP was developed to provide an efficient and effective process for implementing an island-wide seabird conservation program and for obtaining regulatory compliance for Applicant activities causing otherwise prohibited take of Federal and State-listed seabirds. Over the 30-year term of the KSHCP, additional Applicants will have the opportunity to prepare and submit a complete application for an ITP/ITL (including a PIP) covering their activities and requesting take coverage pursuant to the KSHCP, as long as there is sufficient mitigation "cushion" to accommodate the anticipated take impacts. New ITP/ITLs will be granted, as appropriate, on a first-come-first-serve basis until the maximum take allowed for under the KSHCP has been fully assigned to individual permittees/licensees. If the addition of a new participant would cause the maximum total take under the KSHCP to be exceeded, then an amendment to the KSHCP would be required before any additional ITPs and ITLs could be issued.

Under the KSHCP, all types of artificial lighting including land-based lights found at parks, retail stores, resorts, condominium complexes, agribusiness, and industrial facilities can be covered, as well as lighting on ocean-going vessels such as cruise ships. The specific nighttime lighting type and intensity depends upon the purpose for the lighting. Artificial lighting includes the placement (and replacement) and operation of existing light structures as well as the placement and operation of new or future lights that have similar effects. Outdoor lighting fixtures may include, but are not limited to: parking lot lights; security lights; spotlights and floodlights; building and structural, architectural, and other facility lights; landscape lighting; recreational lights; and signage lights.

Under the KSHCP, applicants that conduct actions with the potential to cause incidental take of the Covered Species may submit an application for an ITP and ITL to request incidental take authorization based on their site-specific PIP. The anticipated take (annual and 30-year) associated with implementing each PIP s based on analyses of available data provided by DOFAW, the Service, and prospective applicants. The annual take amounts under the KSHCP are totals of specific estimates presented in PIPs derived using methodologies to estimate applicant take as described in the KSHCP, Section 6.2.2. Each PIP submitted in support of an ITP/ITL application will identify the artificial lights to be covered under the ITP/ITL and the specific combination of minimization strategies to be implemented by individual applicants at their respective facility. The proposed minimization strategies consider the needs and uses of lights, any regulations pertaining to the uses of lights, and the guidelines defined in Section 5.3 of the KSHCP (Avoidance and Minimization). The PIPs will also define the level of funding that the Participant will provide to support implementation of KSHCP conservation measures to mitigate for the effects of their unavoidable take of the Covered Species. Under the KSHCP, conservation measures (discussed below) will be implemented to minimize and mitigate the impacts of authorized take on the Covered Species by all Participants in the Plan. Conservation measures to mitigate for the maximum level of take covered by the KSHCP will be implemented by a contracted party (Prime Contractor), even if the total requested take by applicants is less than the maximum amount of take provided for under the KSHCP.

The KSHCP defines scientific approaches for estimating an applicant's anticipated level of take, for monitoring the effect of the applicant-authorized taking, and for establishing minimization measures and mitigation actions commensurate with those take impacts, including long-term management, monitoring and reporting responsibilities to adaptively manage and implement the KSHCP. Evaluation of permit issuance criteria for individual permit applications will be based on adherence to the standards and actions delineated in the KSHCP, and acceptable minimization actions for individual applicants as outlined in the PIPs. Under the KSHCP, the impacts of any authorized incidental taking of the Covered Species would be minimized and mitigated to the maximum extent practicable and offset with a net recovery benefit for the species affected. The duration of the Plan is 30 years; however, the term of individual permits/licenses under the Plan may vary within that 30-year period.

The following Covered Activities are addressed under the KSHCP: (1) artificial lighting at participant facilities (placement/replacement and operation of current light structures that can cause disorientation of fledgling and adult seabirds as well as the placement and operation of new or future lights that have similar effects); (2) conservation measures at participant facilities including recovery and release of downed seabirds, implementation of outreach and training, and predator control; (3) conservation activities in Kalalau Valley including barn owl control in the valley and feral cat control along the rim of the valley; and (4) conservation activities at the Kahuamaʻa Seabird Preserve. The location of Covered Activities can be anywhere on the island of Kauaʻi where facility light structures may occur; mitigation activities will be implemented on State Lands. Each of these activities is further discussed below.

As of October 17, 2019, the Service has received ITP applications and PIPs for participation in the KSHCP from the following parties: Alexander & Baldwin, Inc. (A&B); County of Kauaʻi; Kauaʻi Coffee, LLC. (Kauaʻi Coffee); Essex House Condominium Corporation, an affiliate of Marriott International, Inc. (Kauaʻi Marriott Resort); Hawaiʻi Department of Transportation (HDOT) Nāwiliwili Harbor; HDOT Port Allen Harbor; HDOT Līhuʻe Airport; NCL (Bahamas) Ltd. (NCL); SOF – XI Kauaʻi PV Hotel, LP (Princeville Resort Kauaʻi); and the Sheraton Kauaʻi. If these applications are approved, and the Service issues associated ITPs and the State issues ITLs, the permits would authorize take of the Covered Species caused by Covered Activities as stipulated in each ITP/ITL.

Artificial Lighting at Facilities

The KSHCP covers a full range of lighting types and activities involving the placement/replacement and operation of current structures as well as new or future light structures that have similar effects at applicant facilities on Kauaʻi. A variety of lighting types are used on Kaua'i, the specific type and intensity of which depend upon the purpose of the lighting. Under the KSHCP, all types of artificial lighting including land-based lights found at parks, retail stores, resorts, condominium complexes, agribusiness and industrial facilities, as well as lighting on ocean-going vessels such as cruise ships, can be addressed in site-specific PIPs prepared by applicants.

Applicants to the KSHCP shall submit a PIP, providing detailed information on outdoor lighting, such as the following: light type, make and model, light output (e.g. lumens) and bulb type, bulb color, quantity (number of fixtures), location, purpose of the lights, direction of light angle (e.g. up, down, out), full cut-off or shielded fixture and or, time on and time off. In addition, the PIP shall describe any lighting standards required for facility operations or other requirements that necessitate the use of lighting (e.g., required for security, safety, operations) and any required standards for future light plans. The PIP shall also describe measures to be implemented by the applicant to avoid or minimize the impacts of light attraction specific to their facilities on the Covered Species, using the *Guidelines to Adjusting Lighting at Facilities* in Appendix E of the KSHCP. These guidelines were prepared using best available science on seabird-friendly lighting. Possible avoidance and minimization measures include, but are not limited to,

deactivation of non-essential lights, installation of full cut-off light fixtures, shielding of light fixtures, moving the light fixtures, decreasing lighting levels, and installation of motion sensors to trigger light activation. The guidelines in Appendix E will be updated as new information becomes available to minimize artificial lighting. The PIP shall also identify the timing for implementation of take avoidance and minimization measures, and compliance with the minimization plan will be monitored yearly. Under the KSHCP, all minimization measures will be implemented within one year of issuance of the ITP, and maintained throughout the life of the permit. Compliance with the avoidance and minimization measures in a PIP will be monitored and reported at the onset of the KSHCP, and annually thereafter (see KSHCP Section 6.8.1).

New facilities or expansion of existing facilities identified in a PIP shall use, as appropriate, the avoidance and minimization measures described in this section. The installation of "new" lights (those that are proposed or planned but do not exist at the time of the application for an ITP) has the potential to exacerbate existing adverse light attraction impacts on the Covered Species and cause fallout of the Covered Species. Participants in the KSHCP shall consult with the Service and the DLNR in advance on their plans to install new lights at existing facilities or to construct new facilities to determine the required avoidance and minimization measures. Depending on their potential impact, installation of new lights at an existing Participant's facility may require an amendment to a PIP and the permit that has been issued to a Participant.

Because the KSHCP functions as a plan under which multiple entities may apply for incidental take authorization, it cannot be known exactly how much take will be covered under the KSHCP. However, the KSHCP remains as a plan for additional potential permit recipients to apply for incidental take requests and receive permits from the regulatory agencies as long as there is sufficient mitigation "cushion" to accommodate them. This BiOp describes the incidental take requested by prospective applicants to date, however, we also analyze the maximum take amounts that could be permitted under the KSHCP. An amendment to the KSHCP would be necessary if take requests exceed the KSHCP maximum take amounts (see KSHCP Sections 6.13.1 and 6.13.2 on minor and major amendments).

Conservation Measures at Applicant Facilities

Conservation measures at applicant facilities that are anticipated to minimize impacts on the Covered Species include the recovery and release of downed seabirds, implementation of outreach and training, and predator control at applicant facilities. Seabirds that are downed at Applicant facilities are vulnerable to direct mortality from depredation by free-roaming dogs, cats, rats, and other predators. Individual PIPs will describe facility-specific planned measures to minimize such mortality. These measures may include actions to use appropriate searching strategies targeted to finding downed birds quickly, conduct outreach and training for hotel workers and guests to ensure proper responses to detections of downed seabirds, and reduce on-site populations of potential predators at applicant facilities.

Recovery and Release of Downed Seabirds

Covered Species that are grounded due to light attraction are considered "take" under State and Federal laws. However, not all grounded seabirds are subject to the same level of injury or mortality. The Save Our Shearwaters (SOS) organization was initiated by the DLNR - Division of Forestry and Wildlife (DOFAW) in 1979, to respond to the annual grounding of hundreds of light-attracted fledgling shearwaters and petrels. The SOS has evolved into a multispecies rehabilitation effort based out of the Kaua'i Humane Society. The Kaua'i Island Utility Cooperative (KIUC) funds the program with the focus on shearwaters and petrels. The conservation measure of recovering, evaluating, rehabilitating (if needed), and releasing Covered Species in adequate condition is anticipated to minimize injury or harm to the affected individual caused by light attraction when that individual is released within 48 hours (2 days) of being grounded (see KSHCP, Section 4.1.3 and 4.2.1 for discussion). Seabirds that receive this treatment are considered take, but in a "non-lethal" manner. Grounded seabirds that are not recovered (i.e., undiscovered seabirds) are taken in the form of harm, and these seabirds are anticipated to eventually suffer mortality due to depredation, vehicle collision, or starvation and dehydration. Covered Species that are killed due to collisions and grounded seabirds that are not recovered are considered to be "lethally taken." Covered Species that cannot be rehabilitated and released (e.g., due to severe injury or poor body condition) are euthanized. Those seabirds and those that die during rehabilitation are also considered to be taken in the form of harm, and considered "lethally taken."

Of the Newell's shearwaters recovered by SOS in the ten-year period between 2006 to 2016, 88% were evaluated, deemed to be in good condition, and released back into the wild (SOS, unpublished data), and 12% were turned in dead, died in care, or deemed unfit for release back into the wild and euthanized.

The above statistics are generalized based on all seabirds turned in to SOS, and does not account for site-specific circumstances. The Service anticipated that the annual take of the Covered Species as a result of light attraction is likely to remain constant based on recent trends in SOS recoveries island-wide on Kaua'i. Between 1993 and 2013, the population of Newell's shearwater is estimated to have declined by 94% and the population of Hawaiian petrel is estimated to have declined by 78% (Raine et al. 2017d). While this suggests the potential for a decline in future fallout numbers due to smaller population sizes, over the past five years (2011-2015), island-wide SOS recoveries of the Newell's shearwater, with the exception of one large fallout event in 2015 near Kōke'e Air Force Base, have been stable since 2000 (DLNR 2016). Considerably fewer Hawaiian petrels and band-rumped storm-petrels are impacted by light attraction, based on SOS recovery records (DLNR 2016). Of the total SOS recoveries of the Covered Species between 2011 to 2015, approximately 5% of retrieved birds were Hawaiian petrels and 0.6% of retrieved birds were band-rumped storm-petrels. The majority of light attraction take involves fledgling seabirds. However, adult and sub-adult seabirds are occasionally found grounded in association with bright lights.

Currently, all downed birds on Kaua‘i that are discovered are turned into the SOS program. This program has been in existence since 1978, when the DLNR initiated this community-based conservation effort. Funding to perpetuate the SOS program has come from various sources, but has been primarily funded via the KIUC since 2005, initially as part of their Short-Term Habitat Conservation Plan (STHCP). KIUC has stated its intent to continue funding the SOS program for a portion of their Long-Term HCP, which is under development. In the event that the SOS program is no longer available, a veterinarian with appropriate permits to handle listed species shall be hired by the Prime Contractor to accomplish this minimization measure (see Section 6.11.8 of the KSHCP). Should the success rate for rehabilitation of birds that undergo treatment through the SOS program or veterinarian care or treatment by other qualified parties not achieve the 88% release rate targeted by the KSHCP, individual Participants would need to determine whether the level of take authorized under their permit is likely to change and, if so, they may apply for a permit amendment (See KSHCP Section 6.11.8). If the increased lethal take can be accommodated under the current KSHCP, the process for re-evaluating costs is described in Section 6.5 of the KSHCP. If it cannot be accommodated under the current KSHCP, Participants or an individual Participant may elect to initiate a Major Amendment pursuant to Section 6.13.2 of the KSHCP. Under the KSHCP, each participant is responsible for addressing any additional minimization and mitigation measures, as necessary.

Implementation of Outreach and Training

An important factor in reducing mortality of downed seabirds is the likelihood of quickly finding and recovering downed birds efficiently. This is most likely to occur when on-site staff and workers are properly able to identify Covered Species, understand and fully implement the protocol for their detection and safe capture, and have a clear search strategy for recovering downed birds.

Under an approved PIP, each Participant is required to conduct annual outreach and training immediately prior to September 15 (the start of fallout season) for designated searchers for the Covered Species at their facilities beginning in Year 1 of their ITP. The Participant Monitoring Plan to be included in a PIP is required to include details on the search strategy, including a map of search routes (which should vary), the frequency of searches, likely problem locations and how these locations will be searched, the personnel involved, time required to complete the searches, date(s) on which searching will be conducted and how data will be collected and presented. A detailed slideshow presentation was developed on this subject and has been provided by the Agencies; handouts are also provided in this slideshow in Appendix F (Training and Outreach Materials) of the KSHCP. Other presentations or programs could be developed to meet this objective, subject to approval by the Prime Contractor and the Agencies. The goal is to properly train workers who will be responsible for the monitoring of downed seabirds at facilities, and who may find a downed seabird incidentally while performing other duties. Each Participant will also produce seabird outreach materials tailored to their customers, guests, or the public who may be present at their facilities during the seabird fallout season. These materials will supplement efforts of Participant staff members by encouraging more “eyes on the

ground" to identify and recover downed seabirds. Outreach at Participant facilities can also help increase general awareness of endangered species issues on Kaua'i.

Outreach materials may include, but are not limited to:

- Making guests/residents aware of the requirement to close blinds/curtains during seabird fallout season to reduce light attraction caused by interior lights;
- Seabird identification information;
- Location of nearest SOS aid stations;
- Instructions for handling seabirds and notifying appropriate staff; and
- Coloring books, children's activity books, cartoon depictions, or other means of educating young age groups.

Predator Control at Applicant Facilities

Seabirds that are downed at Participant facilities are vulnerable to direct mortality from predation by free-roaming dogs, cats, rats, and other predators. Downed seabirds that subsequently become predated are considered as being lethally taken in the form of mortality (see Section 4.2.1 of the KSHCP). In order to receive incidental take authorization from the Service and DLNR for downed seabirds, Participants are required to reduce the presence of predators at their facilities.

The following measures are required to reduce the potential for Covered Seabird predation at Participant facilities:

(1) A prohibition on loose, free-roaming cats and dogs (i.e., they must be leashed or otherwise restrained at all times while outside). This prohibition shall be clearly communicated with appropriate signage; and
(2) A trapping and removal program shall be conducted at the facility for feral cats and dogs; feral cats and dogs shall be humanely removed and not returned to the Covered applicant facility.

Minimization measures shall be described in individual PIPs submitted to the Service and DLNR as part of the application process. All measures to reduce presence of predators at Participant facilities shall be implemented within Year 1 of issuance of the ITP, and as needed throughout the life of the permit if predators are present at Participant facilities (see Section 6.8.3 of the KSHCP and the requirement to record the presence of predators). Applicants will be responsible for providing monitoring reports to the Agencies to demonstrate the efficacy of their predator control efforts at their facility.

Conservation Activities in Kalalau Valley

KSHCP conservation activities in Kalalau Valley include the control of barn owls (*Tyto alba*) in the valley and feral cat (*Felis catus*) control along the rim of the valley. The trapping and shooting of barn owls and feral cats is likely to benefit existing seabird nesting colonies in Kalalau Valley throughout the 30-year term of the KSHCP. With implementation of the KSHCP,

the benefits to Covered Seabird populations from implementation of barn owl and feral cat control in the Kalalau Valley were estimated in terms of seabird distribution, reproduction, and numbers. Immediate actions in the first year of the KSHCP to protect occupied breeding habitat of the Covered Species from barn owls and feral cats will address an important component of the survival and recovery needs of these species within the Kalalau Valley. The control of barn owls and feral cats is likely to enhance adult seabird survivorship and reproductive success of pairs breeding in the affected area (Service 2017b).

Barn owls are aerial predators with a large home range of up to 31 square kilometers (km^2) (Martin et al. 2014). Control of the predatory barn owl will involve monitoring for roosting areas, the use of bal chatri or goshawk traps, the playing of owl or prey calls, and shooting individual owls at dusk and dawn. Technicians will be trained in the use of firearms and in identifying the non-native barn owl to avoid causing harm to the native Hawaiian owl (pueo) (*Asio flammeus sandwichensis*). Best management practices to be incorporated in the predator control program include use of existing footpaths, maintaining distance from known seabird nesting areas, and closing traps each morning to prevent non-target effects. Observations by DOFAW avian predator control technicians on Kaua‘i suggest a continuing invasion every 3 to 12 months of new individual barn owls into territories where control efforts are carried out (G. Reid 2017, pers. comm.).

Feral cat control will consist of regular trapping along the rim of the Kalalau Valley, an area where cats have been observed on a near-weekly basis (K. Pias 2016, pers. comm. in KSHCP 2020). Feral cat control in Kalalau Valley will be conducted beginning in Year 1 of the KSHCP and continue throughout the 30-year term of the Plan. Control actions are considered likely to enhance adult seabird survivorship and the reproductive success of the Covered Species breeding in the vicinity of the Kalalau Valley. Feral cats utilize the roads and trails in Kōke‘e as ingress points to prey upon established seabird colonies in the Kalalau Valley and rim, and in the Pihea and Honopū valleys. Feral cats are voracious predators of seabirds and are regularly documented visiting known colonies (Ainley et al. 2001, Hodges and Nagata 2001, Raine and Banfield 2015, Raine et al. 2017d). Control of feral cats will involve linear trapping lines off roadways between the Kalalau and Pu‘u o Kila lookouts, trapping lines along likely cat trails into neighboring seabird colonies, and ad hoc trap placement based on monitoring information. It is anticipated that trapping will remove individual cats, reduce migration towards existing seabird colonies, and reduce feline breeding in the area. Technicians will be trained in the use of a variety of traps, lures, and baits to maximize effectiveness of the cat control actions.

The breeding phenology and susceptibility of the Covered Species to predation by barn owls and feral cats suggest that barn owl and feral cat control will result in an increase in the reproduction and numbers of seabirds breeding in Kalalau Valley outside of the 2-hectare Preserve site. According to population distribution models and data collected on seabird occurrence and threats, seabird predation by non-native barn owls and feral cats during the breeding season contributes to limiting the distribution of Covered Species on the island of Kaua‘i (Troy et al. 2014, Raine et al. 2017e, Service 2017c). The Covered Species are primarily susceptible to

predation by barn owls and feral cats during the 6-9 months following breeding periods when they are present at nesting colonies. The specific period is species dependent: for the Newell's shearwater, the period is late March and early April through December 15 (Raine and McFarland 2013a, p. 2); for the Hawaiian petrel, mid-February to early-March through late December (Raine et al. 2017i); and for the band-rumped storm-petrel, late May through late November (Raine et al. 2017d, pp 78, 79) (see the Status of the Species section below for detailed information on Covered Species' breeding phenology).

Barn owl and feral cat control are components of the KSHCP mitigation package that have the potential to be modified in scale as an Adaptive Management response (see Section 6.9.2 of the KSHCP). For example, cat trapping lines could be extended into "hanging" valleys (tributary valley higher than the main valley) where topography allows or barn owl control could be conducted in smaller adjacent valleys. However, at this time, based on known information on seabird breeding colonies, Covered Seabird life history and habitat, it is not anticipated that expanding predator control within Kalalau Valley alone would provide benefits to completely offset take impacts anticipated under the KSHCP.

Benefits to the Newell's Shearwater from Barn Owl and Feral Cat Control

The Newell's shearwater population in the Kalalau Valley that will be protected under the KSHCP is estimated at 2,700 birds, using statistical methods described in Service (2017a). This meta-population size was projected by the Service based on statistical analyses of data on Newell's shearwater vocalizations collected by KESRP during auditory surveys on Kaua'i. The KESRP data were compiled by the Service in a Geographic Information System (GIS) that allows mapping of the number of calls and their locations relative to specific areas on Kaua'i. This information can be segregated into separate polygons (i.e., shapes linked to geographic areas). Because the data contained in KESRP polygons do not have an estimate of colony size, a statistically rigorous assessment relating vocalization data to information on environmental variables (e.g., slope, aspect) collected at known seabird breeding burrows was developed to project Newell's shearwater population estimates for each polygon, allowing for meta-population estimates to be calculated (Joyce 2013). Using this approach, the subset of the Newell's shearwater meta-population within the Kalalau Valley that is breeding outside the proposed 2-hectare fenced Preserve site is estimated to include 2,700 individuals.

The benefit of barn owl and feral cat control on Newell's shearwater reproduction was estimated using a mitigation efficacy calculator (Service 2017a) and adjusted based on additional information on adult and chick distributions across the populations projected in the models, as provided by the Service in May of 2017. The effect of barn owl and feral cat control on seabird reproduction was expressed as a change in the number of fledglings produced by the breeding pairs estimated to breed in Kalalau Valley (outside of the 2-hectare Preserve site) compared to the existing condition. Implementation of barn owl control is anticipated to provide a reproductive benefit of five Newell's shearwater fledglings per year and 150 fledglings over the

30-year duration of the KSHCP. This expected benefit was based on the following assumptions: an 80% decrease in barn owl predation of Newell's shearwater in the Kalalau Valley; beginning barn owl control in Year 1 of the KSHCP; and otherwise low Newell's shearwater predation levels within the Kalalau Valley, as defined in Appendix C of the KSHCP: Social Attraction Benefit Estimator. These results (as well as the estimated benefit of feral cat control below) rely on the assumption that breeding adults protected by predator control (above the baseline level) will contribute to the anticipated increase in fledgling production annually. Model estimates will be updated with the results of monitoring data (See Section 12.1.3. of the KSHCP, Appendix A: Kahuama'a Seabird Preserve Management Plan).

The effectiveness of barn owl control in the Kalalau Valley will likely be limited by the level of barn owl detection, which is influenced by the frequency of monitoring and control activities. The KSHCP estimates of predator control effectiveness assume an 80% reduction in the number of shearwaters predated by barn owls. This estimate respects the fact that control efforts are never likely to be totally effective. For example, in 2015 in an area (the Upper Limahuli Valley) which has received intensive predator control since 2011, an adult Newell's shearwater was found predated by a barn owl and at least one barn owl was observed hunting on multiple occasions (Raine et al. 2016b).

Implementation of feral cat control is expected to provide a reproductive benefit of 10 Newell's shearwater fledglings per year and 300 fledglings over the 30-year duration of the Plan. This is based on the following assumptions: a 30% decrease in feral cat predation of Newell's shearwaters in the Kalalau Valley; initiation of feral cat control in Year 1 of KSHCP implementation; and otherwise low Newell's shearwater predation levels within the Kalalau Valley (see Appendix C: Social Attraction Benefit Estimator in the KSHCP). This level of predation is also discussed in Service (2017a), and is consistent with modeling for the social attraction project (discussed above).

The limited spatial coverage of feral cat trapping will likely limit the effectiveness of the feral cat control in the Kalalau Valley. Under the KSHCP, the feral cat control is likely to suppress, but not eliminate, the ingress of feral cats via the rim of the valley (a known movement corridor of feral cats) into Newell's shearwater breeding sites. The control effort is not expected to stem the influx of feral cats from the valley floor, where feral cats occur in high numbers (Pias 2016, pers. comm.). Further surveys are needed to evaluate the movement patterns of cats in the valley to determine the extent of primary cat corridors up valley walls to seabird breeding sites. At nearby Newell's shearwater nesting colonies within the Hono o Nā Pali Natural Area Reserve (NAR), at least 11 Newell's shearwaters (8 adults and 3 chicks) were predated by feral cats over the two year period, 2014 -2015. During this same time period, cat control was ongoing in montane areas within the NAR (Raine and Banfield 2015a, Raine and Banfield 2015b, c, Raine et al. 2016a, Raine et al. 2016d, Raine et al. 2016e). Based on the above information and the known locations of Newell's shearwater breeding colonies within the Kalalau Valley (See Section 5.4 of the KSHCP, Figure 5-1 and Appendix A: Kahuama'a Seabird Preserve Management Plan of the KSHCP), conservative estimates of efficacy assume that cat-trapping along the rim of the

Kalalau Valley may achieve a 30% reduction in the number of shearwaters predated by feral cats Griesemer and Holmes (2011).

In addition, the estimated benefit of predator control on Newell's shearwater reproductive success is based on the 2018-projected Newell's shearwater population size in the control area. This estimate did not take into account the following factors influencing the shearwater population in the valley over time throughout the term of the Plan: (1) the ongoing impacts of seabird predation caused by rats, cats, pigs and barn owls; and (2) the beneficial effects of establishing a breeding colony of Newell's shearwater within a fully protected, terrestrial predator-free, fenced social attraction site (See Section 4.1.1 of the KSHCP).

Benefits of Barn Owl and Feral Cat Control to the Hawaiian Petrel and Band-Rumped Storm-Petrel

Due to the low amount of anticipated incidental take of the Hawaiian petrel and the band-rumped storm-petrel at Participant facilities, no modeling of these species populations was conducted to estimate the potential increase in their reproduction due to mitigation measures, inclusive of barn owl and feral cat control. However, these species are expected to experience some benefits from these mitigation measures.

One of the largest Hawaiian petrel populations outside of the Haleakalā colony on the island of Maui breeds on Kaua'i at Hono o Nā Pali NAR adjacent to the Kalalau Valley. Within the NAR, a minimum of 240 petrel nesting burrows were documented across several colonies, including the Pihea, Pōhākea, and North Bog colonies (Raine et al. 2017h, f, g). The Hawaiian petrel population breeding in native-dominated forest on the southwestern rim of Kalalau Valley is likely an extension of the Pihea colony.

Song meters and auditory surveys have been used to monitor petrel and shearwater populations in this area because the terrain is often too steep to allow for safe burrow searches (Raine et al. 2017h). The same song meters monitored populations of both the Newell's shearwater and the Hawaiian petrel in this area on 450 total nights and 501 total hours (Raine et al. 2017h). The song meters in this study were programmed to record 1 out of every 5 minutes, for 5 hours starting at sunset, then record 1 out of every 10 minutes for the 5 hours preceding sunrise.

In 2015, the highest number of calls detected by these song meters in the Kalalau rim area equaled approximately six Newell's shearwater calls per minute (6.37 +/- 6.56 calls/minute +/- sd) and five Hawaiian petrel calls per minute (4.77 +/- 4.24 calls/minute +/-sd) (Raine et al. 2016a). These sites were also surveyed in 2013 and 2014, and no significant differences were found between years for all three years of both Newell's shearwater and Hawaiian petrel monitoring (Raine et al. 2016a). Barn owls and feral cats regularly depredate Hawaiian petrels at their nesting colonies. For example, the carcasses of adult Hawaiian petrels killed by barn owls were found in the Upper Limahuli colony in 2011 (n=2) and in the Pōhākea colony in 2013 (n=1) (Raine et al. 2017f). Within the Hono o Nā Pali NAR over a two-year period (2014-2015), at

least 36 seabirds were killed by feral cats of which 7 carcasses were confirmed to be Hawaiian petrels (4 adults and 3 chicks), 11 were confirmed to be Newell's shearwaters, and the rest (n=18) could not be identified to species (Raine and Banfield 2015a, Raine and Banfield 2015b, c, Raine et al. 2016a, Raine et al. 2016d, Raine et al. 2016e).

Evidence of a band-rumped storm-petrel population in Kalalau Valley is based on detections of vocalizations during their breeding season (Wood et al. 2002, Raine et al. 2017c). Additional ground and auditory surveys are needed to estimate the population of band-rumped storm-petrel in Kalalau Valley; however, auditory detections of high rates of calling indicate that the species is likely breeding throughout the valley (See Section 5.4, Figure 5-1 and Appendix A: Kahuamaʻa Seabird Preserve Management Plan of the KSHCP). Raine et al. (2017c) reported that band-rumped storm-petrel calling rates in this area, detected during auditory surveys (conducted in 2006-2015), exceeded 128 calls per hour. The carcass of a depredated band-rumped storm-petrel found on the Nā Pali Coast and observations of barn owls attracted to broadcast calls of band-rumped storm-petrel during banding sessions (Raine et al. 2017c) suggest barn owls regularly hunt this species. Feral cats are known to occur on the rim above the valley between the Honopū Valley and the Kalalau Valley (Banfield et al. 2013), and are also likely preying on band-rumped storm-petrels breeding near the top of walls in the Kalalau Valley where their calls have been detected (see Section 5.4, Figure 5-1 and Appendix A: Kahuamaʻa Seabird Preserve Management Plan of the KSHCP).

It is reasonable to assume that barn owl and feral cat control is likely to provide an annual benefit of at least 2 fledglings and 2 adult or sub-adult Hawaiian petrels and at least 1 fledgling and 1 adult band-rumped storm-petrels on Kauaʻi. These estimates are based on known breeding activity of the Hawaiian petrel and band-rumped storm-petrel in the Kalalau Valley, records of predation by barn owls and feral cats of these species in nearby colonies, and the anticipated increase in seabird reproduction and adult survival resulting from barn owl and feral cat control. Over the 30-year term of the KSHCP, this assumed benefit totals 60 fledglings and 60 adults or sub-adults of the Hawaiian petrel as well as 30 fledglings and 30 adults or sub-adults of the band-rumped storm-petrel.

Conservation Activities at the Kahuamaʻa Seabird Preserve

The goal of the Kahuamaʻa Seabird Preserve is to create a new protected breeding colony of the Newell's shearwater through the use of predator-proof fencing and social attraction. The 2-hectare social attraction site is located on Kalalau Rim in northwestern Kauaʻi at approximately 1,200 meters in elevation (i.e. mid- to high-elevation) at a similar elevation to occupied Newell's shearwater nesting colonies in that region of the island. The site occupies a portion of an area known as "Kahuamaʻa Flat," on Conservation District land owned by the State of Hawaiʻi and managed by the DLNR Division of State Parks (por. 5-9-001:016 (Kōkeʻe State Park (Resource subzone)) and por. 5-9-001:001 (Nāpali Coast State Wilderness Park (Protective subzone)). The habitat and topography at this site were determined to be suitable for predator-proof fencing (L. Young, 2017, pers. comm.). Within the fenced site, breeding pairs will be attracted using a social attraction sound system after eradication of feral cats, rats, and ungulates (pigs, goats, and deer) is achieved. A cat and

rodent control grid will also extend 50 meters around the outside perimeter of the fence to minimize and avoid future terrestrial predator invasion into the fenced site. Barn owl trapping and shooting will be carried out around the perimeter of the fence to protect seabirds recruited to and breeding within the preserve. Non-native, invasive weeds will also be removed within the fenced site to protect existing, native-dominated vegetation and prevent degradation of suitable seabird habitat. Social attraction (playing Covered Seabird Species calls to attract birds on the flyway from neighboring colonies to breed inside the protected predator proof fence) will also be conducted within the site. These techniques will be used to lure prospecting seabirds to breed at restoration sites by utilizing acoustic playbacks of vocalizations and the use of decoys, mirrors, scents and artificial burrows, all of which replicate features of an established seabird breeding colony from a distance (Jones and Kress 2012). Because the Newell's shearwater is most heavily impacted by light attraction, the development of the Preserve is designed primarily to mitigate for unavoidable take of the species due to light attraction.

Also, given the close proximity of known Newell's shearwater breeding colonies to the social attraction site and the estimated flight paths of shearwaters using this area (Service 2017c, a), there is a high likelihood that prospecting shearwater adults and sub-adults will visit the site and be exposed to social attraction cues. The social attraction site will be managed for the 30-year term of the KSHCP. On that basis, the benefits to the Newell's shearwater population on Kaua'i are anticipated to start once the predator-proof fence is completed, predators are removed from the fenced area, and social attraction is initiated and successful in establishing breeding seabirds within the fenced area.

Implementation of the seabird social attraction project at the Kahuama'a Seabird Preserve is targeted to benefit the Newell's shearwater because this species (in comparison to the other Covered Species) is most heavily impacted by light attraction at Participant facilities. These benefits were estimated in terms of the increase in protected habitat as well as enhancement of the reproduction, numbers and distribution of shearwaters within the Preserve compared to existing baseline conditions for the species in this region of Kaua'i.

Management of the Kahuama'a Seabird Preserve is anticipated to increase the productivity of breeding Newell's shearwaters on the site to levels that support colony growth and result in a positive population growth rate on Kaua'i, vitally important for a K-selected species with a marginalized baseline condition. K-selected species are characterized by relatively low reproductive output due to the delay in reaching sexual maturity and production of, at most, one young per year. The long-term management of the 2-hectare site, which currently contains high quality breeding habitat for seabirds at a level that may support large numbers of nesting seabirds, is critical to support recovery of the Newell's shearwater. In addition, creating a "new" colony serves to expand the Newell's shearwater's distribution. This objective is recognized as important to increasing the likelihood of its persistence and survival in the wild (Service 2017a, b; 1983).

Population modeling was used to calculate the anticipated increase in Newell's shearwater reproduction within the protected, fenced and managed Preserve site (see Appendix C: Social Attraction Benefit Estimator, of the KSHCP). Newell's shearwater reproduction and survival are impacted by predation at nesting colonies from late March and early April through mid-November (Raine et al. 2017h). Thus, the beneficial effects for individual shearwaters are anticipated to occur

during the breeding season. The beneficial effect on reproduction can be expressed as a change in the number of fledglings produced by the Newell's shearwater pairs anticipated to breed within the fenced site compared to the existing condition for pairs breeding outside the fenced site. Based on surveys conducted at the Preserve site, there may already be some level of on-site breeding activity (KSHCP Appendix A: Kahuamaʻa Seabird Preserve Management Plan). Between May 31 and June 3, 2016 and August 28-30, 2017, KSHCP staff conducted auditory surveys at the site and observed Newell's shearwaters transiting over the site, circling, and possibly calling from the ground on more than one occasion. However, because breeding is unconfirmed, the modeling of population change within the fenced site is assumed to have a starting population size of zero.

Based on the results of population modeling, implementation of the seabird social attraction project over a 30-year period is anticipated to provide a reproductive benefit of 697 fledglings to the Kauaʻi Newell's shearwater population (see KSHCP Appendix C: Social Attraction Benefit Estimator, Table 7). This benefit relies on the following assumptions: (1) completion of a predator exclusion fence protecting 2 hectares of native habitat by Year 2 of the KSHCP; (2) eradication of terrestrial predators within the fenced site (100% efficacy of removing feral cats, rats and ungulates) by Year 2; (3) initiation of social attraction in Year 2; (4) initiation of barn owl control around the perimeter of the fence in Year 1 (80% efficacy, as discussed in Section 4.1.2 of the KSHCP); and (5) 10% of prospecting sub-adult birds are available for recruitment to the site (i.e., sub-adults, ages 2-5 years old, returning to Kauaʻi during the breeding season to prospect for nest sites and potential breeding partners). The 100% efficacy in the removal of terrestrial predators (ungulates, cats, rats) was considered achievable based on the successful eradication of these species in densely forested habitat within the Nihoku predator exclusion fence located at the Kīlauea Point National Wildlife Refuge (PRC 2017). Additional information on Newell's shearwater modeling assumptions for site fidelity, flight paths, burrow density and Kauaʻi population size are provided in the KSHCP, Appendix C: Social Attraction Benefit Estimator. Although model outputs indicate the social attraction project could provide a reproductive benefit up to a maximum of 1,045 fledglings, the conservative estimate of 697 fledglings (KSHCP Appendix C: Social Attraction Benefit Estimator, Table 7) was selected to provide a very high level of confidence and certainty in the reproductive outcome that will result from implementation of the project.

The numbers of Covered Seabird chicks or eggs that are likely to be killed as a result of its parent's death) due to light attraction were estimated (Table 1) using information on population demographics (see Status of the Species). Based on this information, up to two Newell's shearwater chicks or eggs (1.75 rounded to 2) are likely to be killed over the 30-year KSHCP duration. This assumes 70% of adults killed due to light attraction would have been breeding and 50% of breeding attempts would have resulted in a chick fledging the nest (i.e. breeding probability of 70% and reproductive success of 50%) (Griesemer and Holmes 2011). Also, based on this information, up to 10 Hawaiian petrel chicks or eggs (9.6 rounded) are likely to be killed over the 30-year term of the KSHCP, assuming a breeding probability of 89% (Simons 1984) and reproductive success of 72% (Simons 1985).

No data exists on the population demographics of the band-rumped storm-petrel in the Hawaiian Archipelago. However, breeding probability and reproductive success of adult pairs in the European storm-petrel (*Hydrobates pelagicus*), a similar sized small seabird (Dunning 2008) in

the same family (Hydrobatidae; order Procellariiformes) as the band-rumped storm-petrel, was estimated at 69% (Hemery et al. 1986 in Mougin et al. (1997)) and 53% to 63%. This range is from four studies, 1980 to 2001, in Cadiou (2001) and consistent with Sanz-Aguilar et al. (2008). Based on these data from an analogous species, three band-rumped storm-petrel chicks or eggs are likely to be killed over the 30-year Plan duration, assuming 69% breeding probability and 58% reproductive success (mid-point of above range).

An injury of a parent Covered Seabird and its subsequent rehabilitation and release of an adult (its survival) may disrupt incubation or provisioning patterns, and result in the loss of a chick or egg. Both Newell's shearwater and Hawaiian petrel parents take turns incubating the egg and provisioning the chick. Therefore, the number of Covered Seabird chicks or eggs that are likely to be killed as a result of this disruption of adult care was estimated using the population demographic information explained in the previous paragraph (Table 1). Table 2, Table, 3, and Table 4 presents the individual Applicant lethal and non-lethal take requested for the Covered Species.

Table 1. Modelled maximum take and mitigation potential of the Kahuama'a Seabird Preserve and conservation activities in Kalalau Valley.

Species	**Total Annual**		**Total 30-year**	
	Mortality (Lethal)	**Injury (Non-lethal)**	**Mortality (Lethal)**	**Injury (Non-lethal)**
Newell's shearwater				
Fledglings	30	45	900	1,350
Adults or sub-adults	0.33	0.33	10	10
Eggs/chicks	<0.1		2	
Hawaiian petrel				
Fledglings, adults, or sub-adults	2	2	60	60
Eggs/chicks	0.33		10	
Band-rumped storm-petrel				
Fledglings, adults or sub-adults	1	1	30	30
Eggs/chicks	0.1		3	

Table 2. Amount of lethal and non-lethal fledgling Newell's shearwater take requested by Applicants.

Applicant	**Newell's shearwater fledglings**			
	Annual		30-Year	
	Lethal	Non-lethal	Lethal	Non-lethal
A&B	3.46	2.64	104	80
County of Kaua‘i	9.184	7.218	276	217
HDOT Līhu‘e Airport	0.72	1.41	22	43
HDOT Nāwiliwili Harbor	0.42	1.58	13	48
HDOT Port Allen Harbor	2.24	1.76	68	53
Kaua‘i Coffee	1.12	0.88	34	27
Kaua‘i Marriott	1.1	0.704	33	22
NCL	1	1	30	30
Princeville Resort Kaua‘i	4.16	15.84	125	476
Sheraton Kauai‘i	2.69	2.112	81	64
Total	**26.094**	**35.144**	**786**	**1060**

Table 3. Amount of lethal and non-lethal fledgling Hawaiian petrel take requested by Applicants.

Applicant	**Hawaiian petrel fledglings**			
	Annual		30-Year	
	Lethal	Non-lethal	Lethal	Non-lethal
A&B	0.1	0.1	3	3
County of Kaua‘i	0.56	0.13	17	4
HDOT Līhu‘e Airport	0.09	0.18	3	6
HDOT Nāwiliwili Harbor	0.04	0.18	2	6
HDOT Port Allen Harbor	0	0	0	0
Kaua‘i Coffee	0	0	0	0
Kaua‘i Marriott	0.033	0.033	1	1
NCL	0.2	0.2	6	6
Princeville Resort Kaua‘i	0.2	0.2	6	6
Sheraton Kauai‘i	0.033	0.033	1	1
Total	**1.256**	**1.056**	**39**	**33**

Table 4. Amount of lethal and non-lethal fledgling band-rumped storm-petrel take requested by Applicants.

Applicant	**Band-rumped storm-petrel fledglings**			
	Annual		30-Year	
	Lethal	Non-lethal	Lethal	Non-lethal
A&B	0.033	0.033	1	1
County of Kaua‘i	0.112	0	4	0
HDOT Līhu‘e Airport	0.03	0.06	1	2
HDOT Nāwiliwili Harbor	0	0	0	0
HDOT Port Allen Harbor	0	0	0	0
Kaua‘i Coffee	0	0	0	0
Kaua‘i Marriott	0.033	0.033	1	1
NCL	0.2	0.2	6	6
Princeville Resort Kaua‘i	0.033	0.033	1	1
Sheraton Kauai‘i	0.08	0.06161	3	3
Total	**0.521**	**0.42061**	**17**	**14**

Adaptive Management

The KSHCP identifies potential actions that may be implemented in response to monitoring results and changed circumstances. Compliance and effectiveness monitoring will be conducted to ensure that authorized amounts of incidental take are not exceeded and to enable the wildlife agencies to determine if mitigation actions are meeting the conservation goals of the Plan. Adaptive Management procedures will be implemented in the event that monitoring indicates the mitigation actions are not likely to meet the conservation goals of the KSHCP.

If the adaptive management provisions are triggered, from that point, all future Covered Actions would involve coordination with Service and DLNR staff to determine if adaptive management actions are practicable and appropriate, and monitoring is in place to measure the success or effectiveness of the adaptive management measures. Such measures may include:

- Incorporation of additional minimization and avoidance actions that were not detailed in the initial PIP for an Applicant facility, if initial minimization actions are determined to be insufficient to reduce the level of incidental take to the amount authorized by the ITP.
- Substituting new actions for initial minimization measures to allow for adoption of new technologies, different lighting designs, or more effective searching strategies for downed birds.
- Incorporation of additional mitigation actions if results of monitoring indicate that initial predator control methods are not adequately controlling predators in the Kalalau area.
- Substituting new actions for initial mitigation actions for management of the social attraction site, such as expanded predator control of barn owls, feral cats, or rats or funding of other conservation efforts implemented by DOFAW, the Kaua‘i Watershed Alliance, the KESRP, or another entity approved by the Service and DLNR that provide direct benefit to the Covered Species, if the social attraction site fails to meet identified objectives that would lead to a breeding colony.

The above changes to management protocols or the scope of the mitigation actions may need to be addressed as an amendment to the KSHCP, as determined by the Service and DLNR. An amendment would require compliance with applicable permitting requirements, potentially including a supplemental NEPA analysis.

Best Management Practices and Avoidance and Minimization Measures at Mitigation Sites

Comprehensive avoidance and minimization measures have been developed to prevent adverse impacts to native species and to natural habitat as a result of mitigation activities (See KSHCP, Appendix A: Kahuama‘a Seabird Preserve Management Plan). The KSHCP Prime Contractor will also ensure that all avoidance and minimization measures are followed and, when necessary, shall recommend changes or additions to these avoidance and minimization measures that will be included in annual reports on KSHCP implementation to the Service and DLNR for approval and implementation.

Action Area

The action area is defined at (50 CFR 402.02) as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.” The Service has determined that the action area for the KSHCP is the island of Kaua‘i because applicant facilities have the potential to occur island-wide depending on where their facilities are located. The proposed social attraction project at the Kahuama‘a Seabird Preserve, and the barn owl and feral cat control actions will take place on the Kalalau rim and in the Valley on the northeast section of the island.

The Kahuama‘a Seabird Preserve is located near the terminal end of Highway 550, within the DLNR Division of State Parks – Kōke‘e State Park and the Nā Pali Coast State Park, between the Kalalau and Pu‘u O Kila visitor lookouts, identified on the map as part of Kahuama‘a Flat (Figure 1). The site is along the western rim of the Kalalau Valley in the northwestern portion of

the island at approximately 1,200 meters in elevation (i.e. mid- to high-elevation) at a similar elevation to occupied nesting colonies of the Covered Species in that region of the island (Figure 2).

Figure 1. Satellite image of Kahuama‘a Flats with Kalalau Lookout. Red pin indicates the proposed Kahuama‘a Seabird Preserve. Image from Google Maps.

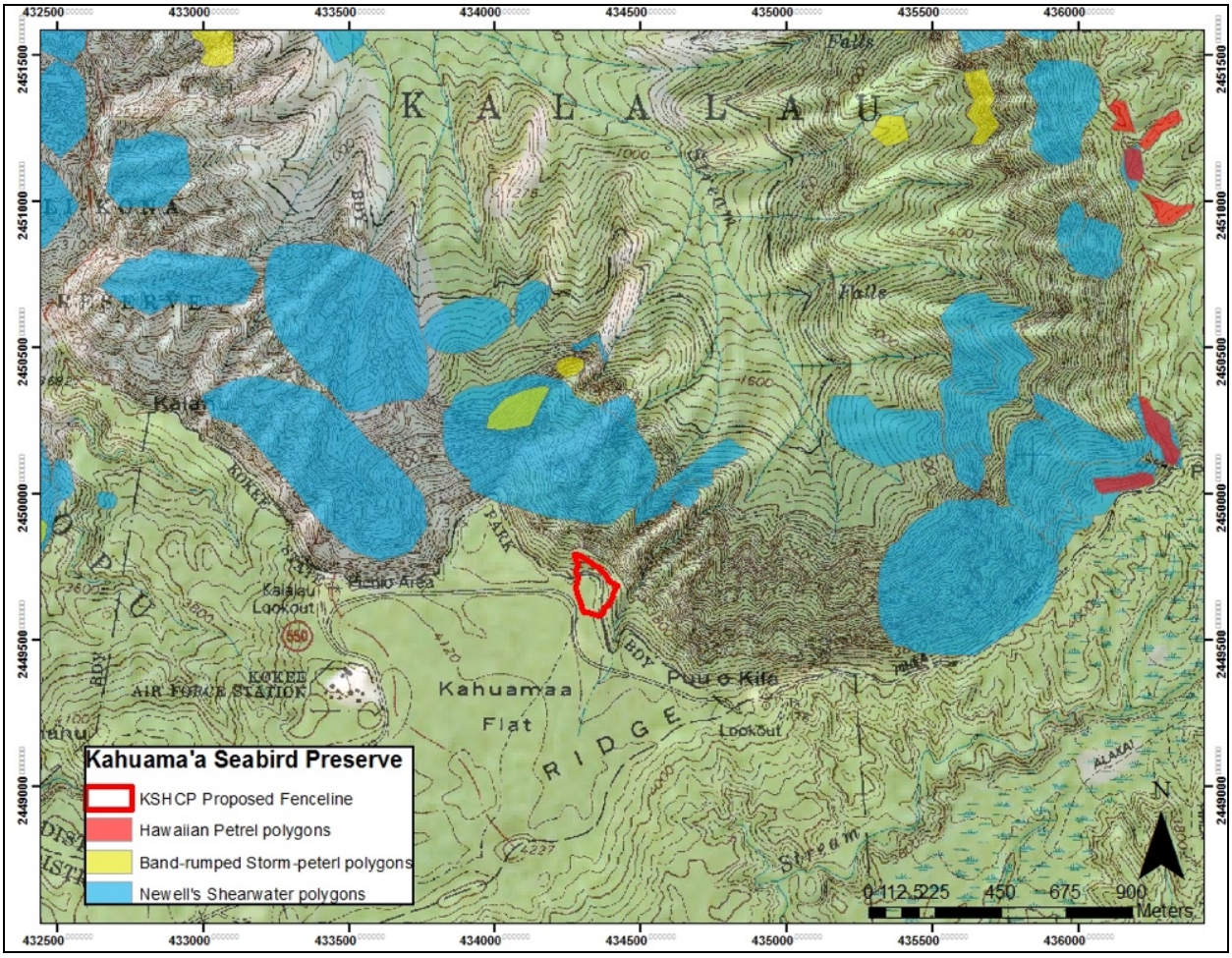

Figure 2. Area map of the proposed Kahuama‘a Seabird Preserve.

Analytical Framework for the Jeopardy and Adverse Modification Analyses

Jeopardy Analysis

In accordance with policy and regulation, the jeopardy analysis in this BiOp relies on four components: (1) the *Status of the Species*, which evaluates the range-wide condition, the factors responsible for that condition, and the survival and recovery needs of each listed species that may be affected by the proposed action; (2) the *Environmental Baseline*, which evaluates the condition of the affected listed species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of each affected species; (3) the *Effects of the Action*, which determines the consequences of the proposed Federal action on each affected listed species; and (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the each of the affected listed species.
In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the Newell’s shearwater, Hawaiian petrel,

and band-rumped storm-petrel current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the Newell's shearwater, Hawaiian petrel, and band-rumped storm-petrel in the wild.

The jeopardy analysis in this Biological Opinion places an emphasis on consideration of the range-wide survival and recovery needs of the Newell's shearwater, Hawaiian petrel, and band-rumped storm-petrel and the role of the action area in their survival and recovery as the context for evaluating the significance of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

STATUS OF THE SPECIES

Status of the Newell's Shearwater

Listing Status, Taxonomy, and Species Description

The Newell's shearwater was listed as a threatened species in 1975 (USFWS 1983), pursuant to the Endangered Species Preservation Act of 1966. The *Hawaiian Dark-Rumped Petrel and Newell's Manx Shearwater Recovery Plan* was published in 1983 (USFWS 1983). Species five-year reviews on Newell's shearwater were completed in 2011 and 2017. Each of the reviews recommended up-listing the Newell's shearwater to endangered status primarily due to precipitous declines in the global population over the last two decades. The *Amendment to the Hawaiian Dark-Rumped Petrel and Newell's Manx Shearwater Recovery Plan* was published in 2019. This plan includes revisions of criteria for recovery (i.e. support representation by ensuring ecological, morphological, behavioral, and genetic diversity of the species throughout its range; resiliency through stable or increasing populations; and redundancy by recommending distribution throughout the historical range). These recovery criteria were amended to include objective and measurable criteria based on the best available data. Critical habitat has not been designated for the Newell's shearwater (USFWS 1983).

The Newell's shearwater taxonomically belongs to the *Puffinus* genus, in the *Procellariidae* family and *Procellariiformes* order, along with 20 other extant shearwaters ranging throughout the Indian, Atlantic, and Pacific oceans (Gill and Donsker 2016). Genetic analyses conducted by Martíinez-Gómez et al. (2015) confirmed the taxonomic status of Newell's shearwaters (*P. auricularis newelli*) as a subspecies alongside the Townsend's shearwater (*P. auricularis auricularis*). These two subspecies comprise *P. auricularis*. The two subspecies exhibit minor differences in plumage patterns and breeding chronology (Martíinez-Gómez et al. 2015, p. 1026). The Townsend's shearwater is endemic to the Revillagigedo Archipelago located off the coast of Mexico and south of Baja California Peninsula. The Townsend's shearwater's range and distribution has been significantly contracted to a single island with less than 100 breeding pairs remaining (Martíinez-Gómez et al. 2015, p. 1032; and BirdLife International 2016a).

The Newell's shearwater is approximately 12 to 14 inches long, with a wingspan of 30 to 35 inches (Berger 1972, p. 46), and weighs approximately 14 ounces (Ainley et al. 1997a, p. 15). Its plumage is glossy black above, and white below (Ainley et al. 1997a, p. 15). The Newell's shearwaters' maneuverability is characterized by fast, directional, and a low-to-water flight pattern, due to high wing-loading. A Newell's shearwater wing-loading averages about 60 N [newtons]/m2 (± 5.3 SD) with a low aspect ratio (10.3 ± 0.45 SD); significantly different from other shearwaters or petrels (Spear et al. 1995; Warham 1977). To achieve flight, Newell's shearwaters require extended height above the ridges of their montane burrows, and have been observed climbing larger trees to achieve wing loading (Troy et al. 2016, p. 203). It has a dark gray to brown bill that is sharply hooked at the tip (Ainley et al. 1997a, p. 15). Its claws are well adapted for burrow excavation and climbing.

Life History

Newell's shearwaters have a long lifespan (up to 36 years), do not reproduce until 6 years of age, lay one egg per year, and their offspring require significant parental investment (Ainley et al. 2001). The Newell's shearwater is a K-selected species meaning they are species characterized with long lifespans and low reproduction at high energetic cost, due to their evolution in stable environments. The breeding season begins in late March or early April when adults and sub-adults arrive to inland breeding colonies, followed by a 2-4 week exodus when breeding adults forage to build-up reserves (Raine and McFarland 2013, p. 2; Raine and Banfield 2015a, p.2). The incubation period begins in May and continues through July, and the chick provisioning stage occurs in late July through September (Raine and McFarland 2013, p. 2). Both sexes equally incubate the egg (Ainley et al. 1997a, p. 10). The fledging or late chick rearing stage, when young leave the nest for the first time occurs from September 15 through December 15 (Raine and McFarland 2013, p. 2). Adults travel from breeding to feeding areas and return to feed their chicks irregularly every one to three nights throughout the chick rearing stage (Ainley et al. 1997). Newell's shearwaters, similar to other birds in the Order Procellariiformes, exhibit strong natal philopatry, with breeding pairs returning to the same burrow to breed each year (Bried et al. 2003, p. 242).

Ainley et al. (2001, p. 117) documented higher than expected numbers of active shearwater burrows with no egg or nestling signs present (11%-22%), indicating no breeding attempt was made. Monitoring data of shearwater colonies indicate at least 10% or more of activity within breeding colonies is comprised of non-breeding birds or sub-adults (<6 years old) prospecting for mates or excavating burrows during the breeding season (Raine et al. 2016a, 2016c). Ainley et al. (1997, p. 11) suggested shearwaters on Kaua'i begin returning to their breeding habitat as subadults at 2-3 years of age. The full shearwater breeding season is treated as March 1 to January 1 to cover the entire period when shearwaters may transit to and from the ocean and inland breeding sites (Travers et al. 2016, p. 5). All transit over land occurs in darkness, with a peak over land passage during the year coinciding with the late incubation and chick rearing stages (Travers et al. 2013, p. 35). Fledglings leaving the nest for the first time exhibit strong phototropic behavior and rely on ambient light from the moon to navigate to open ocean (Telfer et al. 1987, p. 410).

Historic and Current Distribution

The Newell's shearwater is believed to have colonized, historically, many of the southeastern Hawaiian Islands, including Hawai'i, Maui, Moloka'i, O'ahu, and Kaua'i (USFWS 1983, p. 2; Pyle and Pyle 2009, p.3). Birds were thought to be extinct after 1908, due largely to habitat loss and predation, but in 1954 a specimen was collected on the island of O'ahu (King & Gould 1967) and in 1967 a breeding colony was found on Kaua'i (Sincock & Swedberg 1969). No Newell's shearwater breeding colonies have been identified on the island of O'ahu; however, downed Newell's shearwaters have been recovered throughout the island since the 1950s (Pyle & Pyle 2009, p.3).

Three fragmented breeding areas were identified in the Puna District on Hawai'i Island in 1993, based on nocturnal calling, visual detections of birds in flight, and two Newell's shearwater carcasses found along the highway but no active burrows were found (Reynolds and Ritchotte 1997, p. 31). Currently, research staff at Haleakalā National Park on Maui consistently report Newell's shearwater ground calling within Kīpahulu Valley and along the northern slope of Mount Haleakalā near Ko'olau Gap, indicating a breeding site (NPS 2012, p. 18). However, due to sensitive resources in the area and the difficult terrain, no ground surveys have been conducted in these locations (NPS 2012, p. 19). In 2015, acoustic song meters were placed at 41 sites in remote areas of Haleakalā National Park to detect potential new seabird breeding colonies (McKown and Savage 2015, p. 1). Song meters detected Newell's shearwater ground calls in low numbers (averaging 2 ground calls per survey night) at five of the 41 sites, with only one site recording regular activity during the 30-day study period (McKown and Savage 2015, p. 15). Additional longer-term acoustic and ground surveys are needed to evaluate the extent, distribution, and viability of Newell's shearwater on Maui and Hawai'i islands.

In a study conducted by Young et al. (2019, p. 3) song meters detected Newell's shearwaters at two sites on O'ahu. Calls were detected on the leeward slope of Mount Ka'ala in the Wai'anae Mountains and at Poamoho in the Ko'olau Mountains, multiple times across the entire breeding season, and over two years, indicating that the sites are visited regularly by the species. It is unclear if these call detections indicate breeding populations at these sites. To date, no burrows have been detected. Recorded calls may be remnant bird populations, or outer island individuals prospecting for new burrow sites (Young et al. 2019, p. 6).

The Service believes that while some knowledge gaps remain concerning its distribution, the Newell's shearwater has experienced a significant breeding range contraction and currently, an estimated 90 percent of the population of Newell's shearwaters occurs on Kaua'i, with small colonies also occurring on Hawai'i Island, Maui, and possibly O'ahu (Ainley et al. 1997; Griesemer & Holmes 2011; and Young and VanderWerf 2016). Documented breeding colonies currently exist on Kaua'i and Maui.

Ainley *et al.* (2001) had documented 14 shearwater breeding colonies distributed across Kaua'i (Figure 3). Surveys have shown significantly lower levels of breeding activity at three previously highly active colonies (Kalāheo, Anahola, and Makaleha), and the extirpation of

others (e.g., Kaluahonu) (Ainley et al. 1995, Holmes and Troy 2008). No population data exists for Newell's breeding on other islands.

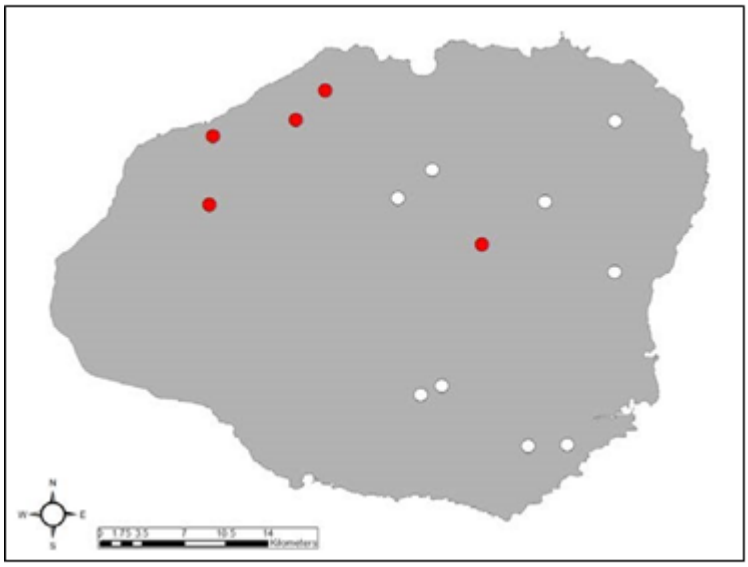

Figure 3. Map of Kaua'i showing Newell's shearwater breeding colony locations (n=14) (Ainley *et al.* 2001); unfilled circles (n=9) represent colonies near extirpation (<5 burrows).

Of the Newell's shearwater breeding on the island of Kaua'i, 104 breeding pairs were being monitored and an additional 64 burrows in Upper Limahuli Preserve (ULP) were monitored in 2015 but could not be identified to species (i.e., burrows were either Newell's or petrels) (Raine et al. 2016a, 2016c). The majority of the monitored shearwaters (82 breeding pairs) in 2015 were concentrated within the ULP, enclosed by an ungulate exclusion fence. Auditory surveys documented several additional areas of concentrated shearwater ground-calls indicating breeding activity within Lumaha'i Valley and Lā'au Mountain in montane habitat and within Honopū Valley along the Nā Pali coast (Banfield *et al.* 2013). However, due to inaccessible and difficult terrain, no numbers or estimates exist for shearwaters breeding in these locations.

Based on historic and current distribution of breeding sites, Newell's shearwaters prefer breeding habitat in montane wet (e.g., Hono o Nā Pali colony) to lowland wet and wet cliff (e.g., Upper Limahuli colony) habitat of 200 meters to 1,000 meters in elevation, steep to moderate slopes with thick native understory of uluhe fern (*Dicranopteris linearis*) and open canopy of dispersed 'ōhi'a trees (*Metrosideros polymorpha*) (Troy *et al.* 2014, p. 325). The preference for montane forested habitat beneath dense uluhe fern helps to conceal shearwater burrows from predators while dispersed 'ōhi'a trees may provide a take-off point for shearwaters to regain flight (Troy *et al.* 2014, p. 318). The Newell's substrate preference includes rocky volcanic soils with a moderate amount of fine soil particles and suitable drainage to prevent burrow flooding (Troy *et al.* 2014, p. 324). Seabird surveys have resulted in the first confirmed Newell's

shearwater burrows (n=3) along the Nā Pali coast in Kaua‘i, in dry cliff habitat (Raine and Banfield 2015a, p. 11).

Current Population Demographics

At-sea surveys conducted in the central and eastern tropical Pacific between 1980 and 1994 (Spear et al. 1995) estimated the total Newell's shearwater population at 84,000 (95% CI = 57,000-115,000) including juveniles and sub-adults. An updated assessment based on survey data collected by the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA-NMFS) Southwest and Pacific Islands Fisheries Science Centers from 1998 to 2011, estimated the total Newell's shearwater population at 27,011 (95% CI = 18,254-37,125) including juveniles and sub-adults (Joyce 2013). Given 90 percent of the global population resides on Kaua‘i (Ainley et al. 1997a; Griesemer and Holmes 2011), the estimated population of Kaua‘i is 24,310 individuals (USFWS 2017b, p. 113). The percentage of the population that is breeding age (6 years of age or older) is estimated at 0.637 (Ainley et al. 2001, p.115), equaling an adult population size of 15,485 (approximately 7,500 pairs).

Annual survivorship and juvenile/sub-adult survivorship of the Newell's shearwater has not been studied in the field (i.e., estimated from banding efforts and recapture). Population viability modeling efforts estimate Newell's shearwater adult survivorship at 0.905 (Ainley et al. 2001, p. 116) to 0.920 (Griesemer and Holmes 2011, p. 20; USFWS 2017c) and juvenile/sub-adult survivorship at 0.333 (Ainley et al. 2001, p. 116) based on long-term survivorship data of related species. The likelihood of Newell's shearwater adults (≥ 6 years of age) to breed in any one year was estimated to vary between 0.60 and 0.50 (Ainley et al. 2001, p. 118), which is markedly lower than the breeding probability (0.82) of other Procellariidae species. Based on a five-year monitoring study of a single Newell's shearwater colony on Kaua‘i the annual reproductive success of shearwaters was estimated at 0.66 fledglings per breeding pair (Ainley et al. 2001, p. 117).

Based on Newell's shearwater population parameters, SOS data, and carcass searches under power lines, Ainley *et al.* (2001) estimated the global population of Newell's shearwaters are declining at least 5.9 percent per year (λ=0.941). Ainley *et al.* (2001, p. 118) found that the main factor limiting the population growth rate of the Newell's shearwater was the extremely low breeding probability (0.547), which is associated with individual fitness and habitat quality. Ainley *et al.* (2001) suggested that the low breeding probability could be the result of high mate loss due to predation or other threats affecting individual fitness. Indeed, adults that lose a mate due to predation cannot obtain a new one quickly and have been observed not to breed the following season (Ainley *et al*. 2001, p. 118). The purpose of the Ainley *et al.* (2001) population demographic study was to evaluate the status of Newell's on Kaua‘i. The study sampled an average of 65 burrows for seven seabird seasons, 1981–1985 and 1993–1994. The colony sampled was in a natural state (i.e., receiving no conservation management actions) and the sample was not constrained to only experienced breeders, but rather sought to maximize the total number of burrows monitored each season (Ainley *et al.* 2001, p. 112).

Ornithological radar data was first used to monitor populations of Newell's shearwaters and Hawaiian petrels on Kaua'i in 1992-1993 (Day *et al.* 2003, p. 670), based on methods developed to monitor marbled murrelet (*Brachyramphus marmoratus*) populations in the Pacific Northwest (Cooper *et al*. 2001). Radar has been used to monitor the summer movement patterns of Newell's shearwaters and provide an accurate estimate of birds as they transit through the detection area at 13 sites throughout the island (Day and Cooper 1995; Raine et al. 2017d). Day et al. (2003) reported a mean annual rate of 11.2 percent decline in the Newell's shearwater population between 1993 and 2001, based on the analyses of ornithological radar data.

A subsequent study using visual observations, species-specific timing of petrel and shearwater movements, and radar data analysis showed an appreciable reduction in the number of shearwaters transiting to and from montane breeding colonies from 1993 to 2013 (Raine et al. 2017d), updating the analyses presented in Day et al. (2003). Radar surveys were conducted in coastal areas of known seabird flyways in May through mid-July, during the incubation and early chick-rearing stage. Therefore, these radar data are a conservative index of breeding activity. The overall mean for shearwaters across all 13 radar sites surveyed in 1993 was 524 ± 207 targets/hour and in 2013 was 34 ± 9 targets/hour, representing a mean decrease of 94% between the two periods ($t = 2.37$, $P = 0.03$; Raine et al. 2017d). All of the 13 sites showed a large decrease in movement rates over the entire period, with movement rates at 12 (92%) out of 13 sites showing statistically significant declines (Raine et al. 2017d). Based on the radar data (Raine et al. 2017d) as a proxy for the breeding population, the Newell's shearwater population on the island of Kaua'i declined, annually, at a mean rate of 12.5 percent over the 20-year period. This updated rate of decline of the Newell's shearwater population is comparable to the mean annual rate of 11.2 percent between 1993 and 2001 reported by Day et al. (2003, p. 673). In two breeding colonies on Kaua'i, ULP and Hono o Nā Pali NAR, efforts are currently underway to curtail the population decline through the removal of predators. The reproduction output of the 104 monitored Newell's shearwater pairs breeding within these areas are measured in terms of their reproductive success (i.e. percentage of eggs laid that result in young fledged (Warham 1996)). Since 2011, the reproductive success of Newell's shearwater pairs within ULP has increased by 27 percent, from 0.692 to 0.882 in 2011 and 2015, respectively (Raine et al. 2016a, p. 16). This increase appears to be a direct result of the ungulate exclusion fence completed in 2010 and intensive predator control that began in 2011. Indeed prior to these conservation efforts, surveys at ULP documented a 0.545 reproductive success rate (Table 2). Newell's are less prevalent than petrels within Hono o Nā Pali Natural Area Reserve NAR and have not been as successful in reproducing (due primarily to predation by cats, rats and feral pigs, despite the ungulate exclusion fencing and predator control). In addition there were an additional 162 burrows at ULP and Hono o Nā Pali NAR monitored in 2015 that could not be identified to species (i.e., burrows were either used by Newell's shearwaters or petrels).

Table 5. Reproductive success rates for Newell's Shearwater breeding pairs (*n*) monitored each year (2010-2016) at Upper Limahuli Preserve and Hono o Nā Pali Natural Area Reserve's Pōhākea site (Raine et al. 2017a, Raine et al. 2017b).

Year	2010 (*n*)	2011 (*n*)	2012 (*n*)	2013 (*n*)	2014 (*n*)	2015 (*n*)	2016 (*n*)
ULP	0.545 (11)	0.692 (15)	0.682 (34)	0.784 (46)	0.840 (59)	0.882 (82)	0.768 (82)
Hono O Pōhākea	No data	No data	No data	0.571 (8)	0.375 (20)	0.667 (22)	0.647 (29)

The updated rate of decline of the Newell's shearwater population is comparable to the mean annual rate of -11.2 percent between 1993 and 2001 reported by Day et al. (2003, p. 673). The independent SOS fallout data also showed a reduction of Newell's shearwater fledglings. SOS data showed an annual average of 955 birds from 1979 to 1992. SOS data collected from 1992-2015 showed a sharp decline in fallout numbers, averaging 157 birds annually (Raine et al. 2017c, p. 8).

When taken together, the data suggest that the population has undergone a dramatic decline over a relatively short period of time. The population trend of a vertical asymptote toward zero, indicates the population decline continues, despite a reduction in overall fallout observed by the SOS program. Current demographics may be representative of remnant bird populations, or populations whose habitat range is constrained due to habitat loss, predation, or other factors.

Threats

Primary threats to the Newell's shearwater include artificial nighttime lighting (Reed *et al*. 1985; Cooper and Day 1998), collisions with power lines (Cooper and Day 1998; Podolsky *et al*. 1998), predation by introduced predators (Raine and Banfield 2015b, 2015c), and changes to breeding habitat due to introduced invasive plants (Troy *et al*. 2014). These threats to the Newell's shearwater have been steadily increasing (Raine et al. 2017c).

Artificial light sources collectively are a significant mortality factor associated with Newell's shearwaters (Ainley *et al*. 2001; Troy *et al*. 2011). Upward projecting nighttime lighting interferes with the shearwaters ability to navigate to and from their breeding sites. Shearwaters, primarily fledglings and sub-adults, are disoriented by nighttime lighting and will circle light sources until they become exhausted and fall to the ground. After grounding, birds are vulnerable to being killed by feral cats, dogs, or vehicles (Travers *et al*. 2013, p. 81). They often fly into utility wires, poles, trees, and buildings and fall to the ground; this phenomenon is referred to as "fallout". Once these seabirds fall to the ground, they are unable to regain flight unless they have access to an area with sufficient take-off conditions to allow enough air to move under their wing to provide lift (Ainley *et al*. 2015, p.32). Since 1979, the DOFAW on Kaua'i has supported the Save our Shearwaters (SOS program to collect "downed" Newell's shearwaters and Hawaiian petrels (*i.e*., birds that have either collided with structures or fallen out, or have been injured or killed due to exhaustion caused by light attraction). Over a 37-year period (1979-2016), the SOS program documented a total of 30,552 Newell's shearwaters recovered, injured or killed due to

artificial nighttime lighting (DOFAW 2016). In the 1980s through 1990s, an average of 1,247 Newell's shearwaters were processed by the SOS program each year, where carcasses were documented or injured birds were rehabilitated and released (Raine et al. 2017c).

Adults and sub-adults are subject to collisions with power lines while flying between their nesting colonies and at-sea foraging areas (Cooper and Day 1998, p. 18; Podolsky *et al.* 1998, p. 21). Nestlings are indirectly affected as they rely on provisioning from both parents in order to survive, thus the loss of either parent results in nestling fatality. In 1993, in a single breeding season Podolsky *et al*. (1998, p. 30) documented deaths of at least 70 breeding adults and 280 sub-adult shearwaters over the summer months, in addition to 340 fledgling deaths in the autumn months, all as a result of collisions with power lines on Kaua'i. However, this study covered only the eastern and southern portions of the island (Podolsky *et al.* 1998, p. 30).

Based upon recent information collected from passive acoustic song meters (n=51) by the KIUC Underline Monitoring Program, the Service has conducted modeling to extrapolate the amount of documented take (i.e., collisions with power lines) to the entire power line system, encompassing power lines and infrastructure in the central, eastern, northern, southern, and western portions of the island (USFWS 2017a). As a result of covered activities under the KIUC STHCP and ITP, the Service estimates that approximately 1,875 Newell's shearwater, 765 Hawaiian petrel, and 26 band-rumped storm-petrel mortalities are occurring per year as a direct result of power line strikes under the KIUC STHCP and ITP, based on updated observational data proportions provided by KESRP and USFWS 2016 strike projections from scenarios IV, VB, and VIA selected in the USFWS Newell's Shearwater Landscape Strategy, Appendix 2 (2017b). These numbers are substantially greater than what was anticipated at the time the ITP was issued. The KIUC Short-Term HCP and Incidental Take Permit authorized the annual take of up to 162 Newell's shearwaters and 2 Hawaiian petrels (adults and sub-adults) from 2011 to 2016.

Introduced predators, particularly cats, rats (i.e. black rats, *Rattus rattus*; Norway rats, *R. norvegicus*; and Polynesian rats, *R. exulans*), feral pigs, small Indian mongoose (*Herpestes auropunctatus*), and barn owls, are a severe threat to the continued existence of the Newell's shearwater. Adults, sub-adults, and young are susceptible to predation by these introduced predators (Raine and McFarland 2013, p. 16; Raine and Banfield 2015a, p. 38). These non-native predators occur throughout the Hawaiian Islands, with the exception of the mongoose, which its establishment is uncertain on the island of Kaua'i (Phillips and Lucey 2016).

Another threat to the Newell's shearwater is habitat loss due to invasive vegetation. Invasive plants alter the three-dimensional structure of Hawaiian forests (Asner et al. 2008) as well as disrupt other ecological processes. A vegetation shift in areas of Kaua'i away from native understory to invasive vegetation, including but not limited to strawberry guava (*Psidium cattleianum*) and ginger (*Hedychium gardnerianum*) has been associated with at least one abandoned Newell's shearwater colony on Kaua'i (KESRP, unpublished data). Extreme weather events such as hurricanes 'Iniki (1992) and 'Iwa (1982) have caused significant disruptions in forest habitat and, coupled with colonization of invasive plants, have resulted in permanent

habitat loss for forest birds (Pratt 1994). In addition, areas of degraded habitat have facilitated the spread of invasive mammalian predators (Raine et al. 2016b, 2016c, 2016d). For example, in a heavily degraded habitat Ainley et al. (2001) counted 30 dead Newell's shearwater sub-adults and adults due to predation in one season (Ainley et al. 2001, p. 121).

Other threats include climate change and its affects to both seabird adult survivorship and recruitment (Sandvik et al. 2012) by generally affecting food availability (Oro 2014). Research by Spear et al. (2007) and Ainley et al. (2014) also indicate that Newell's shearwaters forage readily with yellowfin tuna and may be vulnerable to fishery interactions.

Survival and Recovery Needs

For purposes of this Biological Opinion, the "survival condition" of the Newell's shearwater in the wild represents the level of reproduction, numbers, and distribution necessary to support a persistent population in the Hawaiian Archipelago that is fully protected by the ESA. For purposes of this Biological Opinion, the "recovery condition" of the Newell's shearwater is that where the threats to the species have been addressed such that the protections of the ESA are no longer necessary to insure the survival condition of the Newell's shearwater in the wild.

The 1983 recovery plan (USFWS 1983) for the Newell's shearwater did not contain recovery criteria; rather general goals are listed that require revision due to a substantial amount of new information. However, the Service completed the draft Newell's Shearwater Recovery Strategy (Service 2016) which focuses on managing and enhancing extant colonies in areas with minimal light impacts, mitigating threats at the colony and those encountered while in transit to the colony, and creating new colonies through social attraction and translocation. Further, State and Federal partners finalized a 5-year Action Plan for Newell's shearwaters, Hawaiian petrels, and band-rumped storm-petrels (Holmes et al. 2015) that identifies specific actions to "protect and enhance existing colonies, reestablish extirpated colonies, create new colonies in suitable areas, and mitigate new and existing threats."

In 2017, the Service finalized the *Newell's Shearwater Landscape Strategy* (USFWS 2017c). The Newell's Shearwater Landscape Strategy (USFWS 2017c) focuses on managing and enhancing extant colonies in areas with minimal light impacts, mitigating threats at the colony, and those encountered while in transit to the colony, and creating new colonies through social attraction and translocation (USFWS 2017c). This recovery strategy relies on actions completed by Kaua'i Island Utility Cooperative under their STHCP, including a predator-exclusion fencing feasibility study (Young and VanderWerf 2014) and the 2013–2014 Kaua'i island-wide auditory survey reports to locate new shearwater and petrel colonies (Banfield *et al*. 2013; Raine and Banfield 2015b). The draft strategy describes general tools (i.e., manual predator control, ungulate and predator-exclusion fences) as well as translocation and social attraction activities to protect, augment, or create new breeding colonies. Removing terrestrial predators (e.g. feral cats) that depress adult and pre-breeder survival and establishing predator-free breeding habitat is required to successfully restore seabird colonies (Buxton *et al*. 2014; Jones and Kress 2012). On Kaua'i, repeated access into the colony to conduct intensive predator control in open systems

can degrade sensitive vegetation, while predator ingress and predation remains constant. In montane habitat, manual predator control should be conducted as an incremental step towards the goal of constructing a predator exclusion fence culminating with predator removal or eradication.

Predator fencing has been identified as the most effective tool against mammalian depredation at the colony, particularly for indigenous species that are highly sensitive to predation (Young *et al*. 2013; Norbury *et al*. 2014). Within the current range of Newell's shearwater, topography, streams, and remoteness limit the number of sites and size of areas that can be protected with predator exclusion fences. Preliminary surveys of eight sites known to have Newell's shearwater populations identified three as suitable for predator fencing; the other five were eliminated because of topography or streams (Young and VanderWerf 2014). The KESRP continues to survey areas for Newell's shearwater activity so active sites suitable for predator fencing, in addition to those identified in the Newell's Shearwater Landscape Strategy, could be identified in the coming years. At a minimum, the two sites recommended by Young and VanderWerf (2014) with identified Newell's shearwater burrows should be fenced. The third site identified in this study was found to have only Hawaiian petrel burrows. Other sites located independently by KESRP and verified as occupied and suitable for fencing should be fenced. These sites should be protected using manual predator control until the fences are complete. To increase recruitment once fences are complete, social attraction should be a component of the project.

The strategy prioritizes management efforts to occur in colonies already receiving conservation management actions under the existing KIUC STHCP, by relying on the concept of a 'no light conservation zone' or NLCZ to define an area which contains very little artificial nighttime lighting or light impingement. The NLCZ is based on the belief that artificial nighttime lighting is the sole factor constraining the distribution of Newell's shearwater breeding colonies and therefore colonies located in the NLCZ are more viable and should receive conservation actions. The NLCZ encompasses the northwest corner of Kaua'i and includes coastal areas as well as mountainous steep terrain with a relatively small human population, resulting in minimal artificial nighttime lighting in the area. The NLCZ contains very little nighttime lighting currently, unfortunately there are no county ordinances or other mechanisms to support or require the continued existence of an NLCZ into the future. The strategy also calls for generally minimizing the effects from artificial nighttime lights and power lines.

In addition to this isolated area there is a need to generally address light attraction. Many sources of lights have already been modified to minimize attraction of fledging Newell's shearwaters, but a standard island-wide study is needed at regular intervals to identify new locations of concern for light attraction and those that might be out of compliance. A study is also needed to test the various types of LED bulbs available against the existing low pressure sodium bulbs to assess which is most suitable for seabirds. The results of this study should be used to determine which lighting configuration has the least impact on Newell's shearwaters and inform future recommendations on retrofitting lights, targeting the highest impact lights first. In the interim, problematic lights should be removed, turned off during the fledging season,

reduced in intensity, or fitted with shields to direct the light toward the ground to minimize impacts.

Population viability modeling efforts conducted by the Service defined Newell's shearwater adult survivorship at 0.92, based on a boxplot assessment and linear regression of adult survivorship data from proxy Procellariformes (USFWS 2017a). Because the Newell's reproductive strategy has evolved to have a high adult survivorship, adult mortality is particularly harmful to the population. Left unchecked low adult survivorship (or conversely high adult mortality) will serve to depress the colony population to unsustainable numbers thereby increasing the vulnerability of these populations to invasive predators and other stochastic events (e.g., hurricanes damaging breeding habitat or climate shifts altering food availability).

The survival and recovery needs of the Newell's shearwater are described in the succeeding paragraphs based on components from the recovery plan and landscape strategy documents highlighted above, as well as the best currently available scientific information. The survival condition of the Newell's shearwater is represented by the biological factors necessary for a persistent population. The survival condition of the Newell's shearwater will need to include over a generation time (i.e., 7-8 years), an annual and stable breeding probability of 0.80 and consistently high reproductive success levels of at least 0.85 fledglings per breeding pair, per season. In order to achieve these biological factors, immediate actions need to be taken to protect occupied breeding habitat from invasive predators by constructing predator-exclusion fences and concurrently increasing predator removal efforts around the two extant and accessible breeding colonies on Kaua'i (Upper Limahuli and within Hono o Na Pali). Once a predator exclusion fence is constructed and predators are eliminated within the fence, management efforts should incorporate social attraction techniques using acoustic and visual/olfactory cues (Buxton and Jones 2012) to lure prospecting non-breeders and sub-adults into the protected breeding habitat. Current telemetry data shows that the Hono o Na Pali and Upper Limahuli colonies are minimally affected by power line collisions and artificial nighttime lighting based on actual flight paths (n = 9) to and from foraging areas and breeding habitat (Raine *et al*. 2016e, p. 24). The main land-based threats to the Hono o Na Pali and Upper Limahuli colonies are introduced predators and invasive vegetation.

Maintaining the ecological life-support systems (i.e., habitat requirements) for the two largest Newell's shearwater breeding colonies is critical to the long-term survival of the species. Management of breeding habitat within predator exclusion fences should include invasive vegetation control during the non-breeding season to support a native understory and canopy and biosecurity measures to prevent introductions of invasive flora and fauna. The size of the predator exclusion fences in montane forested habitat will be dictated to some extent by the terrain, however, each exclusion fence should contain the extant colony, anticipate and minimize erosion, and be large enough ($\geq$ 10 hectares) to encompass enough breeding habitat to sustain at least 1,500 active breeding pairs and small enough to be adequately maintained in perpetuity.

Given these habitat requirements, the minimum "range-restricted" population necessary to retain the species potential for recovery is 3,000 breeding pairs (two colonies with 1,500 pairs each).

Survival of the Newell's shearwater cannot be predicated solely on the existence of two neighboring breeding colonies on a single island. The survival needs of the Newell's shearwater include reducing adult mortality occurring range wide due to the attraction to artificial lights and collisions with power lines. The data gathered from Travers *et al*. (2014) and Travers *et al*. (2015) have vastly improved our knowledge of the scope of the impact of power line collisions and have identified the power line segments, of those surveyed, that have the greatest impact on seabirds. Lines along Power Line Trail in the north central region of the island were responsible for 75 percent of the documented strikes in 2014 (Travers *et al*. 2015). This stretch of lines should be prioritized to be buried, lowered in height, modified such that the top lines are removed, re-directed after appropriate studies to assess minimization effectiveness, or made visible in some manner (e.g., through the use of lasers or bird diverters, both of which are being tested by KESRP). As additional stretches of lines are monitored each year, other high-impact zones will be identified and appropriate avoidance or minimization methods should be implemented. Reducing the impact of power lines is critically important to ensuring the continued existence of Newell's shearwater on Kaua'i.

The SOS program is designed to reduce mortality of fledglings and adults that have been grounded (i.e., unable to regain flight) due to the attraction to artificial lights or collisions with power lines. The continuation of the SOS program is a clear step to reduce adult mortality.

In summary, the recovery condition of the Newell's shearwater is the survival condition plus specific measures to adequately address the specific threats contributing to the species range-wide endangerment. Specific measures needed to achieve a recovery condition include the elimination or minimization of all three high collision-risk power lines (the Power Line Trail, Kilauea, and the Central Region segments) on the island of Kaua'i. The recovery condition will need to include the creation or active management of at least two additional healthy shearwater colonies on Kaua'i and two healthy shearwater colonies on Maui. For example, the two additional colonies on Kaua'i could be any of those identified by Young and VanderWerf (2014), or other colonies located independently by KESRP. For the purposes of this Biological Opinion, a healthy Newell's shearwater breeding colony is defined as containing a: (1) minimum of 1,500 breeding pairs or active burrows, based on long-term monitoring data on the Manx shearwater (Fraser et al. 2013; Brooke 1990; BirdLife International 2016); (2) suitable breeding habitat, including predator-free or low levels of predator presence adequate to sustain in perpetuity a minimum of 1,500 breeding pairs; (3) flyway corridors to and from the colony where there are none or minimal artificial lighting and power line threats; and (4) a colony population growth rate, λ equal to or greater than one, sustained over at least a generation. Protecting and augmenting any existing Newell's shearwater colonies on Maui will ensure genetic representation and redundancy, allowing the Newell's shearwater to maintain an adaptability and evolutionary capacity over time.

Status of the Hawaiian Petrel

Listing Status, Taxonomy, and Species Description

The Hawaiian petrel was listed as an endangered subspecies (Hawaiian dark-rumped petrel, *Pterodroma phaeopygia sandwichensis*) in 1967 (32 FR 4001; March 11, 1967), but was changed to full species status in 2010 (75 FR 9282; March 1, 2010). The *Hawaiian Dark-rumped Petrel and Newell's Manx Shearwater Recovery Plan* was published in 1983 (USFWS 1983). Species five-year reviews were completed in 2011 and 2017. Each review recommended no change to the listing status of the Hawaiian petrel. The *Amendment to the Hawaiian Dark-rumped Petrel and Newell's Manx Shearwater Recovery Plan* was published in 2019. This plan includes revisions of the recovery criteria for the species (i.e. support representation by ensuring ecological, morphological, behavioral, and genetic diversity of the species throughout its range; resiliency through stable or increasing populations; and redundancy by recommending distribution throughout the historical range). These recovery criteria were amended to include objective and measurable criteria based on the best available data. Critical habitat has not been designated for the Hawaiian petrel.

The Hawaiian petrel is a medium-sized seabird in the family Procellariidae (shearwaters, petrels, and fulmars). The Hawaiian petrel is approximately 16 inches long (40 cm) and has a wingspan of about three feet (90 cm). It has a dark gray head, wings, and tail, and a white forehead and belly. The Hawaiian petrel has a stout grayish-black bill that is hooked at the tip, and feet that are pink and black. The Hawaiian petrel and Galapagos petrel (*Pterodroma phaeopygia*; formerly referred to as *Pterodroma phaeopygia phaeopygia*) were commonly known as two subspecies of the dark-rumped petrel (*Pterodroma phaeopygia*) (USFWS 1983, p. 1). The Hawaiian petrel was reclassified as a full species in 1993 because of differences in morphology and vocalization (Sibley and Monroe 1993). In 1997, the evolutionary split was confirmed by genetic analyses (Browne et al 1997). The Hawaiian and Galapagos petrels are also geographically separated, and do not share at-sea foraging areas (Spear et al. 1995, p. 633; Adams et al. 2009). The Service published the change to full species status in 2010 as described above.

Life History

Hawaiian petrels are a K-selected species with a reproductive strategy most suited to a stable environment (Stearns 1977). Hawaiian petrels have a long lifespan (up to 35 years), do not reproduce until six years of age, lay one egg per year, and require significant parental investment for offspring (Simons and Hodges 1998). Hawaiian petrel offspring require up to five months of care from both parents in order to survive. Hawaiian petrels exhibit strong natal philopatry, with breeding pairs returning to the same burrow to breed each year (Bried et al 2003). Hawaiian petrels are exclusively pelagic, spending much of their time at sea resting or foraging for squid, small fish, and crustaceans (Simons 1985). All transit over land occurs in darkness, with a peak overland passage during the year coinciding with the late incubation and chick rearing stages (Travers et al 2015). Fledglings leaving the nest for the first time exhibit strong phototropic behavior and rely on ambient light from the moon and stars to navigate to open ocean (Telfer et al. 1987, p. 410).

Beginning in mid-February to early-March, after a winter absence from Hawaiʻi, breeding and non-breeding birds visit their nests regularly at night. After a period of social activity and burrow maintenance they return to sea. In late April, they return to the breeding colony site and egg laying commences. From mid-March to mid-April, birds visit their burrows briefly at night on several occasions. Then breeding birds return to sea until late April or early May, when they return to lay and incubate their eggs (Simons 1985). Non-breeding birds visit the colony from February until late July (Simons and Hodges 1998). Information provided by Bailey and Duvall (both 2010, pers comm), confirmed Fein's analysis of burrow camera data for the site (Fein 2009, pers comm) indicating birds intermittently occupy their burrows during the day during this period as well. Many non-breeders are young birds seeking mates and prospecting for nest sites, but some proportion is thought to be mature adults that will not breed.

The mean date of egg laying recorded on Haleakala in 1980 and 1981 was May 8 (Simons 1985). The percentage of years in which adult females laid eggs was estimated to be 89 percent (Simons 1985). Fecundity (fledglings produced per egg laid) appears to be primarily dependent on rate of predation. Moderate predation is likely to depress fecundity to 0.49 (Simons 1985). Although Hawaiian petrel nests may fail when they abandon and crush eggs during incubation, higher fecundity (0.72) occurs when predators are absent (Simons 1984). Annual survival for juveniles at sea is 0.834 (Simons 1984). Peak fledging, when young seabirds make their first flight to sea, occurs between September 1 and December 1 (Penniman 2012, pers comm).

Cooper and Day (1998) found that Hawaiian petrels flew inland to their nesting areas primarily between sunset and the point of complete darkness. Movement rates increased rapidly until they peaked just after the point of complete darkness had been crossed and movement continued at a decreasing rate until sunrise (Cooper and Day 1998). In the morning hours, Hawaiian petrels move to sea while it is completely dark, starting one hour prior to sunrise.

Historic and Current Distribution

The Hawaiian petrel was once abundant on all southern islands of the Hawaiian Archipelago including Hawaiʻi, Maui, Lānaʻi, Kahoʻolawe, Molokaʻi, Oʻahu, and Kauaʻi (USFWS 1983, p. 3; Ainley et al. 1997b, p. 24; KIRC 2015, p. 19). Today breeding colonies are found only in remote or high elevation areas on the islands of Hawaiʻi, Maui, Lānaʻi, and Kauaʻi. Radar studies conducted in 2002 also suggest that breeding may occur on Molokaʻi (SWCA 2019) and recent evidence for the species' presence on Oʻahu has also been documented (Young et al 2019). The known breeding habitat varies by location: on East Maui (Haleakalā) and Hawaiʻi Island (Mauna Loa), petrels breed in subalpine habitat at high elevation, while on Kauaʻi and Lānaʻi they breed in lowland wet or in wet cliff habitat with dense ferns (VanZandt *et al*. 2014). Hawaiian petrels are colonial and nest in burrows in the ground, crevices in lava, or under ferns. Burrows detected on Haleakala occur almost exclusively on lava substrates; burrows are located within existing crevasses or excavated in softer material adjacent to rock to boulder-sized lava fragments. Their burrows are generally 3- to 6-feet long (from entrance to nest chamber), although some may be as long as 30 feet (Simons and Hodges 1998).

The current distribution of the Hawaiian petrel is believed to be an artifact of range contraction resulting from predation and habitat destruction rather than preference (Hu *et al*. 2001). Hawaiian petrel breeding colonies are known to exist at five locations on four different islands, although fragmented Hawaiian petrel breeding occurrences (<10 burrows) have been reported in other areas (Simons and Hodges 1998; Spencer 2010). Radar studies conducted in 2002 also suggest that breeding may occur on Moloka‘i (SWCA 2019) and recent evidence for the species' presence on O‘ahu has also been documented (Young et al 2019).

Ainley et al. (1997b) and Spear et al. (1995) previously estimated a total 19,000 birds, including juveniles and subadults, on Kaua‘i. Croxall et al. (2012) estimated a global population of the Hawaiian petrel to be 9,000 to 16,000 mature individuals. Average breeding probability for Procellariformes is estimated at 0.82 (Griesemer and Holmes 2011, p. 17). Pelagic surveys developed by Joyce (2013) using data collected between 1998 and 2011 (Joyce pers. comm. as cited in Vorsino 2020) projected a 2006 estimate of the Hawaiian petrel population to be 52,186 birds, with the caveat that this estimate represented the global minimum for that sampling period (Vorsino 2020). The Hawai‘i Seabird Hui estimated that approximately 33 percent of the main Hawaiian islands population of the species resides on Kaua‘i (17,221 individuals) (Andre Raine pers. comm. as cited in Vorsino 2020). Vorsino (2020) estimated the Kaua‘i population to be comprised of 10,970 adults, 2,885 fledglings, and 3,366 juveniles.

Colonial breeding populations of long-lived seabird species rely on a high rate of adult survivorship. Simons (1984, p. 1067) estimated Hawaiian petrel adult survivorship to be 0.93 in the absence of predation and dropped to 0.80 or lower in years of high predation events.

Most of the Hawaiian petrel global population breeds on the island of Maui within Haleakalā National Park, a location that has had the longest consistent and intensive predator control in place since the 1970s. At Haleakalā National Park, 2,505 nests are known to occur, which is an increase from 700 known nests documented by Simons (1984). The primary reason for the relatively large numbers of petrels and their successful breeding around Haleakalā summit today is the fencing and intensive predator control maintained by Haleakalā National Park since about 1982. Predator control in key habitat areas, the establishment of bird salvage-aid stations, and light attraction studies have been initiated to help conserve the Hawaiian petrel.

The Hawaiian petrel population residing on the island of Kaua‘i is estimated at 1,200 to 1,600 pairs (Ainley et al. 1997b, Pyle and Pyle 2009). On Kaua‘i, while fledgling success in the last few years has improved, the overall population has declined 78 percent since 1993 (Raine et al 2017d). The KESRP monitored 177 burrows in 2017 and 138 burrows were confirmed breeding. At least 116 Hawaiian petrel chicks fledged in 2017 (Raine et al. 2018).

No breeding colonies are known to occur on O‘ahu, however, a study by Young and VanderWerf (2016) detected the presence of Hawaiian petrels on the windward slope of Mt. Ka‘ala at 3,600 feet elevation. Additionally, a total of two dead Hawaiian petrels were found at the Kawailoa

Wind Facility project area (one found on July 21, 2017, and the second bird was found on August 20, 2018) (Tetra Tech 2018).

Monitoring efforts on Lānaʻi using song meters, auditory, and visual observation have noted high densities of birds (Raine et al. 2020). Efforts to monitor burrows in 2017 resulted in very low fledging success, due primarily to predation by cats and black rats (Raine et al. 2020). However, the number of burrows and fledging success has increased significantly over the last three years following installation of landscape level predator control for cats and rats (Raine et al. 2020).

Threats

The primary threat to the Hawaiian petrel includes predation by introduced predators (Hodges and Nagata 2001; Raine and Banfield 2015a, 2015b); particularly cats, rats, mongoose, feral pigs, and barn owls. Additional threats include collisions with power lines and other structures (Cooper and Day 1998; Podolsky et al. 1998; Simons and Hodges 1998); light attraction, although at a lower rate than Newell's shearwaters (Reed et al 1985; Cooper and Day 1998); and changes to breeding habitat due to introduced invasive plants (Troy et al 2014). Other studies suggest another threat to seabirds is climate change and its affects to both seabird adult survivorship and recruitment (Sandvik *et al*. 2012) by generally affecting food availability (Oro 2014). However, other anthropogenic impacts such as oil-spills and interactions with fisheries, as well as previously described land-based threats may confound the association between climate and seabird demography.

Survival and Recovery Needs

State and Federal partners finalized a 5-year Action Plan for Newell's shearwaters, Hawaiian petrels, and band-rumped storm-petrels (Holmes et al. 2015) that identifies specific actions to "protect and enhance existing colonies, reestablish extirpated colonies, create new colonies in suitable areas, and mitigate new and existing threats."

The recovery goals, as described in the *Amendment to the Hawaiian Dark-rumped Petrel and Newell's Manx Shearwater Recovery Plan* was published in 2019, include: 1) protecting and enhancing existing colonies; 2) creating new colonies; 3) mitigating new and existing threats by a) implementing prioritized management actions, and b) undertaking research and outreach to support those actions. Actions identified to accomplish these goals for Hawaiian petrel include conducting surveys for existing colonies, controlling threats at the highest priority colonies, and minimizing and monitoring terrestrial threats away from the colonies (light attraction, power line collisions).

Status of the Band-Rumped Storm-Petrel

Listing Status, Taxonomy, and Species Description

The Hawaiʻi distinct population segment of the band-rumped storm-petrel was listed as endangered in 2016 (81 FR 67786). For a population to be listed under the Act as a distinct

vertebrate population segment, three elements are considered: (1) the discreteness of the population segment in relation to the remainder of the species to which it belongs; (2) the significance of the population segment to the species to which it belongs; and (3) the population segment's conservation status in relation to the Act's standards for listing (61 FR 4722). The Hawai'i population of the band-rumped storm-petrel may be distinct based on geographic and distributional isolation from other band-rumped storm-petrel populations elsewhere in the Pacific and Atlantic oceans. A population also can be considered "discrete" if it is delimited by international boundaries across which exist differences in management control of the species. The Hawaiian Islands population of the band-rumped storm-petrel is the only population within U.S. borders or under U.S. jurisdiction. Critical habitat has not been designated for the band-rumped storm-petrel. A recovery plan has not been drafted for the species, but is anticipated prior to 2022.

The band-rumped storm-petrel is a seabird in the family Hydrobatidae (order Procellariiformes) and a member of the Northern Hemisphere subfamily Hydrobatinae (Slotterback 2002, p. 2), with some taxonomic questions unresolved. Prior to 1900, this species had been described as an unnamed petrel in the genus *Thalassidroma* (Dole 1869, 1879 *in* Stejneger 1887, p. 78), as *Cymochorea cryptoleucura* (Ridgeway 1882, pp. 337– 338), and as *Oceanodroma cryptoleucura* (Stejneger 1887, p. 78). After Henshaw's 1902 publication, the Hawaiian population was known as *O. castro cryptoleucura*, the Hawaiian storm-petrel (Harrison *et al*. 1990, p. 47). Austin (1952, pp. 395-396) examined eleven museum skins from the Hawai'i population and studied the taxonomy of the band-rumped storm-petrel and concluded that, although the various populations exhibited minor size differences, these differences were not significant and the populations were best considered as belonging to a single species with no separable subspecies. Since then taxonomists have typically combined the Pacific populations (Galapagos Islands, Japan, and Hawai'i) of the band-rumped storm-petrel into a single taxon, and currently the American Ornithologist's Union (AOU) regards the species as monotypic with no recognized subspecies (Slotterback 2002). However, some authors designate *Oceanodroma castro* as referring solely to the Madeiran storm-petrel, breeding in the Azores Archipelago and which may belong to two distinct, albeit sympatric, populations with separate breeding seasons, as well as distinctive morphologies, vocalizations and moult cycles (Monteiro and Furness 1998; Bolton *et al*. 2008). As such, del Hoyo and Collar (2014) have re-classified the band-rumped storm petrel as *Hydrobates castro*, with breeding populations in the eastern Atlantic from the Berlengas Islands and the Azores (Portugal), down to Ascension Island and Saint Helena (St. Helena to UK), and in the Pacific Ocean off eastern Japan, on Kaua'i, Hawai'i (USA) and in the Galapagos Islands (Ecuador) (del Hoyo *et al*. 1992). Moreover, Pyle *et al*. (2016, p. 59) has reported regular sightings of the Leach's storm-petrel (*Hydrobates leucorhous*) and the band-rumped storm-petrel (*Hydrobates castro*) overlapping in range and plumage coloration around Hawaiian waters, further questioning the taxonomic status of the species. Recent genetic studies of historical and modern samples of the band-rumped storm-petrel (n=24) from the islands of Kaua'i, O'ahu, Maui and Hawai'i island found little differentiation between the Hawai'i and Kaua'i presumed breeding colonies (Antaky et al. 2020, pp. 9, 10). However, the Maui and O'ahu recovered individuals from these samples did not assign to either of the breeding colonies on Hawai'i

island or Kaua‘i, therefore, suggesting the presence of another distinct population in the region (Antaky et al. 2020, pp. 9-10).

The band-rumped storm-petrel is a small seabird about 8 inches long with a wingspan of about 19 in (47 cm), and about 2 ounces (50 grams) in weight. The tail is only slightly notched and may appear almost square. Plumage is an overall blackish-brown with a white band across the “rump” (above the tail). This species typically flies with a relatively shallow wing-beat, and glides on slightly bowed wings as a regular part of flight (Slotterback 2002, p. 2). Sexes are alike in size and appearance. Vocalizations at breeding colonies can be used to further distinguish this species from other Procellariiformes seabirds (Allan 1962, p. 279; James and Robertson 1985, pp. 391–392).

Historic and Current Distribution

The band-rumped storm-petrel probably was common on all of the main Hawaiian Islands prior to Polynesians arrival about 1,600 years ago (Berger 1972, pp. 25-26; Harrison *et al*. 1990, p. 47). As evidenced by abundant storm-petrel bones found in middens on the island of Hawai‘i (Harrison *et al*. 1990, p. 47) and in excavation sites on O‘ahu and Moloka‘i (Olson and James 1982b, p. 33), band-rumped storm-petrels once were numerous and nested in sufficiently accessible sites, including coastal areas, to be used as a source of food and possibly feathers (Harrison *et a1*. 1990, p. 48). They were also known from French Frigate Shoals in the Northwestern Hawaiian Islands (Henshaw 1902, p. 118).

In Hawaii, band-rumped storm-petrels are known to nest in remote cliff locations on Kaua‘i and Lehua Island, in steep open to vegetated cliffs, and in little vegetated, high-elevation lava fields on Hawaii Island (Wood et al. 2002, p. 17–18; VanderWerf et al. 2007, pp. 1, 5; Joyce and Holmes 2010, p. 3; Banko 2015 in litt.; Raine 2015, in litt.; Galase 2019). Vocalizations were heard in Haleakalā Crater on Maui in 1992 (Johnston 1992, in Wood et al. 2002, p. 2), on Lāna‘i (Penniman 2015, in litt.; Raine et al. 2020), and in Hawaii Volcanoes National Park (Orlando 2015, in litt.). Based on the scarcity of known breeding colonies in Hawaii and their remote, inaccessible locations today compared to prehistoric population levels and distribution, the band-rumped storm-petrel appears to be significantly reduced in numbers and range following human occupation of the Hawaiian Islands, likely as a result of predation by nonnative mammals and habitat loss.

Band-rumped storm-petrels are regularly observed in coastal waters around Kaua‘i, Ni‘ihau, and Hawai‘i Island (Harrison et al. 1990, p. 49; Holmes and Joyce 2009, 4 pp.), and in ‘‘rafts’’ (regular concentrations) of a few birds to as many as 100, possibly awaiting nightfall before coming ashore to breeding colonies. Kaua‘i likely has the largest population, with an estimated 221 nesting pairs in cliffs along the north shore of the island in 2002, and additional observations on the north and south side of the island in 2010 (Harrison et al. 1990, p. 49; Wood et al. 2002, pp. 2–3; Holmes and Joyce 2009, 4 pp.; Joyce and Holmes 2010, pp. 1–3).

Raine et al. (2017b) conducted auditory surveys, automated acoustic surveys and mist netting data to create a predictive distribution model based on key habitat variables. Based on these and previous survey data, breeding is occurring primarily in the steep, remote cliffs areas of the Nā Pali coast in the northwest region of the island, Waimea Canyon, Hanapēpē Valley, rocky cliff faces of the vegetated valleys of Wainiha and Lumahaʻi, and Lehua Islet (Wood et al. 2002; VanderWerf et al. 2007, p.1; Raine et al. 2017b). KESRP has captured multiple birds along the Na Pali coast and Waimea Canyon in recent years with brood patches, strongly suggesting multiple breeding colonies on Kauaʻi. Additionally, retrieval of downed fledglings on Kauaʻi in the fall further points to local nesting locations (VanderWerf et al. 2007, Holmes and Joyce 2009). Auditory surveys also conducted on the island of Lanai in Hauola Canyon, documented high call rates of the band-rumped storm-petrel, suggesting breeding is also currently occurring there (Raine et al. 2020). Birds are also known from Maui (Mitchell et al. 2005), Kahoʻolawe (Olson 1992, pp. 38, 112), and Hawaiʻi Island (Mitchell et al. 2005; Orlando 2015, in litt.). Galase (2019), p. 26, 27) documented the first confirmed breeding colony on the northern slope of Mauna Loa within the US Army's Pōhakuloa Training Area (PTA) on Hawaiʻi Island. The species likely once nested in coastal Maui, where the remains of a chick were found in 1999, and islands such as Niʻihau and Kaʻula, where surveys have not been conducted, likely have suitable nesting habitat and may harbor the species (Penniman 2015, in litt.). We do not have a current estimate of total numbers in Hawaii at this time.

Life History

The band-rumped storm-petrel is long-lived (15 to 20 years) and reaches breeding age in 3-7 years (Ainley 1984, Harrison 1990). The band-rumped storm-petrel breeding biology in Hawaiʻi is poorly known. Like most seabirds a single egg is laid per season. Breeding birds return to nest sites in late May and complete egg laying by mid-June, and incubate until the beginning of August (Raine et al. 2017b). The incubation period averages 42 days and fledging occurs 70 to 78 days after hatching (Harris 1969). Fledglings depart the nest site between October and late November, with peak fledging in October (Raine et al. 2017b).

Nesting sites are in burrows and in crevices, holes, and on protected ledges along cliff faces, where a single egg is laid (Allan 1962, p. 274–275; Harris 1969, pp. 104–105; Slotterback 2002, p. 11). Plant communities in the vicinities of possible nesting areas include shrubs and grasses, common herbs, randomly distributed tree species, and dry mesic cliff species (Wood et al. 2001a, Wood et al. 2001b). Raine et al. (2017b) predicts highest occurrence of breeding in areas with low rainfall, little to no vegetation and greater than 40-degree slopes.

When not at nesting sites, adults spend their time foraging on the open ocean for small fish, squid, and crustaceans. They have been observed feeding during the day, but it is likely that they also feed at night (KESRP 2017). During the non-breeding season, some birds apparently remain near their breeding islands, while others undertake long-distance movements of unknown extent. The band-rumped storm-petrel has been detected west of the Galapagos Islands during spring but not during autumn counts; >620 miles north of Hawaiian Islands during summer surveys; and

>990 miles south of Hawai‘i in the Phoenix Islands, as well as the entire distance from the Hawaiian Islands to Japan (Slotterback 2002, Mitchell et al. 2005).

Threats

Depredation by nonnative animals on nests and adults during the breeding season is the greatest threat to the Hawaiian population of the band-rumped storm-petrel. These predators include feral cats, barn owls, small Indian mongoose, black rats, Norway rats, and Polynesian rats (Scott et al. 1986, pp. 1, 363–364; Tomich 1986, pp. 37–45; Harrison et al. 1990, pp. 47–48; Slotterback 2002, p. 19; Raine 2015, in litt.). The band-rumped storm-petrel lacks effective predator defenses, and has a lengthy incubation and fledgling period, making adults, eggs, and young highly vulnerable to depredation by introduced vertebrates. Wood *et al*. (2002) observed introduced barn owls flying along basalt cliff faces where the band-rumped storm-petrels nest in Pōhakuao, Kaua‘i.

Another impact to the band-rumped storm-petrel results from the effects of artificial lights on fledgling young and, to a lesser degree, adults. Artificial lighting along roadways, resorts, ballparks, residences, and other developed areas both attracts and confuses night-flying band-rumped storm-petrel fledglings, resulting in fallout (Harrison *et al*. 1990) and collisions with buildings and other objects (Banko *et al*. 1991). Since 1979, a total of 40 band-rumped storm petrels have been processed by the SOS program (Anderson 2015, p. 4-13), where carcasses have been documented or live birds rehabilitated and released. The majority of these birds landed on cruise ships enroute and these ships subsequently docked at Nāwiliwili Harbor, Kaua‘i and submitted injured birds to the SOS for care (Anderson 2015, p. 4-13). In 2014, a record number of three band-rumped storm petrel individuals were processed by the SOS program. The first was a subadult After Hatch Year (AHY) bird picked up in September from Kapa‘a. The second band-rumped storm-petrel was a Hatch-Year (HY) bird attracted to the lights from a research boat offshore from the Nā Pali coast and was subsequently unable to regain flight. The third band-rumped storm-petrel was also a HY bird found at the Kaua‘i Sheraton Hotel in Kōloa, Kaua‘i in November 2014. All three band-rumped storm-petrel individuals were successfully released after rehabilitation by the SOS program.

The small numbers of these birds and their nesting areas on remote cliffs make population-level impacts difficult to document. However, the band-rumped storm-petrel has similar behavior, life history traits, and habitat needs to the other seabirds discussed above that have sustained major losses as a result of light attraction and collisions with lines or other objects (Banko et al. 1991, p. 651; Banko 2015, in litt.; Raine 2015, in litt.). Therefore, we conclude that these are threats to the band-rumped storm-petrel as well.

Erosion and landslides at nest sites caused by nonnative ungulates is a threat in some locations on the island of Kaua‘i (Raine 2015, in litt.). Nonnative plants outcompete native plants and can also affect nesting sites of the band-rumped storm-petrel by accelerating erosion, leading to landslides and rockfalls (Wood et al. 2002, pp. 7–19). The small population size and limited distribution of the band-rumped storm-petrel in Hawaii is a threat to this population (Soule´

1987, p. 8; Lande 1988, pp. 1455, 1458–1459; Harrison et al. 1990, p. 50; Furness 2003, p. 33). During the breeding season, a single hurricane or landslide caused by erosion could cause reproductive failure and kill a significant number of adult birds. Commercial fisheries and ocean pollution have negative impacts to seabirds, and also are likely to have negative impacts to the band-rumped storm petrel, although the information about the impacts of fisheries and plastics on storm-petrel species is limited.

Survival and Recovery Needs

Recovery goals have not been established for the band-rumped storm-petrel, but the Service's Regional Seabird Conservation Plan (USFWS 2005, p. 200) contains recommended actions for the species that include controlling predators in nesting areas, assessing status of the population, locating and describing nesting areas, identifying limiting factors and developing a recovery strategy. As described above, the efforts to recover and release downed seabirds through the SOS program are expected to support the survival and recovery needs of the species. Increased surveys for band-rumped storm-petrels throughout the Hawaiian Archipelago would serve to obtain needed population demographic information in order to effectively identify survival needs of the species. Based on the locations of known breeding sites along cliff faces of the shoreline and multiple occurrences of band-rump storm-petrels interacting with vessels at sea, additional recovery needs would include minimization of artificial nighttime lighting while vessels are at sea near band-rumped storm petrel breeding colonies.

Ongoing Conservation Actions for All of the Covered Species

The following conservation actions are currently being implemented to benefit the survival and recovery of the Covered Species:

- Hono O Nā Pali NAR occupies 1,448 hectares on the northwest coast and was designated in 1983 and expanded in 2009 to preserve native natural communities in the Hanalei and Waimea Districts, including the Hanakāpīʻai, Hanakoa, and Waiahuakua ahupuaʻa. The remote mountains and steep slopes in the Hono O Nā Pali NAR provide vital breeding sites for the Covered Species.
- Construction of an ungulate-proof fence in 2009; and subsequent ungulate removal in 2010, at the ULP, protects Newell's shearwaters and Hawaiian petrels. Currently, approximately 30 burrows at that site are monitored for breeding activity. Intensive predator control is also conducted there.
- A partnership and funding from the Service, Pacific Rim Conservation, the KESRP, American Bird Conservancy (ABC), National Fish and Wildlife Foundation (NFWF), DLNR and Kauaʻi Natural Area Reserves System staff (with funding from the KIUC), National Tropical Botanical Garden, and the David and Lucille Packard Foundation created the Nihoku Ecosystem Restoration Project. Completion of the 3-hectare predator exclusion fence occurred in 2014, at the Nihoku conservation unit within Kīlauea Point National Wildlife Refuge. Hawaiian petrel nestling translocations began in 2015, and the first Newell's shearwater nestling translocations began in 2016. Translocations will continue through the 2020 breeding season for each species with the goal of establishing a new Hawaiian petrel and Newell's shearwater breeding colony within a fully protected predator-free area on

Kaua‘i. Predator control efforts to benefit Newell’s shearwaters that began in June 2016 and expected to continue for the next 2-4 years, within a discrete area (≤ 1 hectare) in Hono o Nā Pali Natural Area Reserve, funded by the ABC.

- In 2014, the NFWF assisted the Service in funding the development and validation decision support tool to be used by conservation and ecosystem managers for planning, threat mitigation and strategic habitat prioritization to help define conservation efforts for the Newell’s shearwater and the Hawaiian petrel. This project will identify areas of conservation concern and will model the efficacy of threat management approaches to increase the long-term viability of the populations.
- In 2016, NFWF provided funds to the ABC through the end of the 2019 breeding season to support predator control work to protect the Covered Species at newly identified sites, Hanakāpī‘ai and Hanakoa, and to develop a “rapid response team” to target control efforts throughout the Hono O Nā Pali NAR on Kaua‘i during the seabird breeding season where hot spots of predator activity were identified.
- In 2018, NFWF provided funding to Pacific Rim Conservation (PRC) to identify, visit and assess the conservation fencing potential adjacent to three nesting locations of the Newell’s shearwater, and Hawaiian petrel on Kaua’i and provide implementation plans for these fences to serve both as social attraction sites, and hopefully capture active burrows within. The project identified preferred fencing alignment, and assess the feasibility, cost and benefits of various fencing strategies for the preferred fencing alignment and the initiation of necessary compliance in anticipation of building the fence.
- As part of the Kawailoa Wind HCP and the Kahuku HCP mitigation funds were provided to the KESRP to conduct auditory surveys Newell’s shearwater and Hawaiian petrel nesting colonies in 2013 and 2014. Both HCPs funded KESRP for barn owl predator control throughout the 2014 through 2017 breeding seasons.
- The Kawailoa Wind HCP Amendment will provide mitigation funds for predator control and burrow monitoring at the Hanakāpī‘ai and Hanakoa seabird colonies within the Hono O Nā Pali NAR in 2020. This is anticipated to increase survival and successful fledgling for the population of Hawaiian petrels within these colonies.
- A 5-year partnership (Honopū Seabird Conservation Initiative) supported with funding from the Department of Defense Readiness and Environmental Protection Integration program began in 2019 to establish an effective predator control program in Honopū Valley on Kaua‘i. The purpose of the initiative is to construct a 3 acre predator-proof fence, within a 214 acre ungulate fence, to eradicate and control predators, to restore native habitat, to use social attraction with the goal of establishing and protecting a new breeding colony of Newell’s shearwaters, Hawaiian petrels, and band-rumped storm-petrels within a fully protected predator-free area on Kaua‘i.
- Construction of two 1.8-hectare predator-exclusion fences (one each for Newell’s shearwater and Hawaiian petrels) in West Maui to protect unoccupied Newell’s shearwater breeding habitat. Upon completion of the fence in 2013, social attraction techniques including installation of artificial burrows, decoys, and auditory broadcasts calls have been implemented at the site, along with native vegetation restoration efforts. In June 2016, two prospecting Newell’s shearwater adults were recorded on remote cameras (Craig 2016, p. 28).

- Construction of 5.5 miles of cat-proof fencing to protect the Mauna Loa Hawaiian petrel colony within Hawai‘i Volcanoes National Park. Construction was initiated in 2013 and completed in 2016. The cat-proof fence protects 243 hectares of occupied Hawaiian petrel breeding habitat with approximately 50 active nests.
- Completion of an ungulate fence at Kahikinui, on the south flank of Haleakalā, in 2013. Although sparsely populated with Hawaiian petrels, monitoring indicates an increase in the number of birds utilizing the area due to ungulate removal and ongoing predator control (Penniman 2017, pers comm).
- Construction of ungulate exclusion fencing in 2017 to enclose 856 hectares at Haleakalā National Park within the new Nu‘u unit was added to the park in 2008.
- A large-scale predator control and monitoring project was initiated in 2016 on Lāna‘i by Pūlama Lāna‘i and the KESRP to protect four key colonies on the island – Hi‘i, East Hauola, North Hauola, and Kunoa ridge. Auditory surveys and roving song meter deployments have been on-going on the island over the last three years to get a contemporary distribution of the species within its core distribution. Predator control has involved the deployment of a large Good Nature rat trapping grid, tomahawk cat traps and targeted barn owl hunts within key areas on the Lāna‘ihale.
- Predator control efforts to benefit two new colonies of Hawaiian petrel (Hanakāpi‘ai and Hanakoa) began in June 2016 and are expected to continue for the next 2 to 4 years, within a discrete area in Hono O Nā Pali Natural Area Reserve, funded by the National Fish and Wildlife Foundation and American Bird Conservancy.
- Hawaiian petrel burrow monitoring and large scale predator control has been ongoing at three locations within Hono O Nā Pali Natural Area Reserve (Pihea, North Bog and Pōhākea) as part of the KIUC STHCP. This STHCP ended in 2016, and it is hoped that these actions will be incorporated into the LTHCP.
- State and Federal partners finalized a 5-year Action Plan for Newell’s shearwaters, Hawaiian petrels, and band-rumped storm-petrels in 2015, which identifies specific actions to “protect and enhance existing colonies, reestablish extirpated colonies, create new colonies in suitable areas, and mitigate new and existing threats.”
- Predator control and colony monitoring at the ungulate fenced, ungulate-free ULP.
- Continued testing of power line collisions minimization strategies, such as laser fences and bird diverters.

Recommendations for Future Actions for All Covered Species Conservation

The following actions are recommendations from the Service and partner seabird experts to support the survival and recovery of the species:

- Maintain support and oversight of the two 1.8-hectare Makamaka‘ole Seabird Predator-Proof Fences in West Maui, constructed by First Wind, Inc. and maintained by Kaheawa Wind Power LLC, specifically to create a new Newell’s shearwater and a Hawaiian petrel breeding colony within a predator-free area on Maui. Efforts at this site should be

focused on restoring native montane habitat, since this site was previously used for agricultural purposes.

- Conduct additional acoustic surveys within remote areas of Haleakalā National Park in southeast Maui, to identify the areas of Newell's breeding habitat and the relative colony population size.
- Construct a predator exclusion fence to fully enclose the entirety of ULP colony, followed by efforts to eradicate terrestrial predators and control barn owls.
- Construct a predator exclusion fence to protect the Pōhākea colony within Hono o Nā Pali NAR; followed by eradication of terrestrial predators within the fence, efforts to reduce barn owl predation, and social attraction techniques to expand the colony.
- Construct a predator exclusion fence along the ridgeline surrounding the Upper Manoa Valley colony, followed by eradication of terrestrial predators within the fence, efforts to reduce barn owl predation, and social attraction techniques to expand the colony.
- Construct a predator exclusion fence along the edge of the Kalalau Valley, followed by eradication of terrestrial predators within the fence, efforts to reduce barn owl predation, and social attraction techniques.
- Implement erosion control measures, best management practices (e.g., area closures) and native vegetation restoration to prevent damage to sensitive montane habitat, caused by continual access into seabird colonies.
- Reduce impacts of high collision rate power line segments at the Power Line Trail, the Waimea Canyon, the Kīlauea area, and line segments within the Central region including Līhu‘e to Kilohana Crater to Power Line Trail.
- Maintain consistent, intensive predator control within and surrounding the Mauna Loa Hawaiian petrel colony.
- Conduct strategic and low impact surveys for occupied Hawaiian petrel breeding habitat within the extensive Nu‘u unit of Haleakalā National Park in conjunction with ungulate fence construction, in order to prioritize predator control efforts in this area.
- Construct a predator exclusion fence to protect the largest extant Hawaiian petrel colony at Hono o Nā Pali, Kaua‘i while limiting the impact and restoring where possible the montane wet ecosystem of this area.
- Conduct predator control at the Lāna‘ihale Hawaiian petrel colony, in conjunction with and prior to any additional ground surveys in order to limit vegetation trampling and predator ingress.
- Conduct colony monitoring once the Mauna Loa Hawaiian petrel fence is complete and colony monitoring at the Haleakalā colony to obtain updated population demographic information and life history parameters.
- Controlling introduced avian and mammalian predators in the current core areas of the band-rumpled storm-petrel's breeding distribution (e.g. eradication of rats from Lehua Islet in tandem with ongoing efforts to control barn owls on the islet). Adding artificial nest burrows may to help increase breeding success in certain areas, such as Lehua Islet, by increasing available breeding habitat (as has been shown with other *Ocenodroma* species, e.g., McIver et al. 2016).

ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated and/or ongoing impacts of all proposed federal projects in the action area that have undergone Section 7 consultation, and the impacts of state and private actions which are contemporaneous with the consultation in progress.

Current Condition of the Species in the Action Area

The action area is the entire island of Kaua‘i, which includes all areas affected by light attraction and the mitigation site at the Kahuama‘a Seabird Preserve. The island of Kaua‘i is the northernmost and oldest of the eight Main Hawaiian Islands. Measuring 549 square miles, Kaua‘i is roughly circular in shape, running 32 miles east-to-west and 22 miles north-to-south. The island of Kaua‘i is characterized by steep cliffs and deeply eroded canyons and valleys. The north and east coasts receive wind and moisture carried on the trade winds and support lush vegetation, streams, and waterfalls, while the south and west coasts receive minimal moisture and are typically hot and arid. The island supports unique natural plant and animal communities from montane bogs, montane wet forest, lowland mesic forest, lava tube caves, long stretches of sandy beach, and many streams and rivers. Because of the age of the island and its relative isolation, Kaua‘i contains higher levels of species endemism than elsewhere in the State (Mitchell et al. 2005).

The ridges and slopes along the northwestern coast of Kaua‘i were identified by KESRP as displaying the highest levels of breeding activity of the Newell’s shearwater and Hawaiian petrel. KESRP conducted auditory surveys and identified the ridges and slopes along the northwest coast of Kaua‘i as displaying the highest levels of Newell’s shearwater and Hawaiian petrel breeding activity. These areas are known as ‘polygons’ or ‘calling hotspots’ (Figure 4) (Banfield et al. 2013, Raine et al. 2017f, d, g, e). These surveys helped to determine suitable areas on the Kalalau Valley area for a preserve with high levels of activity of the Covered Species, relatively easy locations to access, and land belonging to the State (see KSHCP Appendix A). The habitat in the area is already of high quality for the Covered Species and management actions at the Kahuama‘a Seabird Preserve and the Kalalau rim and Valley will optimize this habitat. The area is known to be relatively free of artificial light at the mitigation site as well as the flyway to and from the ocean. This remote northwestern region of the island has the greatest number of occurrences of the Covered Species and is far away from areas with the highest light intensities (Figures 4 and 5, Troy et al. 2011; KESRP, see KSHCP Appendix A).

The Covered Species do not nest at any Applicant facilities; however, they fly through the area when navigating from their high elevation nesting areas to foraging areas in the sea. While flying through the area they are attracted to artificial light. Artificial light attracts adults, sub-adults, and fledglings and they will circle light sources until exhausted and fall to the ground.

Considerably fewer Hawaiian petrel, and even less band-rumped storm-petrel, are grounded by light attraction than Newell’s shearwater according to recent SOS program recovery records

(DLNR 2016). Of the total SOS recoveries of the Covered Seabirds in the years 2011 to 2015 (n=853, including fledglings, adults, and sub-adults), 94% (n=805) were Newell's shearwater, 5% were the Hawaiian petrel (n=43), and 0.6% were the band-rumped storm-petrel (n=5).

The majority of the seabirds grounded as a result of light attraction on the island of Kaua'i are fledglings. Adults and sub-adults are occasionally found in association with bright lights, usually near breeding colonies (e.g. northern region of the island of Kaua'i). SOS recoveries indicate a higher percentage of grounded birds are adults for Hawaiian petrel and band-rumped storm-petrel (~20% adults) than for Newell's shearwater (~5% adults). Less is known of the likelihood of adult take of petrels occurring.

The background information described above on island-wide SOS recoveries, pertaining to the species composition, the percentage of seabirds deemed to be in good condition and released, and the likelihood of adult take per species, is not necessarily reflective of the fallout records of prospective Applicants. However, fallout of the Covered Species on sites managed by the applicants, in the absence of the minimization and mitigation in the HCP, is expected to be stable, consistent with the recent, island-wide fallout trend. Fallout estimates assume continuation of ongoing lighting modifications may reduce impacts to seabirds, but do not completely eliminate lighting threats.

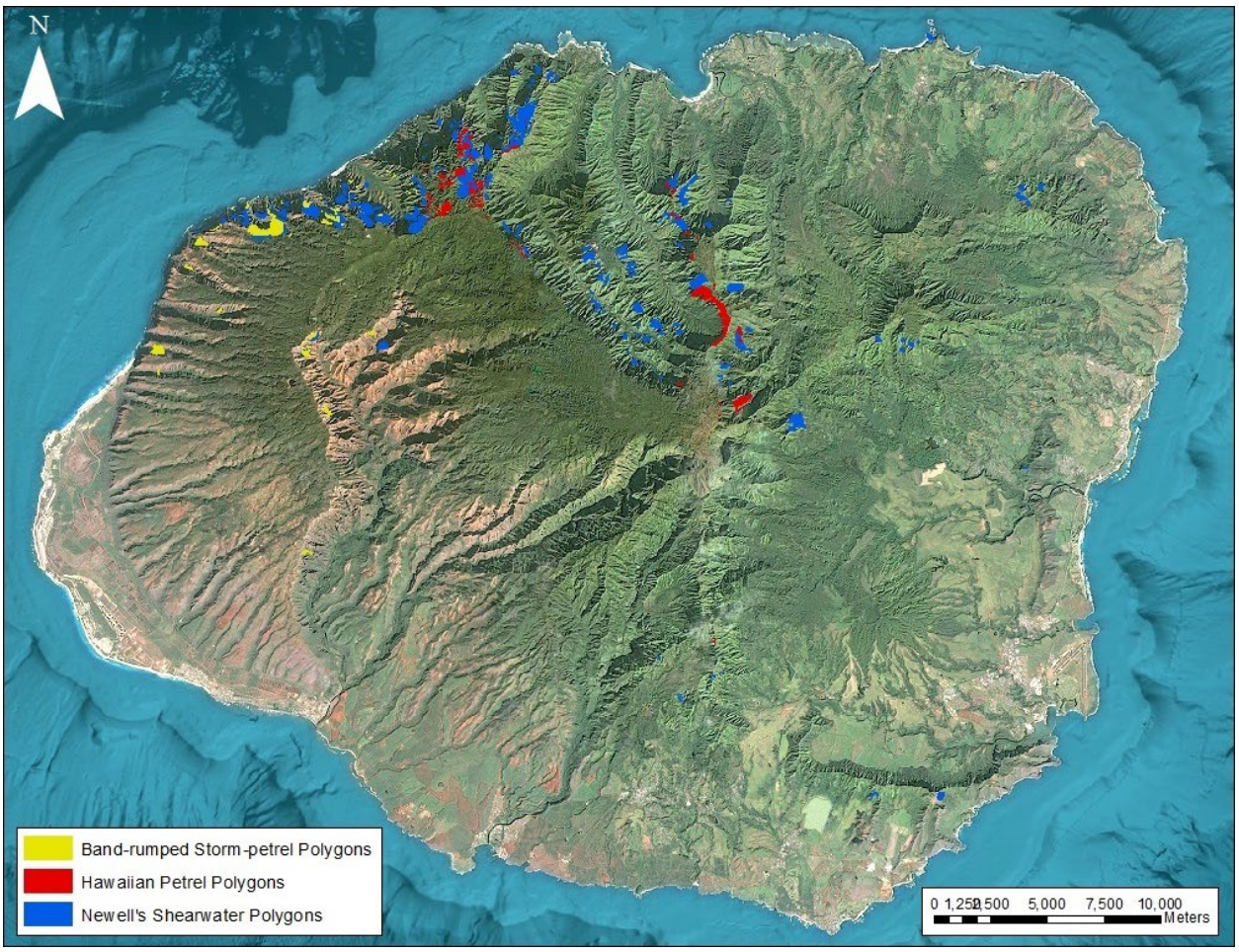

Figure 4. Map of 'Calling Hotspots' on Kaua'i (KESRP, see KSHCP Appendix A).

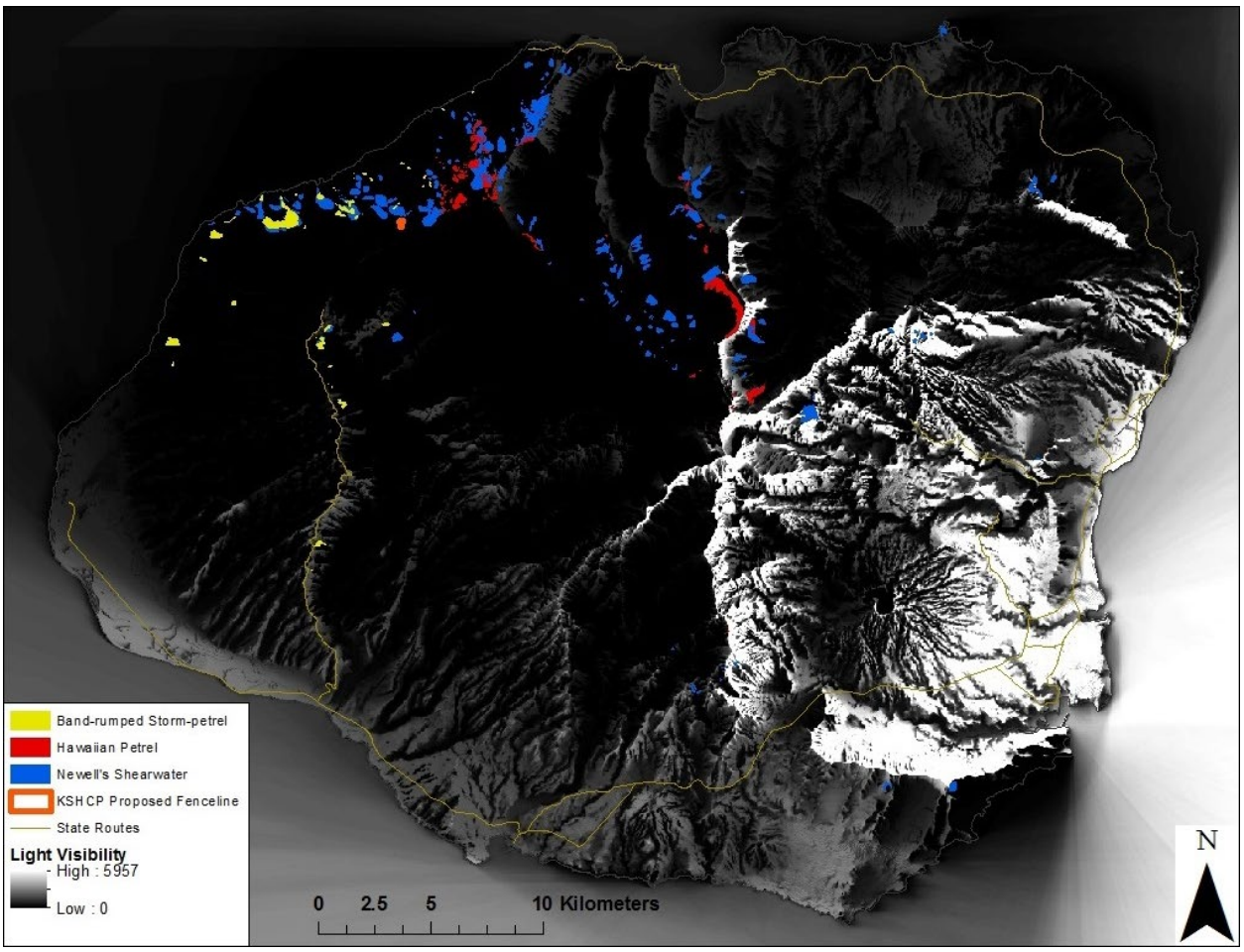

Figure 5. Light pollution measured via satellite overlaid with locations of active and inactive Covered Species' colonies (see KSHCP Appendix A: Source of light information: Troy et al. 2011; Source for colony locations: KESRP).

Within the action area other threats to the Covered Species include depredation by introduced predators; particularly cats, rats, feral pigs, and barn owls; collisions with power lines; and changes to breeding habitat due to introduced invasive plants as discussed above in the Status of the Species.

Conservation Role of the Action Area

While some knowledge gaps remain concerning its distribution, the Newell's shearwater has experienced a significant breeding range contraction and currently, an estimated 90 percent of the population of Newell's shearwaters occurs on Kaua'i, with small colonies also occurring on Hawai'i Island, Maui, and possibly O'ahu (Ainley et al. 2019; USFWS unpublished; and Young and VanderWerf 2016). Documented breeding colonies currently exist on Kaua'i and Maui. Therefore, the action area will play a particularly important role in the recovery of the species.

Most of the Hawaiian petrel global population breeds on the island of Maui within Haleakalā National Park, where 2,505 nests are known to occur. On Kaua‘i, while fledgling success in the last few years has improved, the overall population has declined 78 percent since 1993 (Raine et al. 2017d). The KESRP monitored 177 burrows in 2017 and 138 burrows were confirmed breeding. At least 116 Hawaiian petrel chicks fledged in 2017 (Raine et al. 2018).

In Hawai‘i, band-rumped storm-petrels are known to nest in remote cliff locations on Kaua‘i and Lehua Island, in steep open to vegetated cliffs, and in little vegetated, high-elevation lava fields on Hawai‘i Island (Wood et al. 2002, p. 17–18; VanderWerf et al. 2007, pp. 1, 5; Joyce and Holmes 2010, p. 3; Banko 2015 in litt.; Raine 2015, in litt.; Galase 2019).

Previous consulted-upon actions on the Action Area include the actions involving artificial nighttime lighting, powerlines, and communication towers affecting one or more of the Covered Seabirds:

Project	**Federal Entity**	**Covered Seabird Take**	**Duration**	**Mitigation to Offset Take?**
Pacific Missile Range Facility (PMRF) Base-wide Operations	Navy	Newell's shearwater -3 juveniles per year; Hawaiian petrel -1 juvenile every 10 years; Band-rumped storm-petrel -2 juveniles every 10 years	2014-2015	No
Kōke‘e Air Force Station	Air Force	Newell' shearwater -2 adults/juveniles, 1 egg/chick per year; Hawaiian petrel -1 adult/juvenile, 1 egg/chick per year; Band-rumped storm-petrel -1 adult/juvenile, 1 egg/chick every 10 years	2017-foreseeable future	Yes-barn owl control in seabird colonies
Kalepa Comm. Tower	Coast Guard	Newell's shearwater -4 adults, 2 eggs/chicks; Hawaiian petrel -2 adults, 1 egg/chick	2013-2033	Yes- seabird colony mgmt.
Kalaheo Comm. Tower	FCC	Newell's shearwater -3 adults, 2 eggs/chicks; Hawaiian petrel -1 adult, 1 egg/chick	2013-2033	Yes-seabird colony mgmt.
PMRF Base-wide Reinitiation for effects on Newell's Shearwater	Navy	Newell's shearwater -total maximum of 63 fledglings, 450 adults, 63 chicks or eggs over 50 years	2018-2068	Yes-seabird colony mgmt.

Other management of seabird colonies -
Management actions to benefit the species that have occurred in the last five years in addition to actions related to HCPs and ongoing Federal actions include:

- Hono O Nā Pali NAR occupies 1,448 hectares on the northwest coast and was designated in 1983 and expanded in 2009 to preserve native natural communities in the Hanalei and Waimea Districts, including the Hanakāpīʻai, Hanakoa, and Waiahuakua ahupuaʻa. The remote mountains and steep slopes in the Hono O Nā Pali NAR provide vital breeding sites for the Covered Species.
- A partnership and funding from the Service, Pacific Rim Conservation, the KESRP, ABC, NFWF, DLNR-DOFAW and Kauaʻi Natural Area Reserves System staff (with funding from KUIC), National Tropical Botanical Garden, and the David and Lucille Packard Foundation created the Nihoku Ecosystem Restoration Project. Completion of the 3-hectare predator exclusion fence occurred in 2014, at the Nihoku conservation unit within Kīlauea Point National Wildlife Refuge. Hawaiian petrel nestling translocations began in 2015, and the first Newell's shearwater nestling translocations began in 2016. Translocations will continue through the 2020 breeding season for each species with the goal of establishing a new Hawaiian petrel and Newell's shearwater breeding colony within a fully protected predator-free area on Kauaʻi.
- In 2014, the NFWF assisted the Service in funding the development and validation decision support tool to be used by conservation and ecosystem managers for planning, threat mitigation and strategic habitat prioritization to help define conservation efforts for Newell's shearwater and Hawaiian petrel. This project will identify areas of conservation concern and will model the efficacy of threat management approaches to increase the long-term viability of the populations.
- In 2016, NFWF provided funds to the ABC through the end of the 2019 breeding season to support predator control work to protect the Covered Species at newly identified sites, Hanakāpīʻai and Hanakoa, and to develop a "rapid response team" to target control efforts throughout the Hono O Nā Pali NAR on Kauaʻi during the seabird breeding season where hot spots of predator activity were identified.
- In 2018, NFWF provided funding to PRC to identify, visit and assess the conservation fencing potential adjacent to three nesting locations of Newell's shearwater, and Hawaiian petrel on Kaua'i and provide implementation plans for these fences to serve both as social attraction sites, and hopefully capture active burrows within. The project identified preferred fencing alignment, and assess the feasibility, cost and benefits of various fencing strategies for the preferred fencing alignment and the initiation of necessary compliance in anticipation of building the fence.
- As part of the Kawailoa Wind HCP and the Kahuku HCP mitigation funds were provided to the KESRP to conduct auditory surveys Newell's shearwater and Hawaiian petrel nesting colonies in 2013 and 2014. Both HCPs funded KESRP for barn owl predator control throughout the 2014 through 2017 breeding seasons.
- The Kawailoa Wind HCP Amendment will provide mitigation funds for predator control and burrow monitoring at the Hanakāpīʻai and Hanakoa seabird colonies within the Hono

O Nā Pali NAR in 2020. This is anticipated to increase survival and successful fledgling for the population of Hawaiian petrel within these colonies.

- A 5-year partnership (Honopū Seabird Conservation Initiative) supported with funding from the Department of Defense Readiness and Environmental Protection Integration (REPI) program began in 2019 to establish an effective predator control program in Honopū Valley on Kaua‘i. The purpose of the initiative is to construct a 3 acre predator-proof fence, within a 214 acre ungulate fence, to eradicate and control predators, to restore native habitat, to use social attraction with the goal of establishing and protecting a new breeding colony of Newell's shearwater, Hawaiian petrel, and band-rumped storm-petrel within a fully protected predator-free area on Kaua‘i.

Climate Change

Consistent with Service policy, our analyses under the ESA include consideration of ongoing and projected changes in climate. The term "climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2014a, pp. 119-120). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2014a, p. 119). Various types of changes in climate can have direct or indirect effects on species and critical habitats. These effects may be positive, neutral, or negative, and they may change over time. The nature of the effect depends on the species' life history, the magnitude and speed of climate change, and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2014b, pp. 64, 67-69, 94, 299). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change and its effects on species and their critical habitats. We focus in particular on how climate change affects the capability of species to successfully complete their life cycles, and the capability of critical habitats to support that outcome.

EFFECTS OF THE ACTION

The proposed action's stressors and benefits may include the following actions within the action area: (1) artificial lighting at facilities; (2) conservation measures at Applicant facilities; (3) conservation activities in Kalalau Valley; and (4) conservation activities at the Kahuama‘a Seabird Preserve.

Each stressor and benefit caused by the proposed action may have consequences to listed species. The consequences of the proposed action on the Newell's shearwater, Hawaiian petrel, and band-rumped storm-petrel are discussed below.

Consequences of the Proposed Action on the Newell's Shearwater, Hawaiian Petrel, and Band-rumped Storm-petrel

Artificial Lighting at Facilities

The proposed use of artificial lights during the Covered Species' breeding season (March 1 to January 1) at Applicant facilities is expected to have direct effects on the Covered Species. Applicant PIPs describe the maximum extent practicable minimization measures to decrease the amount of light that shines upward and the amount of light output or intensity. However, because we expect that this will not fully avoid impacts on the Covered Species at Applicant facilities, we anticipate this stressor is likely to affect adults or subadults, and or fledgling seabirds during the breeding season. Additionally, the loss of adults will result in the indirect loss of their eggs and chicks because they rely on provisioning from both parents in order to survive. Therefore, we also expect adverse effects to eggs or chicks at the nest due to the loss of an adult bird no longer incubating and provisioning care for the egg or chick.

Artificial lights affect the Covered Seabirds by degrading the transitory habitat for movement of fledglings in particular from the breeding colonies to the ocean. Fledgling seabirds may become confused or disoriented and suffer extreme fatigue when attracted to artificial lights. Seabirds affected by light attraction exhibit the following typical sequence of behaviors. Seabirds initially approach light sources from higher altitudes and exhibit a period of rapid flight and circling of lit areas. This is followed by descent and slowing of flight, and ultimately "fallout" by landing on the ground at locations where they normally would not have landed (Reed et al. 1985, Telfer et al. 1987) or colliding during flight with artificial structures such as wires, poles, or buildings (Ainley et al. 2001, Travers et al. 2016). Grounded seabirds can suffer injury, starvation, predation, or collision (e.g., with vehicles). Seabirds that collide in flight with artificial structures are commonly injured or killed.

The timing of take of fledgling Covered Seabirds is primarily during the period when they leave their natal colony (the fledging period) from September 15 - December 15 each year. Adult seabirds may also be attracted to lights while transiting to and from their nesting colony during species-specific nesting periods [Newell's shearwater: late March/early April through mid-November (Raine et al. 2017h); Hawaiian petrel: early-April to the end of December (Raine et al. 2017i); and the band-rumped storm-petrel: late-May through mid-October (Raine et al. 2017c)]. Higher levels of seabird fledgling take are expected during new moon periods than during full moon periods, likely because the moon is one of the visual clues seabirds use for first time navigation to the sea (Telfer et al. 1987).

It is anticipated that the annual take of Covered Seabirds will remain constant over the 30-year term of the KSHCP and its associated ITPs and ITLs, based on recent trends of SOS recoveries island-wide in Kaua'i (Newell's shearwater, years 2011-2015; Hawaiian petrel, 2000-2015). Over these years, SOS island-wide recoveries of the Newell's shearwater and the Hawaiian petrel have been stable (DLNR 2016), indicating a stable/consistent rate of threats to the current populations. It is important to note this stable annual downed rate of seabird recovery is at the

latter half of the total time period since first documentation of these threats occurred and after a ten-year period (1993-2013) when the populations of these two species were estimated to have declined by 94% and 78% respectively (average annual rate of approximately 13% and 6% respectively) (Raine et al. 2017d). One exception to the steady annual recovery rate during this period was a large fallout event in 2015 at the Kōkeʻe Air Force base near Newell's shearwater's breeding colonies. Significant modifications to the light regime have since been made to minimize fallout threats at the base (USAF 2016). This indicates that even though development on the island of Kauaʻi may have increased lighting levels during these respective periods of time, island-wide, the threat of fallout of the Newell's shearwater and the Hawaiian petrel have been stable.

Table 3 presents the estimated island-wide take (both lethal and non-lethal) associated with light attraction, calculated from average SOS recoveries (2011-2015) and using a 50% searcher efficiency rate to account for grounded birds present but not found (Ainley et al. 1995). The total amount of take potentially covered under the KSHCP will be less than the total island-wide light attraction effects to the Covered Seabirds. Of the total island-wide light attraction fallout of the Covered Seabirds, the following is expected to be covered and mitigated for directly by the current take requested by Applicants under the KSHCP: about 19% of Newell's shearwater take, 14% of Hawaiian petrel take, and 51% of band-rumped storm-petrel take. The following is expected to be covered and mitigated for directly by the maximum take of the KSHCP: about 24% of Newell's shearwater take, 29% of Hawaiian petrel take, and 105% of band-rumped storm-petrel take. Annual island-wide take estimates are presented in Table 6. Estimates of island-wide take and total amount addressed under the KSHCP do not include indirect effects to chicks or eggs.

Table 7 presents the lethal and non-lethal take of fledgling request by the Applicants and the maximum KSHCP over the permit term.

Table 6. Annual Island-wide take (lethal and non-lethal) estimates due to light attraction.

Newell's shearwater	Annual	30-year		**Hawaiian petrel**	Annual	30-year		**Band-rumped storm-petrel**	Annual	30-year
Total island-wide take estimate	322	9,660		Total island-wide take estimate	17	516		Total island-wide take estimate	2	60
Take Amount requested by Applicants	61.2	1,846		Take Amount requested by Applicants	2.3	67		Take Amount requested by Applicants	0.94	31
Total KSHCP Maximum Take	75.8	2,272		Total KSHCP Maximum Take	4.33	130		Total KSHCP Maximum Take	2.1	63

Table 7. Total (30-year) lethal and non-lethal take requested by the Applicants and maximum KSHCP take analyzed.

Species	Applicant Take: Mortality (Lethal)	KSHCP Maximum: Mortality (Lethal)	Applicant Take: (Non-Lethal)	KSHCP Maximum: Harm (Non-Lethal)
Newell's shearwater Fledgling	786	900	1060	1,350
Hawaiian petrel Fledglings	39	60	28	60
Band-rumped storm-petrel Fledglings	17	30	14	30

Conservation Measures at Applicant Facilities

Recovery and Release of Downed Seabirds

The proposed recovery and release of downed Covered Species at Applicant facilities are expected to reduce the mortality of adult, sub-adult, and fledgling seabirds that have been grounded due to artificial facility lights based on the results of the SOS program to date. We expect this to be an important benefit by increasing the survivability of downed adult, or sub-

adult, and fledgling birds, as well as their eggs and chicks. Implementation of conservation measures at applicant facilities includes the following measures:

Alexander & Baldwin:

- Port Allen Solar Farm: Properties with lights which are normally turned off and rarely or never used will not be searched. There are only two small full cutoff dark sky light fixtures on the control building. They are only illuminated in the case of a nighttime emergency requiring service in the control building. The site will, therefore, not be searched for downed birds.

- Port Allen Center I and II: Searches will be conducted as per KSHCP guidance. One-hundred percent of the total property will be searched twice daily (2-3 hours after sunset, and within 3 hours after sunrise). One to two searchers, depending on safety considerations, will conduct the searchers for Covered Species.

- Port Allen South Parcels: The Shoreline parcel is an empty lot and will not be searched as there are no lights associated with it. Searches will be conducted twice daily at the BEI parcel. Once searcher will conduct searches at the BEI parcel 2-3 hours after sunset, and within 3 hours after sunrise.

- Port Allen Parking Lots: Searches will be conducted as per KSHCP guidance. One-hundred percent of the total property will be searched twice daily (2-3 hours after sunset, and within 3 hours after sunrise). One searcher will conduct searches for the Covered Species.

- Port Allen Steel Warehouse: Searches will be conducted as per KSHCP guidance. Approximately 80 percent of the property will be searched. Due to high crime, one tenant maintains watchdogs within his fenced yard, rendering about 20 percent of the property inaccessible to searchers. One searcher will conduct searches twice daily (2-3 hours after sunset, and within 3 hours after sunrise).

- Port Allen Marina Center: Searches will be conducted as per KSHCP guidance. One-hundred percent of the total property will be searched twice daily (2-3 hours after sunset, and within 3 hours after sunrise). One searcher will conduct searches for the Covered Species.

- Pump 3 Hanapēpē Valley: Properties with lights which are normally turned off and rarely or never used, will not be searched.

- Kalāheo Powerhouse: Properties with lights which are normally turned off and rarely or never used, will not be searched.

- Wainiha Powerhouse: Properties with lights which are normally turned off and rarely or never used, will not be searched.

- Hokulei Shopping Village: Searches will be conducted as per KSHCP guidance. One-hundred percent of the total property will be searched a minimum of twice daily (2-3 hours after sunset, and within 3 hours after sunrise). One to three searchers will conduct searches for the Covered Species.

- The Shops at Kukui‘ula: Searches will be conducted as per KSHCP guidance. One-hundred percent of the total property will be searched a minimum of twice daily (2-3 hours after sunset, and within 3 hours after sunrise). One to three searchers will conduct searches for the Covered Species.

- Waipouli Town Center: Searches will be conducted as per KSHCP guidance. One-hundred percent of the total property will be searched a minimum of twice daily (2-3 hours after sunset, and within 3 hours after sunrise). One to three searchers will conduct searches for the Covered Species.

- Kukui‘ula Development - Plantation Core/The Club: Searches will be conducted as per KSHCP guidance. One-hundred percent of the total property will be searched a minimum of twice daily (2-3 hours after sunset, and within 3 hours after sunrise). One to three searchers will conduct searches for the Covered Species.

County of Kaua‘i:

- Since fulfilling the terms and conditions of probation, the County has continued to monitor its facilities by searching and reporting any grounded or downed seabirds (there have been none) at its facilities lighted with retrofitted lights. At Category 3 facilities, for example, during the fledgling season, Fire Department personnel walk a 10-foot perimeter around the fire stations to locate, record, and report any downed seabirds at the beginning of their shifts at around 7:00 am. The facility maintenance personnel with the Department of Public Works (now with the Department of Parks and Recreation) also conduct a search of the Līhu‘e Civic Center at the beginning of their shifts. In addition, during the 2017,2018, and 2019 Kaua‘i Interscholastic Federation football seasons when night games were held, the County coordinated with the State of Hawai‘i Department of Education, the Kaua‘i Endangered Seabird Recovery Program (KESRP), the DLNR, and the USFWS to monitor, record, and report any circling or downed seabirds.
- In Attachment I of the County of Kaua‘i PIP, the County has chosen a facility for each category as representative of that category and, using that representative facility, has illustrated the monitoring plan that the County will employ for each category. While the search route will vary slightly, the frequency, personnel, time required, dates, problem areas, and data to be collected are consistent by category.

- Aside from the incidental observations that designated personnel would make as they carry out their regular duties, the County does not anticipate undertaking any monitoring of facilities in Categories 1 and 2.
- The County's monitoring plans for Category 5 facilities call for monitoring similar to that conducted at select facilities in 2017, 2018, and 2019. Specifically, whenever lights are on at night at any County-operated Category 5 facility between September 15 and December 15, the County will coordinate with the KSHCP staff to ensure that the facility grounds are monitored by an appropriately sized group of persons trained by KSHCP staff or other agency-designated personnel. The monitoring will include: documentation of the number, species, timing, height and flight patterns of observed seabirds; the number and species of seabirds that appear to have been grounded or downed, as well as seabirds that appeared to be headed for grounding but were not found; and information on the condition of any recovered grounded or downed seabirds. In addition, before turning off the lights immediately following the nighttime use of facilities, the facility grounds will be searched for any grounded or downed Covered Species.
- The County will maintain detailed records of the monitoring results which will be provided to the agencies in its annual report in accordance with the terms of the ITP/ITL and KSHCP. The data will include the location, times, dates, and personnel (including volunteers utilized) involved in the monitoring; and the location, condition, identification, in situ photographs, and fate of each recovered Covered Species. Any grounded Covered Species encountered during such monitoring will be reported to the Service and DOFAW, and all retrieved Covered Species will be transferred to the SOS program in conformance with recommendations of that program.
- At Category 1 facilities (confirmed unlit facilities) there will be no searches conducted. New hire orientation training will be conducted.
- At Category 2 facilities (minimal lighting) there will be no searches conducted. New hire orientation will be conducted.
- At Category 3 facilities (limited external lighting):
- If a report is received during the fledgling season (September 15 – December 15), then searches will be conducted daily in an area up to 10 feet around the area where downing was reported.
- If a report is received during the non-fledgling season (December 16 – September 14), then searches will be conducted weekly in an area up to 10 feet around the area where downing was reported.
- If searches for Category 3 facilities is prompted, then 1 searcher will conduct a search in the a.m. prior to the start of employee shifts.
- New hire orientation and annual training will be conducted.
- At Category 4 facilities (substantial exterior area & court lighting):
- If a report is received during the fledgling season (September 15 – December 15), then searches will be conducted daily on the entire site.
- If a report is received during the non-fledgling season (December 16 – September 14), then searches will be conducted weekly on the entire site.

- If searches for Category 4 facilities is prompted, then 1 or 2 searcher(s) will conduct a search in the a.m. prior to the start of employee shifts.
- New hire orientation and annual training will be conducted.
- In Category 5 facilities (stadium & field lighting):
- If the facility is in use during the fledgling season (September 15 – December 15), then searches will be conducted daily on the entire site.
- If the facility is in use during the non-fledgling season (December 16 – September 14), then searches will be conducted weekly on the entire site.
- If searches for Category 5 facilities occurs, then 1 or 2 (during the fledgling season), up to 4 searcher(s) will conduct a search in the a.m. prior to the start of employee shifts. When the facility is in use during the fledgling season, the facility grounds will be searched immediately after the lights are turned off.
- New hire orientation and annual training will be conducted.

Kaua‘i Coffee:

- Searches for downed Covered Species will be integrated into shift change operations in harvesting and processing. Searches, recovery, and reporting will occur at all shift changes for all lighted areas twice per day at 5:30 pm and 5:30 am. Ten searchers will conduct searches in the harvesting areas; 20 searchers will conduct searches in the processing area.

Kaua‘i Marriott Resort:

- The developed portion of the property is inspected each day at least once a day for all built-upon areas, and more frequently for other areas year round. The entire staff, amounting to some 400 or more employees conduct searches throughout the day. Rooftops are checked by engineering, housekeepers check balconies, and grounds are checked by security and groundskeepers. Groundskeepers also check shrubbery and bushes (laua‘e fern and naupaka). All open areas are visually checked by all associates and guests.
- The DOFAW provided annual Worker Seabird Awareness and Response Training (WSART) to the appropriate facility staff prior to the start of each seabird fallout season from 2003 to 2017. Worker training will continue under the KSHCP for the duration of the permit term. Seabird Awareness Training will be conducted by a trained biologist in 2019, and in subsequent years, the training will be conducted by the Director of Global Safety & Security. The fallout season occurs each year from September 15 to December 15. The training includes: regulatory setting, consequences for noncompliance, standard monitoring, response, and reporting procedures, techniques for proper handling of downed seabirds, personal protection, agency contacts and facility locations. This training will be provided to the engineering staff, Director of Global Safety & Security, security personnel, grounds crew, and any staff tasked with outdoor work around the properties. A copy of the PowerPoint training module is attached as Appendix C of the Kaua‘i Marriott PIP. See also the corresponding Standard Operating Procedures (SOP) (Appendix D of the PIP).

HDOT Nāwiliwili Harbor facilities:

- Conduct nightly/morning searches to recover downed birds at the property and turn them into SOS following protocols (see monitoring plan below).
- HDOT will contract with USDA Wildlife Services (WS) or another wildlife monitor to coordinate and implement an annual seabird monitoring program at Kaua‘i harbors.
- HDOT will include seabird awareness and response activities into the contract with Nāwiliwili Harbor Security Staff as part of its hourly security patrols around the facility.
- HDOT will provide internal SOS aid provisions, but because of security restrictions, is not able to host a public SOS aid station. Any inquiries from the public will be directed to County SOS aid stations.

HDOT Port Allen Harbor facilities:

- HDOT will contract with USDA WS or another wildlife monitor to coordinate and implement an annual seabird monitoring program and response plan into its daily routine at the facility.
- HDOT will provide seabird aid training and protocol to staff and tenants, but because this facility is open to the public and not manned 24 hours, an SOS aid station will not be set up.

HDOT Līhu‘e Airport facilities:

- USDA WS or other contractor will provide seabird awareness training to HDOT airport staff, airport security, tenants, and contractor personnel in August prior to the seabird fallout season. HDOT airport operations workers and contract security personnel are given a summary orientation that enables them to identify seabird species under different scenarios, including in flight and grounded (alive, injured, dead), and provides written instructions on how to handle and report observations or encounters with grounded seabirds. All new hires during fallout season will be shown the training slideshow on first day of work by the trainer, or human resources office.
- HDOT will contract with USDA WS to implement an annual comprehensive seabird monitoring program at Līhu‘e Airport, including the areas outside of the airport secure areas, such as the parking lot. See monitoring plan.
- USDA WS will provide an internal SOS aid station in the secure area of the airport, but because of security restrictions, will not be able to host a public SOS aid station. Any seabirds encountered on airport grounds will be documented, temporarily cared for, and turned over to County SOS aid stations as soon as possible. Any inquiries from the public will be directed to County SOS aid stations.

NCL facilities:

- A seabird awareness training program is conducted for all crewmembers from the Captain down to the cabin stewards once a year just prior to the start of the seabird seasons. If crew members join the ship for their tour of duty during the seabird season, they are given the seabird awareness training prior to them being allowed to take up their duty station. It is an employment requirement that all employees undergo the training

program once a year, or at the start of their tour of duty. The Seabird Awareness Training Program is an integrated part of the NCL Safety and Environmental Management System, which in practice means that Seabird Awareness Training is as considered as important as firefighting, oil spill response or lifeboat training.

- The PowerPoint presentation attached as Appendix D of the PIP includes slides detailing and defining seabird light attraction issues. It also contains slides identifying:
    - Agency and Seabird Program Contacts
    - Slides illustrating both threatened and endangered seabird species as well as the more commonly occurring species protected under the federal MBTA.
    - Regulatory framework, both federal and state
    - Definitions of "take"
    - Penalties for non-compliance
    - Seabird season lighting rules and protocols
    - Seabird handling procedures and protocols
    - The training module is revised each year prior to the start of the seabird season incorporating any needed changes to the program identified during the previous season's activities. Copies of the current version of the PowerPoint slides used in this training program are provided in Appendix D of the PIP, additionally, NCL's seabird consultant re-trains the onboard Environmental Officer just prior to the start of the seabird season each year.

Princeville Resort Kaua'i:

- Loss prevention personnel search the entire built upon portion of the property multiple times a day, 365 days of the year. The entire staff is retrained prior to the seabird season every year. As part of their job responsibilities, they are required to search their duty stations every day that they are on the property. Since there are approximately 400 employees, the coverage of the property is complete. If a bird is found, employees are required to call loss prevention and stay with the bird until they arrive to record, handle and deliver the bird to the SOS station and prepare all of the needed reporting.
- The entire built upon portion of the property is searched multiple times a day, as all associates are required to search their duty stations and Security staff search the rest of the property.
- During the Seabird season, security staff inspects the grounds of the hotel at least twice a day and staff members are required to actively look for birds that have landed on the property in the areas that they work during their entire eight hour shifts.

Sheraton Kaua'i

- The developed portion of the property is inspected each day, year round. Rooftops are checked by engineering, housekeepers check balconies, and grounds are checked by security and groundskeepers. Groundskeepers also check shrubbery and bushes (laua'e fern and naupaka) located around the buildings. All open areas are visually checked by all associates while conducting their respective duties while on the site.

- The Resort is formally searched eight times a day by security, additional Seabird Awareness based searches are made 24/7 by associates. Inspections are conducted throughout the day. Two to three individual first responders as well as the entire staff of 200 or more employees.
- In 2012 the Sheraton Kaua‘i Resort developed a Standard Operating Procedures (SOP) for patrolling, monitoring, documenting and reporting downed seabirds during the fledgling flight season. This document was updated in 2019 (see Appendix E of the PIP, SOP attachment). The General Manager, or designee, will continue to update the SOP as needed during the KSHCP permit term, to reflect best practices for finding, recovering and documenting any downed seabirds.

Implementation of Outreach and Training

The proposed action is likely to have beneficial effects on the Covered Species due to outreach and training of hotel workers and guests at Applicant facilities because these activities are likely to increase the effectiveness of on-site staff and workers to properly monitor and respond in a timely manner if a Covered Species is incidentally downed at the facility. Outreach is also likely to enhance customer, guest, and public understanding of the importance of minimizing interior lighting. Informed parties are more likely to identify and assist in the timely recovery of downed Covered Species that increases the likelihood of more individuals finding downed birds quickly. Such efforts will facilitate a high likelihood that recovered seabirds can be released at sea within 48 hours (2 days) of being grounded.

Outreach and training for A&B facilities include the following:

- Port Allen Solar Farm: Seabird awareness and response training will be provided to all McBryde Resources staff to ensure their understanding and compliance with minimization measures. Training will be provided to on an annual basis. Seabird awareness pamphlets will be distributed to McBryde resources employees and to contractors working outdoors at night at McBryde facilities. Seabird awareness materials will be posted in a conspicuous location at the facility. A copy of the PowerPoint training module is attached as Appendix B2 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

- Port Allen Center I and II: Seabird awareness and response training will be conducted for A&B property managers, employees, operators, and staff that will be conducting the daily seabird searches during the fallout season once a year. Seabird awareness pamphlets will be distributed to A&B employees, to contractors working outdoors at night at the Port Allen facilities, and to all tenants of the facility. Tenants will be encouraged to post seabird awareness materials in a conspicuous location at their facilities. A copy of the PowerPoint training module is attached as Appendix B1 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

- Port Allen South Parcels: No employees will be trained for the empty lot at the shoreline parcel. Seabird awareness and response training will be provided to the A&B property managers and staff that will be conducting the daily seabird searches on the BEI parcel during the fallout season. Seabird awareness pamphlets will be distributed to A&B employees, to contractors working outdoors at night at the Port Allen facilities, and all tenants of the facility. Tenants will be encouraged to post seabird awareness materials in a conspicuous location at their facilities. A copy of the PowerPoint training module is attached as Appendix B1 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

- Port Allen Parking Lots: Seabird awareness and response training will be conducted for A&B property managers, employees, and operators, and staff that will be conducting the daily seabird searches during the fallout season. Training will be provided once a year. Outreach for the Port Allen Parking Lots will consist of posting a seabird informational flyer in the parking lots during the fledging season. A copy of the PowerPoint training module is attached as Appendix B1 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

- Port Allen Steel Warehouse: Seabird awareness and response training will be conducted for A&B property managers and staff that will be conducting the daily seabird searches during the fallout season. Seabird awareness pamphlets will be distributed to A&B employees, to contractors working outdoors at night at the Port Allen facilities, and to all tenants of the facility. Tenants will be encouraged to post seabird awareness materials in a conspicuous location at their facilities. A copy of the PowerPoint training module is attached as Appendix B1 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

- Port Allen Marina Center: Seabird awareness and response training will be conducted for employees and operators once a year and during the permit term. This training will be provided to the A&B property managers and staff that will be conducting the daily seabird searches during the fallout season. During the seabird fledging season seabird awareness pamphlets will be distributed to A&B employees, to contractors working outdoors at night at the Port Allen facilities, and to all tenants of the facility. Tenants will be encouraged to post seabird awareness materials in a conspicuous location at their facilities. A copy of the PowerPoint training module is attached as Appendix B1 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

- Pump 3 Hanapēpē Valley: Seabird Awareness training will be conducted for employees and operators once a year and during the permit term. Seabird Awareness and Response Training will be provided to the McBryde Resources staff and to contractors who will be working outdoors at night at McBryde facilities. Seabird awareness materials will be posted in a conspicuous location at the facility. A copy of the PowerPoint training

module is attached as Appendix B2 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

- Kalāheo Powerhouse: Seabird Awareness training will be conducted for employees and operators once a year and during the permit term. This training will be provided to the McBryde Resources staff and to contractors who will be working outdoors at night at McBryde facilities. Seabird awareness materials will be posted in a conspicuous location at the facility. A copy of the PowerPoint training module is attached as Appendix B2 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

- Wainiha Powerhouse: Seabird Awareness training will be conducted for employees and operators once a year and during the permit term. During the seabird fledging season seabird awareness pamphlets will be distributed to McBryde Resources employees and to contractors who will be working outdoors at night at McBryde facilities. Seabird awareness materials will be posted in a conspicuous location at the facility. A copy of the PowerPoint training module is attached as Appendix B2 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

- Hokulei Shopping Village: Seabird awareness and response training will be conducted for employees and operators once a year and during the permit term. This training will be provided to the A&B property managers, individual shopping center managers, to contractors working outdoors at night at the shopping center, and the staff that will be conducting the daily seabird searches during the fallout season. Seabird awareness pamphlets will be distributed to all tenants of the facility. Tenants will be encouraged to post seabird awareness materials in a conspicuous location at their facilities. A copy of the PowerPoint training module is attached as Appendix B1 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

- The Shops at Kukui‘ula: Seabird awareness and response training will be conducted for employees and operators once a year and during the permit term. This training will be provided to the Alexander & Baldwin Property Managers, individual shopping center managers, and the staff that will be conducting the daily seabird searches during the fallout season. During the seabird fledging season seabird awareness pamphlets will be distributed to A&B employees, to contractors working outdoors at night at the shopping center, and to all tenants of the facility. Tenants will be encouraged to post seabird awareness materials in a conspicuous location at their facilities. A copy of the PowerPoint training module is attached as Appendix B1 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

- Waipouli Town Center: Seabird awareness and response training and outreach will be conducted for employees and operators once a year and during the permit term. This training will be provided to the A&B property managers and employees, all tenants of the facility and individual shopping center managers, to contractors working at the shopping

center, and the staff that will be conducting the daily seabird searches during the fallout season. Tenants will be encouraged to post seabird awareness materials in a conspicuous location at their facilities. A copy of the PowerPoint training module is attached as Appendix B1 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

- Kukui‘ula Development - Plantation Core/The Club: Kukui‘ula Development will conduct training and outreach to staff once a year and during the permit term. This training will be provided to Kukui‘ula staff that will be conducting the daily seabird searches during the fallout season. Seabird awareness pamphlets will be distributed to Kukui‘ula employees, each of the facilities within the Plantation Core and to contractors working outdoors at night at the facilities. Outreach materials will be made available to guests at various locations around the facilities. Seabird awareness materials will be posted in conspicuous locations at the facilities. A copy of the PowerPoint training module is attached as Appendix B1 of the PIP. See also Standard Operating Procedures (SOP) (Appendix C of the PIP).

County of Kaua‘i:

- The County of Kaua‘i is investigating the possibility of adding advisory language to certain building and development permit forms that will inform applicants that all property owners must comply with federal and state endangered species requirements. The language could be modeled on the following language that is currently included in County Film Permit applications (see County PIP).
- During probation, the County was required to train its officers and employees. That training was recorded and is accessible to all County personnel on demand on the County intranet. Upon issuance of an ITL/ITP, all new County personnel will be required to watch the recorded training via the County on-boarding website and will be required to provide an acknowledgment of completion of the training during new-hire orientation. In addition, all new hires will be provided the Monitoring Policy and Procedure (Attachment I) during the new-hire orientation.
- Upon issuance of an ITL/ITP, all County personnel that are required to perform self-monitoring tasks, will receive annual training in August. This will incorporate the volunteer monitor training presentation that the County provides pursuant to protocols established by USFWS as indicated in Attachment J. The County may incorporate or replace the current training with the detailed slide show proposed to be created by the Prime Contractor under the KSHCP and/or Appendix F of the KSHCP. The current training includes general information on the KSHCP, Covered Species biology and identification, cultural and ecological importance of the Covered Species, light attraction and harm, federal and state laws, County efforts, rescue procedures, and the SOS program.
- The County will provide educational flyers to all organizations that use Category 3, 4, and 5 facilities. The flyers will inform the users of the possible presence of Covered Species, the impacts of the use of lights during the fledgling season, and what to do

should the users see seabirds being impacted by the lights. In addition, the County will post signage at all lighted softball fields, basketball courts, and tennis courts, where users are able to manually turn on the lights. The signage will be installed immediately adjacent to the light switches and controllers. The signage will be based on the notices that the County already posts at all lighted facilities during the fledgling season. Please see the County's PIP Attachment G for the sample flyers. The County posted the following notice on its Parks and Recreation website, which lists all County facilities, informing the public of the time of year and reason for prohibiting the use of lights at night at County facilities.

Kaua'i Coffee facilities:

- Providing a summary of regulations protecting the Covered Species; as provided by KSHCP. Search procedures, route, frequency and timing specific to the facility's monitoring plan, for seabirds and green sea turtle nests (if applicable); harvesting supervisors will be responsible for field/farm self-monitoring. Harvesting night shift supervisor will be actively searching in the vicinity of harvesting operations. See Kaua'i Coffee PIP for map example. For instance, if harvesting is taking place in field 218, searches will commence throughout the field and on routes to and from the factory and or shop areas. Searches will be done daily on scheduled work days, throughout the night shift (6:00 pm – 4:30 am) and beginning of the day shift (6:00 am – 9:00 am).

Kaua'i Marriott Resort

- In 2008, the resort developed Standard Operating Procedures (SOP) for patrolling, monitoring, documenting and reporting downed seabirds during the fledgling flight season (see Applicant PIP: Appendix D). The General Manager, or designee, will continue to update the SOP as needed during the KSHCP permit term, based on advice from its seabird biologist for best practices for finding, recovering and documenting any downed seabirds. Between the months of September 15th to December 15th Kaua'i Marriott and its associates will participate in the search, recovery and collection of downed seabirds (Newell's shearwater, Hawaiian petrel, band-rumped storm-petrel and other non-listed seabird species) on property.
- The Kaua'i Marriott Resort has been doing outreach to staff and guests since 2003, and will continue to do so during the KSHCP permit term. During the seabird fledging season Kauai Marriott Resort will display SOS informational posters in break rooms and common staff areas, include information in the resort's daily hotel newsletter "Discovery Page" for all employees. Staff will attend the annual Worker Seabird Awareness Training. Managers will remind staff about seabirds during department stand up meeting (pre-shift meetings) to bring additional awareness. Managers will talk about seabird fallout and monitoring during Monday, Wednesday, and Friday Managers meetings. Additionally, Kaua'i Marriott Resort regularly invites qualified biologists to speak at staff meetings. Kaua'i Marriott Resort will display SOS informational posters in the lobby to promote guest awareness. Kaua'i Marriott Resort will include informational flyer in each

room as awareness to guests, asking them to keep curtains closed during the season. See Appendix E of the PIP.

HDOT Nāwiliwili Harbor facilities:

- USDA WS or other contractor will provide seabird awareness training to HDOT staff and harbor security personnel in August prior to the seabird fallout season and on a routine and regular basis throughout the season; workers and security personnel are given summary orientation that enables them to identify seabird species under differing scenarios, including in flight and grounded (alive, injured, dead) and provides written instructions on how to handle and report observations or encounters with grounded seabirds. All new hires during fallout season will be shown the training slideshow on first day of work by the trainer, or human resources office.
- As part of the awareness training provided for staff, USDA WS or other contractor will provide KSHCP outreach materials (pamphlets and fliers that contain bulleted information and graphics) to staff, harbor security, and tenants. Information will remain in each harbor vehicle that is used on and around the harbor facilities. Cruise ship visitors are provided with these or similar materials to facilitate seabird light-attraction sensitivity training and enable visitors to report their observations to appropriate personnel, either while aboard ship or in the harbor area and surrounding community.

HDOT Port Allen Harbor:

- HDOT will contract with USDA Wildlife Services (WS) or other contractor to provide annual seabird awareness training to all staff and tenants during August. Staff and tenants are given summary orientation that enables them to identify seabird species and written instructions on how to handle and report observations or encounters with grounded seabirds. All new hires during fallout season will be shown the training slideshow on first day of work by the trainer, or human resources office.
- As part of the awareness training provided for staff, USDA Wildlife Services (WS) or other contractor will provide KSHCP outreach materials (pamphlets and fliers that contain bulleted information and graphics) to staff and tenants to put in staff vehicles used at the harbor. Tenants will be asked to display and share outreach materials with their customers.

HDOT Līhu‘e Airport:

- USDA WS or other contractor will provide seabird awareness training to HDOT airport staff, airport security, tenants, and contractor personnel in August prior to the seabird fallout season. HDOT airport operations workers and contract security personnel are given a summary orientation that enables them to identify seabird species under different scenarios, including in flight and grounded (alive, injured, dead), and provides written instructions on how to handle and report observations or encounters with grounded seabirds. All new hires during fallout season will be shown the training slideshow on first day of work by the trainer, or human resources office.

- A letter requiring compliance with seabird-friendly lighting standards will be sent to airport rental tenants as part of seabird awareness training.

NCL facility:

- During the seabird season, NCL will provide information on seabirds, and seabird protocols to its passengers in the "Free Style Daily," the ship's onboard daily newspaper (typical seabird information provided to guests is shown in Appendix H of the PIP). The ship's hotel staff closes cabin draperies each afternoon as part of the turn-down service. Additionally, when cabins are cleaned, draperies will be closed. Passengers are requested to keep their draperies closed as part of the ship's green initiative and to conserve natural resources.

Princeville Resort Kaua'i:

- The entire staff of the resort is retrained every year, and training is usually conducted in early August. The specific dates for the training are based on the hotel occupancy and other personnel issues, but training always happens prior to the seabird season starting in September.
- During the seabird season an article is printed in the weekly guest newsletter about the shearwater season, this newsletter is placed in every guest room. A copy of a typical seabird season guest newsletter is attached as Appendix G of the PIP. Additionally, a printed brochure entitled "The Princeville Resort Kauai Seabird Conservation Program" is handed out to each hotel guest during the seabird season at check---in that encourages them to close their louvered window panels at night to shield light sources that may attract fledgling shearwaters and that also provides information on the birds, the SOS program and the Princeville Resort Kauai's commitment to the conservation of native island resources. A copy of the current brochure is attached as Appendix G of the PIP. Additionally, in guest rooms, staff close the wooden window louvers each evening during turndown service, and shearwater awareness signage has been placed in all guest rooms that requests that guests keep their window louvers closed during nighttime hours during the seabird season. A copy of this display in attached as Appendix H of the PIP. Printed cards are placed in the Prince Junior Suites requesting that guests turn of the bathroom lights when not in use during the seabird season. A copy of these signs is attached as Appendix I of the PIP.
- The Princeville Resort Kauai commissioned artist Patrick Ching to produce a children's coloring book that tells the story of a Newell's Shearwater that has been downed, told through the eyes of other native species including a Hawaiian Monk Seal, Laysan Albatross, crabs etc. The coloring book is used as part of the resort's "Young Voyagers Club," its in---house children's program that is directed at children between the ages of 5 and 12. A copy of the cover and two typical inside pages of the coloring book is attached as Appendix J of the PIP.
- A seabird awareness-training program is conducted for all employees once a year. It is an employment requirement that all employees undergo the training program. There are two modules to the training program, one is given to every employee and the second

"Downed Seabird Advanced Training" is given to the security staff and to the managers. The training module is revised each year prior to the start of the seabird season incorporating any needed changes to the program identified during the previous season's activities. A seabird specialist initially conducted all of the seabird awareness training, for the first four years. During that period the biologist trained the HR and Security department to conduct the training on an annual basis. Copies of the 2017 version of the PowerPoint slides used in this training program are provided in Appendix C of the PIP.

Sheraton Kaua'i:

- The DOFAW provided annual Worker Seabird Awareness and Response Training to the appropriate facility staff prior to the start of each seabird fallout season from 2003 to 2017. Worker training will continue under the KSHCP for the duration of the permit term. Seabird Awareness Training will be conducted by a trained biologist in 2019, and in subsequent years, the training will be conducted by the Manager of Security. The fallout season occurs each year from September 15 to December 15. The training includes: regulatory setting, consequences for noncompliance, standard monitoring, response, and reporting procedures, techniques for proper handling of downed seabirds, personal protection, agency contacts and facility locations. A copy of the PowerPoint training module is attached as Appendix C of the PIP. See also Standard Operating Procedures (SOP) (Appendix E of the PIP).
- The Sheraton Kaua'i has been doing outreach to staff and guests since 2003, and will continue to do so during the KSHCP permit term. During the seabird fledging season, the Sheraton Kaua'i will: display SOS informational posters in break rooms and common staff areas; include information in a Daily Events Calendar for all employees; staff will attend the annual Worker Seabird Awareness Training; managers will remind staff about seabirds during department Daily Focus meeting (pre-shift meetings) to bring additional awareness; managers will discuss seabird fallout and monitoring in our Monday, Wednesday, and Friday Managers weekly stand up meetings; managers will invite a qualified biologist to speak at our staff meeting; the Resort will display SOS informational posters in the lobby to promote guest awareness; have an informational flyer put into each room as awareness to for our guest, asking them to keep curtains closed during the season (Appendix D of the PIP); and show information regarding the seabird fallout season and appropriate protocols that guests should follow on the in-house TV station during the seabird season.

Implementation of Predator Control Actions at Participating Facilities

Control and monitoring of free-roaming dogs, cats, rats, and other predators at Applicant facilities is likely to decrease the likelihood that downed Covered Species will be preyed upon and injured or killed. For that reason, this conservation measure is likely to benefit the Covered Species.

A&B facilities:

- Port Allen Solar Farm: A&B will prohibit and or control unleashed predatory animals, prohibit outdoor feeding of animals, and require sealed rubbish containers at this facility.

This is a secure site with no public access. A&B will meet the goal stated in KSHCP Table 5-1 (Biological Goals), "implement[ation] of actions to reduce presence of free-roaming seabird predators."

- Port Allen Center I and II: A&B will prohibit and or control unleashed predatory animals, prohibit outdoor feeding of animals, and require sealed rubbish containers at this facility. In the event that cats or dogs are reported on the property, county animal control is notified or a pest control company is hired to remove the predators. A&B will meet the goal stated in KSHCP Table 5-1 (Biological Goals), "implement[ation] of actions to reduce presence of free-roaming seabird predators."

- Port Allen South Parcels: The shoreline parcel is vacant land and no predator control will be conducted. A&B will prohibit and or control unleashed predatory animals, prohibit outdoor feeding of animals, and require sealed rubbish containers at the BEI parcel. In the event that cats or dogs are reported on the BEI parcel, county animal control will be notified or a pest control company is hired to remove the predators. A&B will meet the goal stated in KSHCP Table 5-1 (Biological Goals), "implement[ation] of actions to reduce presence of free-roaming seabird predators."

- Port Allen Parking Lots: A&B will prohibit and or control unleashed predatory animals, prohibit outdoor feeding of animals, and require sealed rubbish containers at the Marina Center served by the parking lot. However, this parking lot is not fenced and is between two harbor/launch facilities. It is impossible to effectively control all predators in the greater harbor area. In the event that cats or dogs are reported on the property, county animal control is notified or a pest control company is hired to remove the predators. A&B will meet the goal stated in KSHCP Table 5-1 (Biological Goals), "implement[ation] of actions to reduce presence of free-roaming seabird predators."

- Port Allen Steel Warehouse: A&B will prohibit and or control unleashed predatory animals, prohibit outdoor feeding of animals, and require sealed rubbish containers at this facility. Due to high crime, one tenant maintains watchdogs within his fenced yard. In the event that cats or dogs are reported on the property, county animal control is notified or a pest control company is hired to remove the predators. A&B will meet the goal stated in KSHCP Table 5-1 (Biological Goals), "implement[ation] of actions to reduce presence of free-roaming seabird predators."

- Port Allen Marina Center: A&B will prohibit and or control unleashed predatory animals, prohibit outdoor feeding of animals, and require sealed rubbish containers at this facility. In the event that cats or dogs are reported on the property, county animal control is notified or a pest control company is hired to remove the predators. A&B will meet the goal stated in KSHCP Table 5-1 (Biological Goals), "implement[ation] of actions to reduce presence of free-roaming seabird predators."

- Pump 3 Hanapēpē Valley: A&B will prohibit and or control unleashed predatory animals, prohibit outdoor feeding of animals, and require sealed rubbish containers at this facility. Predatory animal control is not feasible outside of the fenced portion of the facility as this is a rural area. In the event that cats or dogs are reported within the fenced facility, county animal control is notified or a pest control company is hired to remove the predators. A&B will meet the goal stated in KSHCP Table 5-1 (Biological Goals), "implement[ation] of actions to reduce presence of free-roaming seabird predators."

- Kalāheo Powerhouse: A&B will prohibit and or control unleashed predatory animals, prohibit outdoor feeding of animals, and require sealed rubbish containers at this facility. Predator control is not feasible outside the fenced portion of the facility due to the rural area. In the event that cats or dogs are reported on the property, a pest control company will be hired to remove the predators. A&B will meet the goal stated in KSHCP Table 5-1 (Biological Goals), "implement[ation] of actions to reduce presence of free-roaming seabird predators."

- Wainiha Powerhouse: A&B will prohibit and or control unleashed predatory animals, prohibit outdoor feeding of animals, and require sealed rubbish containers at this facility. Predator control is not feasible outside the fenced portion of the facility as this is a wildland area. In the event that cats or dogs are reported within the fenced facility, county animal control is notified or a pest control company is hired to remove the predators. A&B will meet the goal stated in KSHCP Table 5-1 (Biological Goals), "implement[ation] of actions to reduce presence of free-roaming seabird predators."

- Hokulei Shopping Village: A&B will prohibit and or control unleashed predatory animals, prohibit outdoor feeding of animals, and require sealed rubbish containers at this facility. In the event that cats or dogs are reported within the fenced facility, county animal control is notified or a pest control company is hired to remove the predators. A&B will meet the goal stated in KSHCP Table 5-1 (Biological Goals), "implement[ation] of actions to reduce presence of free-roaming seabird predators."

- The Shops at Kukui‘ula: A&B will prohibit and or control unleashed predatory animals, prohibit outdoor feeding of animals, and require sealed rubbish containers at this facility. In the event that cats or dogs are reported on the property, county animal control is notified or a pest control company is hired to remove the predators. A&B will meet the goal stated in KSHCP Table 5-1 (Biological Goals), "implement[ation] of actions to reduce presence of free-roaming seabird predators."

- Waipouli Town Center: A&B will prohibit and or control unleashed dogs, prohibit outdoor feeding of animals, and require sealed rubbish containers at this facility. Effective predator control at this property is not possible unless action is taken by outside agencies to discourage ongoing maintenance of a feral cat population immediately adjacent to the property. Until that time, predator control will be limited to dogs, and in

the event dogs are reported on the property, county animal control is notified or a pest control company is hired to remove the predators.

- Kukui‘ula Development - Plantation Core/The Club: A&B will prohibit and or control unleashed predatory animals, prohibit outdoor feeding of animals, and require sealed rubbish containers at this facility. In the event that cats or dogs are reported on the property, county animal control is notified or a pest control company is hired to remove the predators. A&B will meet the goal stated in KSHCP Table 5-1 (Biological Goals), “implement[ation] of actions to reduce presence of free-roaming seabird predators.”

County of Kaua‘i facilities:

- The County will deploy traps, as necessary, or other appropriate mechanisms during the seabird fallout period to reduce the presence of predators at facilities where minimization measures are not likely to result in the avoidance of seabird take.
- It is unlawful for any person to release any domestic animal at County parks and recreation facilities.

Kaua‘i Coffee:

- Kaua‘i Coffee will remove and control free-roaming predatory animals at the facility by trapping feral cats. Traps at factory sites will be checked daily multiple times throughout the day. Kaua‘i Coffee will prohibit the outdoor feeding of predatory animals. This minimization measure is integrated into the training plan for the facilities. Signs will be posted at time clocks, email blasts and reminders will be sent weekly before shift safety meeting by department managers.

The Kaua‘i Marriott Resort facilities:

- The Kaua‘i Marriott actively removes or otherwise controls free-roaming predatory animals at its facility. Cat traps are deployed as needed. The resort has committed to meet the biological goals and objectives in Table 5-1 of the KSHCP to “Minimize mortality of Covered Seabirds downed due to light attraction by implementing actions to reduce the presence of free-roaming seabird predators such as cats and dogs at Participant facilities.” The resort has also committed to meeting the requirement in Section 5.3.2 of the KSHCP that “All measures to reduce presence of predators must be implemented within Year 1 of an ITP/ITL.” The resort is implementing measures to prohibit the outdoor feeding of predatory animals. Resort staff are trained that feeding of predatory animals is not allowed, and security will monitor compliance with this conservation measure.

HDOT Nāwiliwili Harbor facilities:

- HDOT staff will conduct predator control or contract with USDA Wildlife Services (WS) or other contractors to perform this service. Animal control includes trapping and removing cats and conducting surveillance to detect and remove free-roaming dogs that may enter the facilities. WS will live-trap and remove feral cats and dogs from the facility

during the seabird fallout period (September 15–December 15). All trash/rubbish shall be contained in sealed depositories that are removed routinely by the County.

- HDOT Kaua‘i District Manager will enact a policy that prohibits outdoor feeding of feral cats and dogs at the facility during the seabird fallout period.

HDOT Port Allen Harbor facilities:

- HDOT will contract with WS or another contractor to conduct animal control at the harbor. Animal control includes trapping and removing free-roaming, stray cats and dogs at the facilities. All trash/rubbish shall be contained in sealed depositories that are removed routinely by the County.

HDOT Līhu‘e Airport facilities:

- HDOT prohibits unleashed predatory animals such as cats and dogs and the outdoor feeding of animals on the Līhu‘e Airport premises. HDOT is funding WS to conduct animal control, which includes trapping and removing free-roaming cats and conducting surveillance to detect and remove free-roaming dogs that may enter the airfield; WS also removes barn owls that may present a hazard to aircraft operations and downed seabirds. All trash/rubbish is contained in sealed depositories that are removed routinely by the County.
- WS routinely traps feral cats year-round at Līhu‘e Airport as part of wildlife hazard management operations. During the seabird fallout season, the control of feral cats throughout the airport to date has improved the survival and recovery of Covered Seabirds that have been grounded at the airport. WS also conducts trapping for mongoose for a few weeks after a reported sighting.
- The HDOT Kaua‘i Airport District Manager will enact a policy that prohibits the outdoor feeding of feral cats and dogs at the Līhu‘e Airport during the seabird fallout season.

NCL Facility:

- Implementation of predator control at the NCL facility is not applicable on an ocean-going ship.

Princeville Resort Kaua‘i:

- The resort employs commercial pest control services. The Resort also deploys cat traps as soon as a cat is detected (a rare event to date). The Resort has committed to meet the biological goals and objectives in Table 5-1 of the KSHCP to “Minimize mortality of Covered Seabirds downed due to light attraction by implementing actions to reduce presence of free-roaming seabird predators such as cats and dogs at Participant facilities.” The Resort has also committed to satisfying the requirement in Section 5.3.2 of the KSHCP that “All measures to reduce presence of predators must be implemented within Year 1 of an ITP/ITL.”
- The Resort has committed to prohibiting the outdoor feeding of predatory animals. Resort staff are currently trained to implement this measure, and security staff monitor compliance with this conservation measure.

Sheraton Kaua‘i:

- No unleashed animals are permissible on hotel property, and trash bins have restricted coverings. The Resort has committed to remove/control free-roaming predatory animals at the facility. The Resort deploys cat traps, as needed.
- The Resort has committed to prohibiting the outdoor feeding of predatory animals. Staff are trained to know that such feeding is prohibited, and Resort security monitors compliance with this conservation measure.

Conservation Actions in the Kalalau Valley

Barn owl and feral cat predation of the Covered Species are a constant threat limiting the breeding success of endangered seabird populations within the Kalalau Valley. Implementation of this conservation measure is likely to benefit the reproduction and survivorship of nesting seabirds at their colonies, and enhance their reproductive success and productivity. We expect this measure will provide a benefit to adult and fledgling seabirds, as well as to their eggs and chicks.

Under the KSHCP, barn owl and feral cat control in the Kalalau Valley is likely to cause immediate benefits to the reproduction of the Covered Species (see Section 4.1.3 of the KSHCP). While we expect this conservation measure to benefit Newell’s shearwater reproduction (estimated at 15 additional fledglings per year) during the first year of the KSHCP, given the estimated level of take of the Newell’s shearwater as a result of light attraction and the delay in accruing benefits to Newell’s shearwater reproduction from the seabird social attraction project, only a partial in-year offset of the Newell’s shearwater take is anticipated in the first 12 years of implementing the KSHCP (see section 4.2.3 of the KSHCP).

The barn owl and feral cat control in Kalalau Valley is anticipated to have a beneficial effect on the range-wide population of the Hawaiian petrel and band-rumped storm-petrel beginning in the first year of the KSHCP. The Kalalau Valley is a strategic location to control wide-ranging predators as it geographically positioned to provide protection to multiple, known seabird breeding colonies. The mitigation activities for the Hawaiian petrel and band-rumped storm-petrel are expected to provide benefits to the breeding colonies by reducing depredation of wide ranging cats and barn owls, minimizing depredation on sub-adults and breeding adults, thereby increasing their survival and increasing nesting and fledging success. The benefit is derived from increased breeding capacity and success within multiple colonies in Kalalau Valley as a result of these barn owl and cat control efforts. This reproductive benefit totals 60 fledglings and 60 adult or sub-adults of the Hawaiian petrel as well as 30 fledglings and 30 adults or sub-adults of the band-rumped storm-petrel. The requested lethal take amount by the KSHCP Participants is 39 Hawaiian petrels and 17 band-rumped storm-petrel over the 30-year permit term. Because the requested lethal take is less than the KSHCP total lethal take maximum of 120 Hawaiian petrel and 60 band-rumped storm-petrel, thirty years of barn owl and feral cat control are estimated to provide a total net benefit to the Kaua‘i Hawaiian petrel population of up to 81 individuals and a total net benefit to the Kaua‘i band-rumped storm-petrel of up to 43 individuals (120-39=81; 60-17=43). Although the magnitude of the range-wide beneficial effect of the mitigation on both

species is small, it is positive and commensurate with the impact authorized under ITPs and ITLs for these species.

Conservation Activities at the Kahuama‘a Seabird Preserve

The proposed action is very likely to benefit the Covered Species by removing (i.e., killing) feral cats, rats, barn owls, and feral pigs that are a constant threat limiting the breeding success of listed seabirds. The construction and operation of the Kahuama‘a Preserve is likely to protect and enhance the productivity and reproductive success of the Covered Species because the methods employed for that purpose are tried and true, as detailed in Section 4.1.1. of the KSHCP.

The seabird social attraction project at Kahuama‘a Seabird Preserve, along with barn owl and feral cat control in Kalalau Valley, are likely to enhance Newell's shearwater reproduction output by about 15 fledglings per year (see Section 4.2.4 of the KSHCP) starting in the first year of implementing the KSHCP. Control of barn owls and feral cats in the Kalalau Valley is likely to enhance adult and chick seabird survivorship in the affected area because the methods used to achieve that control (see references in Section 4.2.4 in the KSHCP).

The same immediate reproductive benefit to Newell's shearwater is not anticipated under the social attraction scenario. Although the benefits from social attraction will benefit the Newell's shearwater, social attraction is expected to provide a delayed benefit due to a combination of factors, including: (1) the conservative estimate (0) of the starting population within the fenced 2-hectare site; (2) the several years it takes to recruit breeding adults and increase breeding adult numbers at the social attraction site; and (3) the time delay of 6 years to breeding age for fledgling birds that return to breed at the site. Due to this expected delay in successful initial breeding of the Kaua‘i Newell's shearwater population at Kahuama‘a Seabird Preserve, there is not likely to be a take impact offset in the same year that the take impact occurs for the first 12 years of implementing the KSHCP.

Under the KSHCP, the standard for mitigating take of the Newell's shearwater resulting in mortality will be as follows: increasing Newell's shearwater reproduction by one fledgling to offset each fledgling or egg/chick mortality, and by 3 fledglings to offset the mortality of one adult, given an juvenile/sub-adult survivorship of 0.33 (Ainley et al. 2001). One out of the 15 Newell's fledglings produced annually as a result of barn owl and feral cat control provides for a complete in-year offset for adult Newell's shearwater mortalities anticipated to be covered under the KSHCP (1 adult every 3 years or 0.33 annually). This means the reproductive benefits of the seabird social attraction project increases each year beginning in year 4 (see KSHCP, Appendix C: Social Attraction Benefit Estimator). When these benefits are added to the remaining benefits of barn owl and feral cat control (14 fledglings annually), there is a partial in-year offset of fledgling mortalities in years 1 through 12 of the KSHCP, a complete in-year offset in year 13, followed by a greater than in-year offset in years 14-30 (Figure 6).

The delay in achieving mitigation benefits for the Newell's shearwater associated with the seabird social attraction project and the partial in-year offset of Newell's fledgling take in years 1 to 12 results in a loss of the species' productivity over the term of the KSHCP. Because of the delay, the Kaua'i Newell's shearwater population is likely to experience a loss in breeding productivity due to the mortality of fledglings that would have returned to breed as adults and the loss of productivity of their progeny and subsequent progeny. The number of Newell's shearwater fledglings subject to take impacts that are not mitigated for in the same year as the take impact is shown in Figure 6, including 16 fledglings in year 1, with a decreasing, in-year mitigation deficit from years 4 until year 12.

The loss in the Newell's shearwater's reproduction represented by these impacts that are not mitigated in-year, represents progeny that would have survived to breeding as well as the loss in reproduction of their progeny and subsequent progeny. These effects were calculated for each year of the 30-year KSHCP, based on the species' juvenile to adult survival of 0.28, breeding probability of 70%, and reproductive success of 50% [see KSHCP Appendix C: Social Attraction Benefit Estimator; and Griesemer and Holmes (2011)]. The number of Newell's fledglings that the surviving breeding adults, and their progeny would have produced is equal to 81 fledglings over 30 years.

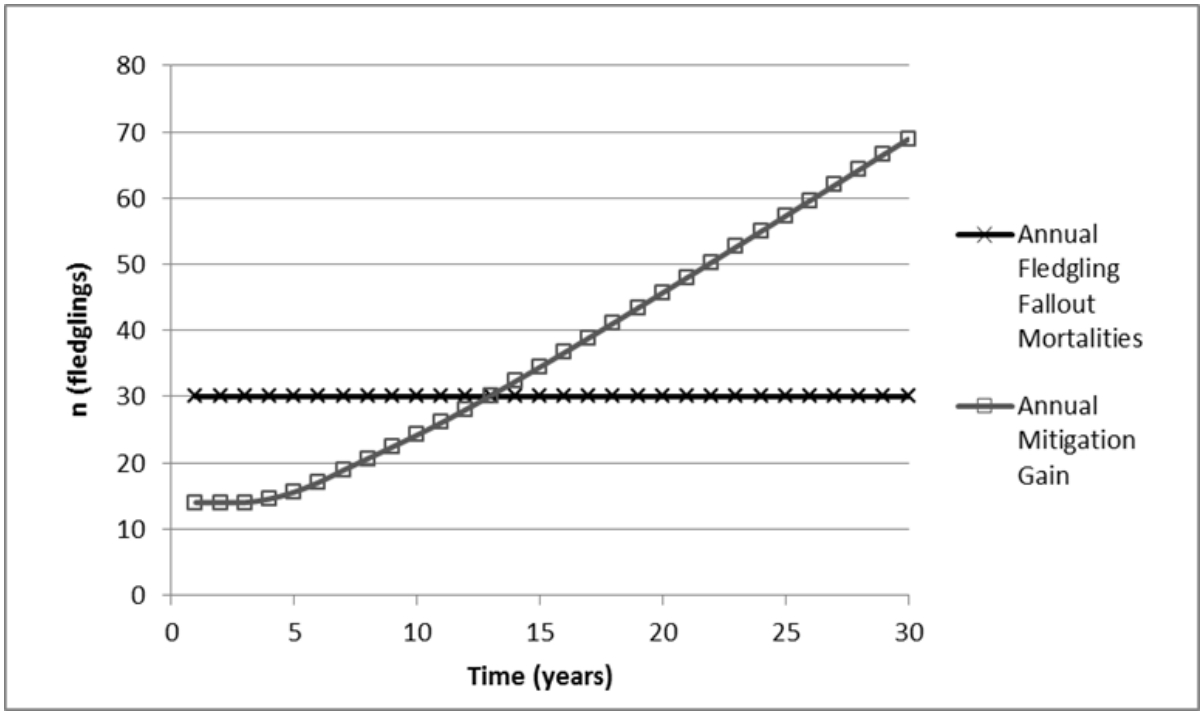

Figure 6. Annual take of fledgling Newell's shearwaters and the annual increase in shearwater fledglings (i.e., the annual mitigation gain) likely to result from KSHCP conservation program*[#]

*Note: An annual increase of one out of the 15 fledgling Newell's shearwater is not included in the annual mitigation gain because one fledgling is anticipated to mitigate the proposed annual adult take of 0.33.
[#]Figure 6 is a graph of a simplistic deterministic assessment to show the probable projected population increase in growth rate given the 5-year lag time that a protected fledgling reaches reproductive age.

Over the 30-year term of the KSHCP, the seabird social attraction project, the barn owl control, and feral cat control are likely to result in a positive Newell's shearwater reproduction output trajectory relative to the fledgling take impacts covered by the KSHCP. Due to the expected delay in productivity at the social attraction site, the Kaua'i Newell's shearwater population is likely to decrease by ~25 breeding adults (0.21% of the Kaua'i adult population in 2018) by Year 16 of the KSHCP. However, in Year 27 of the KSHCP, the cumulative Newell's shearwater fledglings produced by the conservation program (fledglings produced at the social attraction site plus by nesting Newell's shearwater in areas subject to barn owl and feral cat control) is likely to exceed the total fledgling take and total loss of productivity in fledglings from the delay in mitigation (980.7).

From Year 27 through Year 30, the KSHCP conservation program is likely to provide a net benefit to the Newell's shearwater population of 136 fledglings. Subtracting the 2 fledglings required to offset the chick/egg loss from mortality of 10 adult Newell's shearwater over the 30-year term of the KSHCP results in a total net benefit of 134 fledglings. The resulting Newell's shearwater fledgling mitigation replacement ratio (fledgling mortalities: fledglings produced),

therefore, would be 1:1.14 at the end of the plan term. Because the requested lethal take amount by KSHCP Participants is 786 fledgling Newell's shearwaters (in comparison to the total maximum capacity of the KSCHP of 900 fledglings) over the 30-year permit term, the conservation program would likely offset the take impacts more quickly than Year 27 and would result in a minimum total net benefit of 134 fledglings over the 30-year term of the KSHCP. At year 30, it is anticipated that a population of approximately 372 Newell's shearwaters, growing at a rate of 8% per year, would reside within the predator-free fenced area. This represents approximately 6% of the projected island-wide Kaua'i Newell's shearwater population at year 30 (6,200 individuals) within the Kahuama'a Preserve, including the colonies along the Kalalau rim. While the annual level of the species take under the KSHCP represents 1.44% of the anticipated total fledgling production and less than 0.01% of the Kaua'i adult population, the mitigation actions would result in the protection of approximately 6% of the Kaua'i population by year 30.

Adaptive management measures associated with the KSHCP specify that alternate mitigation would be implemented if the social attraction site fails to meet identified objectives that would lead to a breeding colony, or if results of monitoring indicate that initial predator control methods are not adequately controlling predators in the Kalalau area. Alternative mitigation would include, but is not limited to, expanded predator control or funding of other conservation efforts that provides a direct benefit to the Covered Seabirds.

The minimization and mitigation measures included in the Proposed Alternative for the KSHCP were developed to fully offset the maximum level of incidental take requested and are required to be implemented even if the actual level of incidental take requested by future Applicants is less than estimated in the KSHCP.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Future State restoration and management actions on Kaua'i are expected to utilize Federal funding and are subject to section 7 consultation.

The Service is aware of the current take of the Covered Species associated with powerline strikes by the KIUC, as described above in the Status of the Species of the Newell's shearwater. KIUC submitted a permit renewal request to the Service for its STHCP and ITP to cover the period until the Service renders a decision on their Long-Term HCP, which is currently under development. In the interim, KIUC continues to implement the conservation actions under the agreements of STHCP. The amount of take and minimization and mitigation measures that will be included under the KIUC Long-Term HCP is unknown as it continues to be under active

development. However, when the KIUC submits a sufficient HCP and the Service issues an ITP, the issuance of the Permit would require formal consultation pursuant to section 7 of the Act.

The total amount of take potentially covered under the KSHCP will be less than the total island-wide light attraction effects to the Covered Seabirds. For light attraction impacts occurring from sources other than the current KSHCP Applicants, there is currently no identifiable entity to apply for take authorization, though future efforts may be more successful in identifying such entities and potentially covered under a Federal and State HCP. Unless other entities seek take coverage associated with impacts from light attraction or modify lights to fully avoid take, it is anticipated that the effects from light attraction (other than those covered under the current group of Applicants) will continue.

CONCLUSION

After reviewing the current status of the Newell's shearwater, Hawaiian petrel, and the band-rumped storm-petrel, the environmental baseline for the action area, the effects of the proposed, and cumulative effects, it is the Service's biological opinion that the KSHCP, as proposed, inclusive of PIPs, is not likely to jeopardize the continued existence of these three seabird species. As discussed fully stated in the Effects of the Action section above, the total maximum take anticipated in the KSHCP is likely to be minimized and fully offset by conservation measures set forth in the Plan and associated PIPs. A net recovery benefit to the affected Covered Species is anticipated with implementation of the KSHCP and associated PIPs for the reasons presented above.

The anticipated take for individual Applicants over the 30-year permit term is listed below:

Table 8: 30-Year Applicant Requested Take of the Covered Species

Applicant	Newell's shearwater			Hawaiian petrel			Band-rumped storm-petrel		
	Total Take	Mortality	Harm	Total Take	Mortality	Harm	Total Take	Mortality	Harm
A&B	184	104	80	6	3	3	2	1	1
County of Kaua‘i	493	276	217	21	17	4	4	4	0
HDOT Līhu‘e Airport	65	22	43	9	3	6	3	1	2
HDOT Nāwiliwili Harbor	61	13	48	8	2	6	0	0	0
HDOT Port Allen Harbor	121	68	53	0	0	0	0	0	0
Kaua‘i Coffee	61	34	27	0	0	0	0	0	0
Kaua‘i Marriott	55	33	22	2	1	1	2	1	1
NCL	60	30	30	12	6	6	12	6	6
Princeville Resort Kaua‘i	601	125	476	12	6	6	2	1	1
Sheraton Kauai'i	145	81	64	2	1	1	6	3	3
Total Take by Species	**1846**	**786**	**1060**	**72**	**39**	**33**	**31**	**17**	**14**

- A&B
  - Take of up to 184 Newell's shearwater fledglings (104 in the form of mortality, 80 in the form of harm), up to 6 Hawaiian petrel fledglings (3 in the form of mortality, 3 in the form of harm), and up to 2 band-rumped storm-petrel fledglings (1 in the form of mortality, 1 in the form of harm) over 30 years.

- County of Kaua‘i
  - Take of up to 493 Newell's shearwater fledglings (276 in the form of mortality, 217 in the form of harm), up to 21 Hawaiian petrel fledglings (17 in the form of mortality, 4 in the form of harm), and up to 4 band-rumped storm-petrel fledglings (4 in the form of mortality) over 30 years.

- HDOT Līhuʻe Airport
  - Take of up to 65 Newell's shearwater fledglings (22 in the form of mortality, 43 in the form of harm), up to 9 Hawaiian petrel fledglings (3 in the form of mortality, 6 in the form of harm), and up to 3 band-rumped storm-petrel fledglings (1 in the form of mortality, 2 in the form of harm) over 30 years.

- HDOT Nāwiliwili Harbor
  - Take of up to 61 Newell's shearwater fledglings (13 in the form of mortality, 48 in the form of harm) and up to 8 Hawaiian petrel fledglings (2 in the form of mortality, 6 in the form of harm) over 30 years.

- HDOT Port Allen Harbor
  - Take of up to 121 Newell's shearwater fledglings (68 in the form of mortality, 53 in the form of harm) over 30 years.

- Kauaʻi Coffee
  - Take of up to 61 Newell's shearwater fledglings (34 in the form of mortality, 27 in the form of harm) over 30 years.

- Kauaʻi Marriott Resort
  - Take of up to 55 Newell's shearwater fledglings (33 in the form of mortality, 22 in the form of harm), up to 2 Hawaiian petrel fledglings (1 in the form of mortality, 1 in the form of harm), and up to 2 band-rumped storm-petrel fledglings (1 in the form of mortality, 1 in the form of harm) over 30 years.

- NCL
  - Take of up to 60 Newell's shearwater fledglings (30 in the form of mortality, 30 in the form of harm), up to 12 Hawaiian petrel fledglings (6 in the form of mortality, 6 in the form of harm), and up to 12 band-rumped storm-petrel fledglings (6 in the form of mortality, 6 in the form of harm) over 30 years.

- Princeville Resort Kauaʻi
  - Take of up to 601 Newell's shearwater fledglings (125 in the form of mortality, 476 in the form of harm), up to 12 Hawaiian petrel fledglings (6 in the form of mortality, 6 in the form of harm), and up to 2 band-rumped storm-petrel fledglings (1 in the form of mortality, 1 in the form of harm) over 30 years.

- Sheraton Kauaʻi
  - Take of up to 145 Newell's shearwater fledglings (81 in the form of mortality, 64 in the form of harm), up to 2 Hawaiian petrel fledglings (1 in the form of mortality, 1 in the form of harm), and up to 6 band-rumped storm-petrel fledglings (3 in the form of mortality, 3 in the form of harm) over 30 years.

The maximum capacity of the KSHCP is likely to result in the implementation of actions to minimize and fully offset the impacts of the taking of a maximum of up to 2,250 fledgling Newell's shearwaters (take of 900 in the form of mortality and take of 1,350 in the form of harm); up to 120 fledgling Hawaiian petrel (take of 60 in the form of mortality and take of 60 in the form of harm), and 60 fledgling band-rumped storm-petrels (take of 30 in the form of mortality and take of 30 in the form of harm) over 30 years.

The Kaua'i population of Newell's shearwater is estimated at (24,310 individuals) and is becoming more restricted in distribution. The annual mortality of 30 fledglings and less than 0.1 eggs or chicks represents 0.007% of the 4,072 total fledglings (30/4,072 = 0.00736 = 0.007%). The mortality of 0.33 adult Newell's shearwater per year represents less than 0.01% of the adult population (0.33/15485= 0.00002 = less than 0.01%) of the total estimated Kaua'i adult population (15,485 adults).

The Hawaiian petrel population residing on the island of Kaua'i is estimated at 5,485 breeding pairs (10,970 adults) (Vorsino pers. comm. 2020). At this level, the mortality of two adult per year due to light attraction would represent up to 0.02% of the Kaua'i adult Hawaiian petrel population (2/10,970 = 0.00018 = 0.02%). In comparison, the mortality of 2 fledglings and 0.33 eggs or chicks of the Hawaiian petrel per year equals 0.08% of the total fledglings produced on Kaua'i (2,885 fledglings; 2.33/2,885 = 0.000807 = 0.08) each year.

Based on the estimated Kaua'i population of band-rumped storm-petrel of 221 breeding pairs, (Wood et al. 2002) and the assumption of a maximum of 1 fledgling per every breeding pair, the mortality of 1 fledgling and 0.1 eggs or chicks of the band-rumped storm-petrel per year represents 0.99% of the estimated total fledglings produced annually by this species (111 adults; 1/111 = 0.0099 = 0.99%). Comparatively, the mortality of 1 adult band-rumped storm-petrel per year equals 0.23% of the Kaua'i (442) adult population of this species.

The beneficial effects of the Kalalau Valley and Kahuama'a Seabird Preserve will likely more than offset the loss take impacts covered under the KSCHP and result in a net benefit of 134 Newell's shearwater fledglings over the 30-year period if the maximum take request was allowed under the KSCHP; however, as discussed above if the take request is below the maximum request of take allowed, then the net benefit is anticipated to be higher than a net benefit of 134 Newell's shearwater fledglings. Thirty years of barn owl and feral cat control is estimated to provide a total net benefit to the Kaua'i Hawaiian petrel population of up to 81 individuals, and a total net benefit to the Kaua'i band-rumped storm-petrel of up to 43 individuals. Overall, taken all these effects together, there will not be a significant change in the reproduction, numbers, or distribution of the Newell's shearwater, Hawaiian petrel, and band-rumped storm-petrel that will reduce appreciably the likelihood of both the survival and recovery of these species in the wild.

INCIDENTAL TAKE STATEMENT

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

The proposed KSHCP and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize those impacts. All conservation measures described in the proposed KSHCP, together with the terms and conditions described in any associated Implementing Agreement and any section 10(a)(1)(B) permit or permits issued with respect to the proposed HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR 402.14 (i). Such terms and conditions are nondiscretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the act to apply. If the permittees fail to adhere to these terms and conditions, the protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the proposed KSHCP and associated PIPs, associated reporting requirements, and provisions for disposition of dead or injured animals are as described in the KSHCP and its accompanying section 10(a)(1)(B) permit(s).

Amount or Extent of Take Anticipated

Based on our analysis of the KSHCP and associated PIPs, the Service anticipates the amount or extent of take presented in Table 1 and 6 above and summarized below is reasonably certain to occur.

- Up to 900 Newell's shearwater fledglings (30 per year), 10 adults or sub-adults (0.33 per year), 2 eggs or chicks (<0.1 per year) in the form of death over the duration of the project.
- Up to 1,350 Newell's shearwater fledglings (45 per year), 10 adults or sub-adults (0.33 per year) in the form of harm over the duration of the project.
- Up to 60 Hawaiian petrel adult, sub-adults, or fledgling (2 per year) and 10 eggs or chicks (0.33 per year) in the form of death over the duration of the project.

- Up to 60 Hawaiian petrel adult, sub-adults, or fledgling (2 per year) in the form of harm over the duration of the project.
- Up to 30 band-rumped storm-petrel adult, sub-adult, or fledgling (1 per year) and 3 eggs or chicks (0.1 per year) in the form of death over the duration of the project.
- Up to 30 band-rumped storm-petrel adult, sub-adult, or fledgling (1 per year) in the form of harm over the duration of the project.

Effect of Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Covered Species with implementation of the minimization and mitigation measures under the KSHCP and associated PIPs.

Reasonable and Prudent Measures and Terms and Conditions

All conservation measures described in the proposed KSHCP and associated PIPs, together with the terms and conditions described in the section 10(a)(1)(B) permits issued with respect to the proposed KSHCP, are herein incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR 402.14 (i). Such terms and conditions are nondiscretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the act to apply.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The Service has no conservation recommendations over and above the conservation measures set forth in the KCHCP and associated PIPs.

REINITIATION-CLOSING STATEMENT

This concludes formal consultation on the Service's proposed approval of the KSHCP and associated PIPs, and issuance of multiple ITPs for implementation of the KSHCP as outlined in this BiOp. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) if the amount or extent of taking specified in the incidental take statement is exceeded; (2) if new information reveals effects of the action that may affect listed

species or critical habitat in a manner or to an extent not previously considered; (3) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or (4) if a new species is listed or critical habitat designated that may be affected by the identified action.

If you have any questions regarding any of the information contained in this BiOp, please contact the Pacific Islands Fish and Wildlife Office at 808-792-9400.

LITERATURE CITED

Ainley, D. 1984. Storm-petrels. *In* Seabirds of Eastern North Pacific and Arctic waters. Pacific Search Press, Seattle, WA.

Adams, J., D.G. Ainley, J.F. Penniman, and H.B. Freifeld. 2009. Summer movements of ʻuaʻu (Hawaiian petrel; *Pterodroma sandwichensis*) nesting on Haleakalā, Maui and Lānaʻi: can we use satellite tracking to gain new information and advise conservation management? (Draft Interim Summary Report for TE-145562-2). U.S. Geological Survey, Western Ecological Research Center, Moss Landing, California.

Ainley, D.G., T.C. Telfer, and M.H. Reynolds. 1997a. Townsend's and Newell's shearwater (*Puffinus auricularis*). *In* The Birds of North America 20.

Ainley, D.G., R. Podolsky, L. DeForest, and G.Spencer. 1997b. New insights into the status of the Hawaiian petrel on Kauaʻi. *Colonial Waterbirds* 20:24-30.

Ainley, D.G., Walker, W.A., Spencer, G.C., and N.D. Holmes. 2014. The prey of Newell's shearwater *Puffinus newelli* in Hawaiian waters. *Marine Ornithology* 44:69-72.

Ainley, D.G., R. Podolsky, L. de Forest, G. Spencer, and N. Nur. 1995. Kauaʻi endangered seabird study volume 2. The ecology of dark-rumped petrels and Newell's shearwater on the island of Kauaʻi, Hawaiʻi. Final Report prepared for Electric Power Research Institute, Palo Alto, California. Prepared by Point Reyes Bird Observatory, Stinson Beach, California.

Ainley, D.G., R. Podolsky, L. de Forest, G. Spencer, and N. Nur. 2001. The status and population trends of the Newell's Shearwater on Kauaʻi: Insights from modeling. Pages 108-123. Studies in Avian Biology.

Ainley, D.G., E. Porzig, D. Zajanc, and L.B. Spear. 2015. Seabird flight behavior and height in response to altered wind strength and direction. *Marine Ornithology* 43:25–36.

Allan, R.G. 1962. The Madeiran storm petrel *Oceanodroma castro*. *Ibis* 103b:274–295.

Anderson, T. 2015. Save Our Shearwaters Program, 2014 Annual Report. Kauaʻi Humane Society prepared for Kauaʻi Island Utility Cooperative. 52 pp.

Antaky C.C., E.E. Conklin, R.J. Toonen, I.S.S. Knapp, and M.R. Price. 2020. Unexpectedly high genetic diversity in a rare and endangered seabird in the Hawaiian Archipelago. *PeerJ* 8:e8463 DOI 10.7717/peerj.8463

Asner, G.P., R.F. Hughs, P.M. Vitousek, D.E. Knapp, T. Kennedy-Bowdoin, J. Boardman, R.E. Martin, M. Eastwood, and R.O. Green. 2008. Invasive plants transform the three-dimensional structure of rain forests. *Proceedings of the National Academy of Sciences* 105:4519–4523.

Austin, O.L. 1952. Notes on some petrels of the North Pacific. *In* Bulletin of the Museum of Comparative Zoology at Harvard College, vol. 107, no. 7, Cambridge. Pp. 391–407.

Banfield, N.K., A.F. Raine, and B. McFarland. 2013. Auditory surveys for endangered seabirds on Kaua‘i. Annual Report 2012. Kaua‘i Endangered Seabird Recovery Project. Pacific Cooperative Studies Unit, University of Hawai‘i, and Division of Forestry and Wildlife, State of Hawai‘i, Department of Land and Natural Resources, Hawai‘i, USA.

Banko, W.E., P.C. Banko, and R.E. David. 1991. Specimens and probably breeding activity of the band-rumped storm-petrel on Hawai‘i. *Wilson Bulletin* 103:650–655.

Berger, A. J. 1972. Hawaiian birdlife. University Press of Hawai‘i, Honolulu, Hawai‘i. 270 pp.

BirdLife International. 2016. Species factsheet: *Puffinus auricularis*. Downloaded from http://www.birdlife.org on 08/19/2016, accessed 1 August 2016.

Bolton, M., A.L. Smith, E. Gómez-Diaz, V.L. Friesen, R. Medeiros, J. Bried, J.L. Roscales, and R.W. Furness. 2008. Monteiro’s storm-petrel *Oceanodroma monteiroi*: a new species from the Azores. *Ibis* 150:717-727.

Bried, J., D. Pontier, and P. Jouventin. 2003. Mate fidelity in monogamous birds: a re-examination of the Procellariiformes. *Animal Behaviour* 65:235–246.

Brooke, M. 1990. The Manx shearwater. London: A & C Black Publishers Ltd. 264 pp.

Browne, R.A., D.J. Anderson, J.N. Houser, F. Cruz, K.J. Glasgow, C.N. Hodges, and D.G. Massey. 1997. Genetic diversity and divergence of endangered Galapagos and Hawaiian petrel populations. *Condor* 99:812–815.

Buxton, R.T., C. Jones, H. Moller, and D.R. Towns. 2014. Drivers of seabird population recovery on New Zealand islands after predator eradication. *Conservation Biology* 28:333-344.

Cadiou, B. 2001. The breeding biology of the European storm-petrel *Hydrobates pelagicus* in Brittany, France. Atlantic Seabirds 3:149-164.

Cooper, B.A., and R.H. Day. 1998. Summer behavior and mortality of dark-rumped petrels and Newell’s shearwaters at power lines on Kaua‘i. *Colonial Waterbirds* 21:11-19.

Cooper, B.A., M.G. Raphael, and D.E. Mack. 2001. Radar-based monitoring of marbled murrelets. *The Condor* 103(2):219–229.

Craig, M. 2016. Kaheawa Wind Power I Habitat Conservation Plan, Annual Report: FY 2016. Kaheawa Wind Power I, LLC. Wailuku, Hawai‘i. 50 pp.

Croxall, J.P., S.H.M. Butchart, B. Lascelles, A.J. Stattersfield, B. Sullivan, A. Symes, and P. Taylor. 2012. Seabird conservation status, threats and priority actions: a global assessment. Bird Conservation International 22:1-34.

Day, R.H., and B.A. Cooper. 1995. Patterns of movement of dark-rumped petrels and Newell's shearwaters on Kaua‘i. *The Condor* 97:1011–1027.

Day, R.H., B.A. Cooper, and T.C. Telfer. 2003. Decline of Townsend's (Newell's) shearwaters (*Puffinus auricularis newelli*) on Kaua‘i, Hawai‘i. *The Auk* 120: 669–679.

del Hoyo, J., A. Elliot, and J. Sargatal. 1992. Handbook of the birds of the world, vol. 1: ostrich to ducks. Lynx Edicions, Barcelona, Spain.

del Hoyo, J., N.J. Collar, D.A. Christie, A. Elliott, and L.D.C. Fishpool. 2014. HBW and BirdLife International illustrated checklist of the birds of the world. Lynx Editions BirdLife International.

DLNR. 2016. Save Our Shearwaters Database: 1979-2015. Unpublished data available through the DLNR, Division of Forestry and Wildlife, Līhu‘e, Hawai‘i. 2016.

Dunning, J.B. 2008. CRC handbook of avian body masses, second edition. CRC Press, Boca Raton.

Fraser, G.S., J. Russell, G.J. Robertson, R. Bryant, and D.A. Fifield. 2013. Prospects for the Manx shearwater colony on Middle Lawn Island, Newfoundland, Canada. *Marine Ornithology* 41:137-140.

Furness, R. 2003. Impacts of fisheries on seabird communities. *Scientia Marina* 67:33-45.

Galase, N.K. 2019. First confirmed band-rumped storm petrel *Oceanodroma castro* colony in the Hawaiian Islands. *Marine Ornithology* 47:25–28.

Gill, F. and D. Donsker (eds.). 2016. Loons, penguins, petrels at World Bird List Version 6.3. International Ornithologists' Union. http://www.worldbirdnames.org/bow/loons/, accessed 1 August 2016.

Griesemer, A., and N. Holmes. 2011. Newell's shearwater population modeling for Habitat Conservation Plan and Recovery Planning the Hawai'i-Pacific Islands Cooperative Ecosystem Studies Unit & Pacific Cooperative Studies Unit, University of Hawai'i, Honolulu, Hawai'i. Technical Report 176:1-68.

Harris, M. P. 1966. Breeding biology of the Manx shearwater *Puffinus puffinus. Ibis* 17-33.

Harrison, C., T. Telfer, and J. Sincock. 1990. The status of Harcourt's storm-petrel (*Oceanodroma castro*) in Hawai'i. 'Elepaio, Journal of the Hawai'i Audubon Society 50.

Henshaw, H.W. 1902. *Oceanodroma castro* (Harcourt). Ake-ake. Hawaiian stormy petrel. *In* Birds of the Hawaiian Islands being a complete list of the birds of the Hawaiian possessions with notes on their habits, published by Thos. G. Thrum Honolulu. Pp. 118-119.

Holmes, N., and T. Joyce. 2009. Hawaiian petrel *Pterodroma sandwichensis* on Kaua'i: submission to Fish and Wildlife Service for 5-year review of Hawaiian endangered species.

Hodges, C.S.N., and R.J. Nagata. 2001. Effects of predator control on the survival and breeding success of the endangered Hawaiian dark-rumped petrel. Pp. 308–318 *In* Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A vanishing avifauna. (J. M. Scott, S. Conant, and C. Van Riper, III, eds.) Studies in Avian Biology No. 22. Cooper Ornithological Society, Camarillo, California.

Holmes, N., and J. Troy. 2008. Reduction in the breeding range of Newell's shearwater on Kaua'i, Hawai'i: evidence and insights from field surveys and GIS modeling, poster presentation. International Albatross and Petrel Conference, Capetown, South Africa.

Holmes, N., H. Freifeld, F. Duvall, M. Laut, A.F. Raine, J. Penniman, D. Hu, and C.N. Bailey. 2015. Newell's shearwater, Hawaiian petrel, and band-rumped storm-petrel recovery: five-year action plan. USFWS:1-6.

Hu, D., C. Glidden, J.S. Lippert, L. Schnell, J.S. MacIvor, and J. Meisler. 2001. Habitat use and limiting factors in a population of Hawaiian dark-rumped petrels on Mauna Loa, Hawai'i. *In* Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A vanishing avifauna. (J.M. Scott, S. Conant, and C. Van Riper, III, eds.) Studies in Avian Biology No. 22. Cooper Ornithological Society, Camarillo, California. Pp. 234-242.

IPCC 2014a. Climate change 2014: synthesis report. Contribution of working groups I, II and III to the fifth assessment report of the Intergovernmental Panel on Climate Change [core writing team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

IPCC 2014b. Climate change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1132 pp.

James, P.C. and H.A. Robertson. 1985. The calls of male and female Madeiran storm-petrels (*Oceanodroma castro*). *The Auk* 102:391-393.

Jones, H., and S. Kress. 2012. A review of the world's active seabird restoration projects. The *Journal of Wildlife Management* 76:2-9.

Joyce, T. W. 2013. Abundance estimates of the Hawaiian petrel (*Pterodroma sandwichensis*) and Newell's Shearwater (*Puffinus newelli*) based on data collected at sea, 1998-2011. Page 31. Scripps Institution of Oceanography, La Jolla, California, La Jolla, CA.

Joyce, T. and N. Holmes. 2010. Band-rumped storm-petrel *Oceanodroma castro* on Kaua'i: submission to Fish and Wildlife Service for 2010 species assessment and endangered species listing priority. 3 pp.

[KESRP] Kaua'i Endangered Seabird Recovery Project. 2017. Band-rumped storm-petrel factsheet. Retrieved from http://kauaiseabirdproject.org/index.php/the-birds/banp-fact-sheet/, accessed 1 August 2016.

King, W. B., and P. J. Gould. 1967. The status of Newell's race of the Manx shearwater. *The Living Bird* 6:163-186.

Lande, R. 1988. Genetics and demography in biological conservation. *Science* 241:1455–1460.

Martin, M., R. Raid, and L. Branch. 2014. Barn owl (*Tyto alba*). Wildlife Ecology and Conservation Department, Florida.

Martínez-Gómez, J.E., N. Matías-Ferrer, R.N.M. Sehgal, and P. Escalante. 2015. Phylogenetic placement of the critically endangered Townsend's Shearwater (*Puffinus auricularis auricularis*): evidence for its conspecific status with Newell's Shearwater (*Puffinus a. newelli*) and a mismatch between genetic and phenotypic differentiation. *Journal of Ornithology* 156:1025-1034.

McIver, W. R., H. R. Carter, H. A.L, D. M. Marzurkiewicz, and J. Mason. 2016. Use of Social Attraction to Restore Ashy Storm-petrels Oceanodroma Homochroa at Orizaba Rock, Santa Cruz Island, California. Marine Ornithology 44:99-112.

McKown, M., and D. Savage. 2015. Exploratory acoustic surveys for Hawaiian petrel, Newell's shearwater, and barn owl in East Maui, Hawai'i. Conservation Metrics Inc. Prepared for Maui Nui Seabird Recovery Project. 25 pp.

Mitchell, C., C. Ogura, D. Meadows, A. Kane, L. Strommer, S. Fretz, D. Leonard, and A. McClung. 2005. Hawai'i's comprehensive wildlife conservation strategy. Department of Land and Natural Resources. Honolulu, Hawai'i. 722 pp.

Monteiro, L. R., and R. W. Furness. 1998. Speciation through temporal segregation of Madeiran storm petrel (*Oceanodroma castro*) populations in the Azores? Philosophical Transactions of the Royal Society of London B 353:945-953.

Mougin, J.L., C. Jouanin, and F. Roux. 1997. Intermittent breeding in Cory's shearwater *Calonectris diomedea* of Selvagem Grande, North Atlantic. *Ibis* 139:40-44.

[NPS] National Park Service. 2012. Information for programmatic Section 7 consultation, Haleakalā National Park. Makawao, Maui, Hawai'i. 171 pp.

Norbury, G., A. Hutcheon, J. Reardon, and A. Daigneault. 2014. Pest fencing or pest trapping: A bio-economic analysis of cost-effectiveness. *Austral Ecology* 39:795-807.

Olson, S.L. 1992. Appendix C, Survey of Kaho'olawe for bones of extinct birds. *In* Biological database & reconnaissance survey of Kaho'olawe Island including rare plants, animals and natural communities, The Nature Conservancy of Hawai'i, Consultant Report No. 6, Kaho'olawe Island Reserve Commission. Pp. 108–117.

Olson, S.L. and H.F. James. 1982. Prodromus of the fossil avifauna of the Hawaiian Islands. *Smithsonian Contributions to Zoology* 365:1-59.

Oro, D. 2014. Seabirds and climate: Knowledge, pitfalls, and opportunities. *Frontiers in Ecology and Evolution* 2.

[PRC] Pacific Rim Conservation. 2017. Annual report 2016. Unpublished report; Honolulu, Hawai'i.

Phillips, R. and B. Lucey. 2016. Kaua'i mongoose standard operating procedures to conduct and island-wide status assessment and early detection rapid response. U.S. Fish and Wildlife Service and Kaua'i Invasive Species Committee. 25 pp.

Podolsky, R., D.G. Ainley, G. Spencer, L. Deforest, and N. Nur. 1998. Mortality of Newell's shearwaters caused by collisions with urban structures on Kaua'i. *Colonial Waterbirds* 21(1): 20-34.

Pratt, H.D. 1994. Avifaunal change in the Hawaiian Islands, 1983-1993. Studies in avian biology No. 15: 103-118. Cooper Ornithological Society, Camarillo, California.

Pyle, R.L., and P. Pyle. 2009. The birds of the Hawaiian Islands: occurrence, history, distribution, and status. B.P. Bishop Museum. Honolulu, Hawai‘i, U.S.A. Version 1 (31 December 2009).

Pyle, P., D.L. Webster, and R.W. Baird. 2016. White-rumped dark storm-petrels in Hawaiian island waters: the quandary of Leach’s vs. band-rumped storm-petrels throughout the world. Birding 47(1):58-73.

Raine, A.F., McFarland, B. 2013. Monitoring of endangered seabirds in Hono o Nā Pali Natural Area Reserve. Kaua‘i Endangered Seabird Recovery Project, State of Hawai‘i, Department of Land and Natural Resources, Division of Forestry and Wildlife, Līhu‘e, Hawai‘i, USA

Raine, A., M. Vynne, M. McFarlin, and M. Massie. 2016a. Monitoring of endangered seabirds in Hono o Nā Pali Natural Area Reserve (Part I): Pihea annual report 2015. Pacific Cooperative Studies Unit (PCSU), University of Hawai‘i and Division of Forestry and Wildlife, State of Hawai‘i Department of Land and Natural Resources, Hawai‘i, USA.

Raine, A., M. Vynne, M. McFarlin, and M. Massie. 2016b. Monitoring of endangered seabirds in Upper Limahuli Preserve: annual report 2015. Pacific Cooperative Studies Unit, University of Hawai‘i and Division of Forestry and Wildlife, State of Hawaii Department of Land and Natural Resources, Hawai‘i, USA, Kaua‘i, Hawai‘i.

Raine, A.F., N.D. Holmes, M. Travers, B.A. Cooper, R.H. Day. 2017 Declining population trends of Hawaiian petrel and Newell’s shearwater on the island of Kaua‘i, Hawai‘i, USA. *The Condor* 119(3):405-415.

Raine, A.F., M. Vynne, T. Anderson, S. Driskill, H. Raine, and J. Adams. 2018. Pilot project: assessing the effectiveness of the SOS rehabilitation program year 3. Kaua‘i Endangered Seabird Recovery Project, Pacific Cooperative Studies Unit, University of Hawai‘i and Division of Forestry and Wildlife, State of Hawai‘i Department of Land and Natural Resources, Hawai‘i, USA. 35 pp.

Raine, A.F., J. Adams, T. Anderson, M. Boone, M. Vynne, and M. McFarlin. 2017a. Pilot study II - assessing the effectiveness of the SOS rehabilitation project. Kaua‘i Endangered Seabird Recovery Project, Pacific Cooperative Studies Unit, University of Hawai‘i and Division of Forestry and Wildlife, State of Hawai‘i Department of Land and Natural Resources, Hawai‘i, USA.

Raine, A.F., T. Anderson, J. Adams, M. Vynne, and M. McFarlin. 2017b. Assessing the effectiveness of the SOS rehabilitation project - adult powerline collisions – short report. Pacific Cooperative Studies Unit, University of Hawai‘i and Division of Forestry and Wildlife, State of Hawai‘i Department of Land and Natural Resources, Hawai‘i USA, Hawai‘i.

Raine, A.F., and N. Banfield. 2015a. Monitoring of endangered seabirds in Hono o Nā Pali Natural Area Reserve I: Pihea, annual report 2014. Pacific Cooperative Studies Unit, University of Hawai‘i, and Division of Forestry and Wildlife, State of Hawai‘i, Department of Land and Natural Resources, Hawai‘i, USA.

Raine, A. F., N. Banfield, and M. Vynne. 2014. 2014 Endangered seabird colony surveys – constructing a predator proof fence at Kīlauea Point National Wildlife Refuge.

Raine, A.F., and N.K. Banfield. 2015b. Monitoring of endangered seabirds in Hono o Nā Pali Natural Area Reserve (Part II): Pōhākea. Pacific Cooperative Studies Unit, University of Hawai‘i and Division of Forestry and Wildlife, State of Hawai‘i Department of Land and Natural Resources, Hawai‘i, USA.

Raine, A.F., and N.K. Banfield. 2015c. Monitoring of Endangered Seabirds in Hono o Nā Pali Natural Area Reserve III: North Bog. Pacific Cooperative Studies Unit, University of Hawai‘i and Division of Forestry and Wildlife, State of Hawai‘i Department of Land and Natural Resources, Hawai‘i, USA.

Raine, A.F., M. Boone, M. McKown, and N. Holmes. 2017c. The breeding phenolgy and distribution of the band-rumped Storm-petrel, *Oceanodroma Castro*, on Kaua‘i and Lehua Islet, Hawaiian Islands. *Marine Ornithology* 45:73-82.

Raine, A.F. S. Driskill, J.Rothe, and S. Rossiter. 2020. Monitoring of endangered seabirds on Lāna‘i, annual report 2019. Unpublished report. 108 pp.

Raine, A.F., N. Holmes, M. Travers, B.A. Cooper, and R.H. Day. 2017d. Declining population trends of Hawaiian petrel and Newell’s shearwater on the island of Kaua‘i, Hawai‘i, USA. *The Condor* 119.

Raine, A.F., B. McFarland, M. Boone, and N. Banfield. 2017e. An Updated Avifauna of Moku ‘ae‘ae Rock Islet, Kaua‘i. *Pacific Science* 71:67-76.

Raine, A.F., M. Travers, and A. Griesemer 2015. Site visit to Kōke‘e Air Force Base – 9th September 2015. Unpublished report, Pacific Cooperative Studies Unit, University of Hawai‘i and Division of Forestry and Wildlife, State of Hawai‘i Department of Land and Natural Resources, Hawai‘i, USA.

Raine, A.F., M. Vynne, and M. Boone. 2016c. Seabird monitoring at Kōkeʻe Air Force Station – 2016 annual report. Pacific Cooperative Studies Unit, University of Hawaiʻi and Division of Forestry and Wildlife, State of Hawaiʻi Department of Land and Natural Resources, Hawaiʻi, USA.

Raine, A.F., M. Vynne, and M. Boone. 2017f. Monitoring of endangered seabirds in Hono O Nā Pali Natural Area Reserve (Part II): Pōhākea. Pacific Cooperative Studies Unit, University of Hawaiʻi and Division of Forestry and Wildlife, State of Hawaiʻi Department of Land and Natural Resources, Hawaiʻi, USA.

Raine, A.F., M. Vynne, and M. Boone. 2017g. Monitoring of endangered seabirds in Hono O Nā Pali Natural Area Reserve (Part III): North Bog. Pacific Cooperative Studies Unit, University of Hawaiʻi and Division of Forestry and Wildlife, State of Hawaiʻi Department of Land and Natural Resources, Hawaiʻi, USA.

Raine, A.F., M. Vynne, and M. Boone. 2017h. Monitoring of endangered seabirds in Hono O Nā Pali Natural Area Reserve I : Pihea. Pacific Cooperative Studies Unit, University of Hawaiʻi and Division of Forestry and Wildlife, State of Hawaiʻi Department of Land and Natural Resources, Hawaiʻi, USA.

Raine, A.F., M. Vynne, and M. Boone. 2017i. Monitoring of endangered seabirds in Upper Limahuli Preserve. Pacific Cooperative Studies Unit, University of Hawaiʻi and Division of Forestry and Wildlife, State of Hawaiʻi Department of Land and Natural Resources, Hawaiʻi, USA.

Raine, A.F., M. Vynne, M. McFarlin, and M. Massie. 2016d. Monitoring of endangered seabirds in Hono o Na Pali Natural Area Reserve (Part II): Pohakea, annual report 2015. Kauaʻi Endangered Seabird Recovery Project. Pacific Cooperative Studies Unit, University of Hawaiʻi, and Division of Forestry and Wildlife, State of Hawaiʻi, Department of Land and Natural Resources, Hawaiʻi, USA.

Raine, A.F., M. Vynne, M. McFarlin, and M. Massie. 2016e. Monitoring of endangered seabirds in Hono o Nā Pali Natural Area Reserve (Part III): North Bog, annual report 2015 - Kauaʻi Endangered Seabird Recovery Project, Kauaʻi Endangered Seabird Recovery Project. Pacific Cooperative Studies Unit, University of Hawaiʻi, and Division of Forestry and Wildlife, State of Hawaiʻi, Department of Land and Natural Resources, Hawaiʻi, USA.

Raine, A. F., M. Vynne, S. Driskill, and E. Pickett. 2018. Monitoring of Endangered Seabirds in Hono o Nā Pali Natural Area Reserve IV: Hanakāpīʻai Annual Report 2017.

Reed, J.R., J.L. Sincock, and J.P. Hailman. 1985. Light Attraction in Endangered Procellariiform Birds: Reduction by Shielding Upward Radiation. *The Auk* 102:377-383.

Reynolds, M.H., and G.L. Ritchotte. 1997. Evidence of Newell's shearwater breeding in Puna district, Hawai'i. *Journal of Field Ornithology* 68(1):26-32.

Ridgeway, R. 1882. Description of a new flycatcher and a supposed new petrel from the Sandwich Islands. Proceedings of the United States National Museum 337-338.

Sandvik, H., K.E. Erikstad, and B. Saether. 2012. Climate affects seabird population dynamics both via reproduction and adult survival. *Marine Ecology Progress Series* 454: 273-284.

Sanz-Aguilar, A., G. Tavecchia, R. Pradel, E. Mínguez, and D. Oro. 2008. The cost of reproduction and experience-dependent vital rates in a small petrel. *Ecology* 89:3195-3203.

Scott, J.M., S. Mountainspring, F.L. Ramsey, and C.B. Kepler. 1986. Forest bird communities of the Hawaiian Islands: their dynamics, ecology, and conservation. In Studies in Avian Biology, vol. 9, R.J. Raitt and J.P. Thompson (eds.), Cooper Ornithological Society, Lawrence. Pp. 115, 168, 360–363.

Sibley C.G. and B.L. Monroe. 1993. A supplemental guide to distribution and taxonomy of birds of the world. Yale University Press. ISBN: 0300055498, 9780300055498.

Simons, T.R. 1984. A population model of the endangered Hawaiian dark-rumped petrel. *Journal of Wildlife Management* 48:1065-1076.

Simons, T.R. 1985. Biology and behavior of the endangered Hawaiian dark-rumped petrel. *The Condor* 87:229-245.

Simons, T.R, and C.N. Hodges. 1998. Dark-rumped petrel (*Pterodroma phaeopygia*). *In* The Birds of North America, No. 345, edited by A. Poole and F. Gill. The Birds of North America, Inc. Philadelphia, PA.

Sincock, J.L., and G.E. Swedberg. 1969. Rediscovery of the nesting grounds of the Newell's manx shearwater (*Puffinus puffinus newelli*) with initial observations. *The Condor* 7:69-71.

Slotterback, J.W. 2002. Band-rumped storm-petrel, *Oceanodroma castro*. *In* The Birds of North America, No. 673, A. Poole and F. Gill (eds.), Philadelphia. Pp. 1-28.

Soulé, M.E. 1987. Viable populations for conservation. Cambridge University Press; Cambridge, United Kingdom and New York, NY, USA.

Spear, L.B., D.G. Ainely, and W.A. Walker. 2007. Foraging dynamics of seabirds in the Eastern Tropical Pacific Ocean. *Studies in Avian Biology* 35: 1-99.

Spear, L.B., D.G. Ainley, N. Nur, and S.T.N.G. Howell. 1995. Population size and factors affecting at-sea distributions of four endangered Procellariids in the Tropical Pacific. *The Condor* 97:613–638.

Spencer, G. 2010. 2009 Makamaka‘ole seabird mitigation activities, final report under Kaheawa Wind Power Habitat Conservation Plan. Kaheawa Wind Power, LLC. 8 pp.

Stearns, S.C. 1977. The evolution of life history traits: a critique of the theory and a review of the data. Annual Review of Ecology and Systematics 8: 145-171.

Stejneger, L. 1887. Birds of Kaua‘i Island, Hawaiian archipelago, collected by Mr. Valdemar Knudsen, with descriptions of new species. Proceedings of the United States National Museum. Pp. 75-102.

SWCA. 2019. Kaheawa Wind Power II Draft Habitat Conservation Plan (Amended).

Telfer, T.C., J.L. Sincock, V.G. Byrd, and J.R. Reed. 1987. Attraction of Hawaiian seabirds to lights: Conservation efforts and effects of moon phase. Wildlife Society Bulletin 15:406-413.

Tetra Tech. 2018. Kawailoa Wind Power Habitat Conservation Plan FY 2018 Annual Report. Prepared for Kawailoa Wind, LLC.

Tomich, P.Q. 1986. Mammals in Hawai‘i: a synopsis and notational bibliography. Bishop Museum Press, Honolulu. Pp. 37–45, 93–97, 101–102, 120–126, 131–134, 140–150, 152–163.

Travers, M., S. Theis, and A.F. Raine. 2013. Underline monitoring project annual report 2012. Kaua‘i Endangered Seabird Recovery Project. Pacific Cooperative Studies Unit, University of Hawai‘i, and Division of Forestry and Wildlife, State of Hawai‘i, Department of Land and Natural Resources, Hawai‘i, USA.

Travers, M., D. Golden, A. Stemen, and A. Raine. 2016. Underline Monitoring Project Draft Annual Report. 2015 Field Season.

Travers, M., A. Shipley, M. Dusch, and A.F. Raine. 2014. Underline monitoring project annual report – 2013 field season. Kaua‘i Endangered Seabird Recovery Project. Pacific Cooperative Studies Unit, University of Hawai‘i, and Division of Forestry and Wildlife, State of Hawai‘i, Department of Land and Natural Resources, Hawai‘i, USA.

Travers, M., A. Shipley, M. Harris, D. Golden, N. Galase, and A. F. Raine. 2015. Underline monitoring project annual report – 2014 field season. Kaua‘i Endangered Seabird Recovery Project. Pacific Cooperative Studies Unit, University of Hawai‘i, and Division of Forestry and Wildlife, State of Hawai‘i, Department of Land and Natural Resources, Hawai‘i, USA.

Troy, J.R., N.D. Holmes, and M.C. Green. 2011. Modeling artificial light viewed by fledgling seabirds. *Ecosphere* 2(10):109.

Troy, J.R., Holmes, N.D., Joyce, T., Behnke, J.H. & Green, M.C. 2016. Characteristics associated with Newell's shearwater (*Puffinus newelli*) and Hawaiian petrel (*Pterodroma sandwichensis*) burrows on Kaua‘i, Hawai‘i, USA. *Waterbirds* 39:199-204.

Troy, J.R., N.D. Holmes, J.A. Veech, A.F. Raine, and M.C. Green. 2014. Habitat suitability modeling for the Newell's Shearwater on Kaua‘i. *Journal of Fish and Wildlife Management* 5:315-329.

[USAF] U.S. Air Force. 2016. Biological assessment, continuing operations at Kōke‘e Air Force Station and Microwave Antenna Site, Kaua‘i. Unpublished report prepared for the U.S. Fish and Wildlife Service, Honolulu, Hawai‘i.

[USFWS] U.S. Fish and Wildlife Service. 1983. Recovery plan for Hawaiian dark-rumped petrel and Manx shearwater. United States Fish and Wildlife Service.

[USFWS] U.S. Fish and Wildlife Service. 2005. Regional seabird conservation plan, Pacific Region., U.S. Fish and Wildlife Service, Migratory Birds and Habitats Programs, Pacific Region.

[USFWS] U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; endangered status for 49 species from the Hawaiian Islands. U.S. Federal Register Docket No. FWS-R1-ES-2015-0125;4500030113.

[USFWS] U.S. Fish and Wildlife Service. 2017a. Appendix II. Modelling methods and results used to inform the Newell's shearwater landscape strategy. U.S. Fish and Wildlife Service.

[USFWS] U.S. Fish and Wildlife Service. 2017b. Biological opinion and informal consultation of the U.S. Fish and Wildlife Service for the proposed continuing operations at Kōke‘e Air Force Station and Microwave Antenna Site, Island of Kaua‘i. Honolulu.

[USFWS] U.S. Fish and Wildlife Service. 2017c. Newell's shearwater landscape strategy. U.S. Fish and Wildlife Service.

VanderWerf, E.A., K.R. Wood, C. Swenson, and M. LeGrande. 2007. Avifauna of Lehua Islet, Hawai‘i: conservation value and management needs. 14 pp.

VanZandt, M., D. Delparte, P. Hart, F. Duvall, and J. Penniman. 2014. Nesting characteristics and habitat use of the endangered Hawaiian petrel (*Pterodroma sandwichensis*) on the island of Lāna‘i. *Waterbirds* 37(1):43-51.

Vorsino, A.E. 2020. USFWS NESH and HAPE Kaua‘i population number projection – Brief – Draft2. Unpublished report. U.S. Fish and Wildlife Service. 108 pp.

Warham, J. 1977. Wing loadings, wing shapes, and flight capabilities of Procellariiformes. *New Zealand Journal of Zoology* 4: 73–83.

Warham J. 1996. The behaviour, population biology and physiology of the petrels. San Diego: Academic Press Inc.

Wood, K., M. LeGrande, and D. Boynton. 2001a. Kaua‘i diverse mesic cliff and forest, Pohakuao Valley, Kaua‘i. Report to U.S. Fish and Wildlife Service. National Tropical Botanical Garden, Kalāheo, Hawai‘i.

Wood, K., M. LeGrande, and D. Boynton. 2001b. Kaua‘i diverse mesic cliff and forest, Pohakuao Valley, Kaua‘i, Hawai‘i and observations of band-rumped storm-petrel (*Oceanodroma castro*) nesting sites. Technical Report prepared for the Department of Land and Natural Resources, Division of State Parks.

Wood, K., D. Boynton, E. VanderWerf, L. Arnold, M. LeGrande, J. Slotterback, and D. Kuhn. 2002. The distribution and abundance of the band-rumped storm-petrel (*Oceanodroma castro*): A preliminary survey on Kaua‘i, Hawai‘i. Report to the US Fish and Wildlife Service, Pacific Islands Office, Honolulu, Hawai‘i. Available from US Fish and Wildlife Service.

Young, L. and E. VanderWerf. 2014. Feasibility assessment of predator exclusion fencing to protect Newell’s shearwater and Hawaiian petrel nesting locations on Kaua‘i. Pacific Rim Conservation. Honolulu, Hawai‘i. 38 pp.

Young, L.C. and VanderWerf, E.A. 2016 Habitat suitability assessment for listed seabirds in the main Hawaiian Islands. Report for the U.S. Fish and Wildlife Service. 33 pages

Young, L. C, E.A. VanderWerf, M.T. Lohr, C.J. Miller, A.J. Titmus, D. Peters, and L. Wilson. 2013. Multi-species predator eradication within a predator-proof fence at Ka‘ena Point, Hawai‘i. *Biological Invasions* 15: 2627-2638.

Young, L.C., VanderWerf, E.A., McKown, M., Roberts, P., Schlueter, J., Vorsino, A., Sischo, D. 2019. Evidence of Newell's Shearwaters and Hawaiian Petrels on O'ahu, Hawai'i. *The Condor: Ornithological Applications* 121:1-7.

Personal Communications

Bailey, C. 2010. Wildlife Biologist. Haleakala National Park. Personal communication regarding potential mitigation options at Haleakala National Park.

Banko, P. 2015, in litt., Comments on proposed endangered status for the band-rumped storm-petrel, November 4, 2015.

Duvall, F. 2010. Wildlife Biologist, Division of Forestry and Wildlife, Department of Land and Natural Resources. Personal communication regarding seabirds on Maui.

Fein, C. 2009. KC Environmental, Maui consultant for National Science Foundation's Advanced Technology Solar Telescope project, Observations of Hawaiian petrels at Science City, Haleakala.

Galen Reid, 2016, Predator Control Specialist, DOFAW.

Lindsay Young, 2017, Vice President and Executive Director, Pacific Rim Conservation

Orlando, C. 2015, in litt., National Park Service comments on plant species proposed for listing that occur in Hawai'i Volcanoes National Park. November 9, 2015.

Penniman, J. 2012. Hawai'i Department of Land and Natural Resources, Division of Forestry and Wildlife, Maui Seabird Biologist. Information regarding status of seabirds on Lanai and success of fence marking polytape at reducing seabird collision risk.

Penniman, J. 2015. Hawai'i Department of Land and Natural Resources, Division of Forestry and Wildlife, Maui Seabird Biologist. Information regarding the proposed rule to list the band-rumped storm-petrel.

Raine, A. 2015, in litt. Project manager for the Kaua'i Endangered Seabird Recovery Project's comments on the band-rumped storm-petrel, proposed for listing. November 2015.

APPENDIX A: Informal Consultation Findings for the Proposed KSHCP and Associated PIPs.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai‘i 96850

In Reply Refer To:
01EPIF00-2020-I-0266

May 17, 2020

To: Assistant Regional Director, Ecological Services
DOI Regions 9 and 12
Portland, Oregon

From: Acting Field Supervisor, Pacific Islands Fish and Wildlife Office
Honolulu, Hawai‘i MICHELLE BOGARDUS Digitally signed by MICHELLE BOGARDUS Date: 2020.05.17 22:37:43 -10'00'

Subject: Informal Consultation Findings regarding the Service's Proposed Approval of the Kaua‘i Seabird Habitat Conservation Plan (KSHCP) and associated Participant-Inclusion-Plans (PIPs), and Issuance of Incidental Take Permits (ITPs)

This document transmits the U.S. Fish and Wildlife Service's (Service) informal consultation findings regarding the subject action. Formal consultation findings on the subject action are presented in a Biological Opinion (01EPIF00-2020-F-0180) prepared under separate cover and dated (May 17, 2020). At issue are the effects of the proposed issuance of ITPs and implementation of the KSHCP on the federally threatened Central North Pacific distinct population segment (DPS) of the green sea turtle (*Chelonia mydas*) (hereafter green sea turtle) at KSHCP Participant facilities, as well as on the following listed species at the Kahuama‘a Seabird Preserve (Preserve): endangered ‘akeke‘e (*Loxops caeruleirostris*), threatened ‘i‘iwi (*Drepanis coccinea*) (collectively referred to as Hawaiian forest birds); endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*); and the following endangered plants: *Chamaesyce eleanoriae*, *Chamaesyce remyi* var. *remyi*, *Dubautia kalalauensis*, *Euphorbia haeleeleana*, *Exocarpos luteolus*, *Euphorbia remyi* var. *remyi*, *Gouania meyenii*, *Hibiscadelphus woodii*, *Labordia helleri*, *Lysimachia scopulensis*, *Melicope pallida*, *Melicope puberula*, *Myrsine knudsenii*, *Myrsine linearifolia*, *Nothocestrum peltatum*, *Plantago princeps*, *Platydesma rostrata*, *Poa mannii*, *Poa siphonoglossa*, *Polyscias flynnii*, *Psychotria grandiflora*, *Pteralyxia kauaiensis*, *Remya kauaiensis*, *Remya montgomeryi*, *Schiedea attenuata*, *Schiedea kauaiensis*, *Schiedea membranacea*, *Solanum sandwicense*, *Stenogyne campanulata*, *Stenogyne kealiae*, and *Tetraplasandra flynii* (collectively referred to as Hawaiian plants).

For the reasons discussed below, the Service has determined that the subject action may affect, but is not likely to adversely affect the above listed species and the following designated critical

habitat units that occur within or adjacent to the Preserve: Kaua‘i 11—*Euphorbia haeleeleana*—b, Kaua‘i 11—*Exocarpos luteolus*—c, Kaua‘i 11—*Exocarpos luteolus*—e, Kaua‘i 11—*Flueggea neowawraea*—a, Kaua‘i 11—*Gouania meyenii*—b, Kaua‘i 11—*Melicope pallida*—b, Kaua‘i 11—*Myrsine linearifolia*—e, Kaua‘i 11—*Nothocestrum peltatum*—c, Kaua‘i 11—*Plantago princeps*—b, Kaua‘i 11—*Poa mannii*—d, Kaua‘i 11—*Poa siphonoglossa*—a, Kaua‘i 11—*Pteralyxia Kauaiensis*—e, Kaua‘i 11—*Remya Kauaiensis*—b, Kaua‘i 11—*Remya montgomeryi*—c, Kaua‘i 11—*Schiedea Kauaiensis*—b, Kaua‘i 11—*Schiedea membranacea*—b, Kaua‘i 11—*Solanum sandwicense*—a, Kaua‘i 11—*Stenogyne campanulata*—a, Kaua‘i Ecosystem—Dry Cliff—Unit 1, and Kaua‘i Ecosystem—Montane Wet—Unit 2, *Loxops caeruleirostris* Unit 5—Montane Wet, *Oreomystis bairdi* Unit 5—Montane Wet, and *Dropsphila sharpi* Unit 5—Montane Wet (collectively referred to as designated critical habitats).

This intra-Service consultation is based on information provided in the KSHCP (May 2020) and referenced in the Biological Opinion cited above and other information in our files or otherwise available and cited below. A complete decision record for this consultation is on file at the Pacific Islands Fish and Wildlife Office in Honolulu, Hawai‘i. This document was prepared in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq*.).

Project Description

The project description and action areas are the same as described in the Biological Opinion referred to above and incorporated by reference herein; a brief description is presented below. The KSHCP was developed to address light attraction impacts on listed seabirds on the island of Kaua‘i. The KSHCP also provides guidance to addresses lighting impacts on the green sea turtle, and a suite of minimization actions to reduce the effects of lighting on the Covered Species at Participant facilities. The KSHCP requires that each ITP Participant implement all of the measures that are applicable to their facility and operational needs as described in a Participant-Inclusion-Plan (PIP). Under the KSHCP, take minimization measures include: deactivating unnecessary lights; using full cut-off light fixtures (or their functional equivalent); shielding existing light fixtures; angling lights downward; lowering the light output or intensity; decrease lighting levels; using motion sensor light fixtures; decreasing the visibility of interior lights; planting vegetation around lights to reduce light visibility; and lowering the height of lights.

The KSHCP also includes the cost-shared creation and management of the Preserve, a 2-hectare, predator-free fenced enclosure in suitable seabird habitat (each permittee will contribute to the construction, operation and maintenance of the Preserve in accordance with cost-allocation formulas described in the KSCHP and their individual PIPs). Within the enclosure, terrestrial predators will be removed and excluded, and barn owls (*Tyto alba*) will also be controlled to protect seabirds nesting within the site and in neighboring source colonies throughout the Kalalau Valley. Feral cats (*Felis catus*) will also be removed at ingress points to the fenceline area and to neighboring source colonies of nesting seabirds in the Kalalau Valley. Black rats (*Rattus rattus*), Norway rats (*Rattus norvegicus*), Polynesian rats (*Rattus exulans*), feral pigs (*Sus scrofa*), black-tailed deer (*Odocoileus hemionus columbianus*), and feral goats (*Capra hirca*) will also be removed inside the Preserve fence. Eradication of non-native pest and feral ungulates will be completed within the Preserve within the first year. The Preserve fence will be regularly

monitored to ensure that predators remain excluded. Invasive plant species will also be removed from the site to optimize seabird nesting habitat. The goal of the Preserve is to implement a social attraction site for the Newell's shearwater (*Puffinus auricularis newelli*) as described in KSHCP and the Biological Opinion. After predator eradication within the fenced area is complete, artificial burrows and a speaker system will be installed.

Conservation Measures

The conservation measures described below and identified in the proposed KSHCP will be implemented at Participant facilities to avoid and minimize adverse effects to the green sea turtle. Appendix A of the KSHCP presents the Kahuama‘a Seabird Preserve Management Plan and includes comprehensive conservation measures to avoid and minimize adverse effects to Hawaiian forest birds, the Hawaiian hoary bat, listed plants, and to the function of designated critical habitats as a result of mitigation activities. The Prime Contractor for the KSHCP will also ensure that all avoidance and minimization measures are followed and, when necessary, recommend changes or additions to these measures to increase their effectiveness. Changes or additions to the avoidance and minimization measures will be included in annual KSHCP reports to the Service and the State of Hawai‘i Department of Lands and Natural Resources (DLNR) for approval and implementation under the adaptive management provisions of the KSHCP. These conservation measures are considered part of the project description considered herein. Any changes to, modifications of, or failure to implement these conservation measures may result in the need to reinitiate our intra-Service consultation.

To avoid and minimize potential adverse effects to the green sea turtle, the following measures will be implemented at Participant facilities:

- Free-roaming cats and dogs will be prohibited (i.e., cats and dogs will need to be leashed or otherwise restrained) at Participant facilities. This prohibition will be clearly communicated with appropriate signage.
- A trapping and removal program will be conducted at Participant facilities for feral cats and dogs; captured cats and dogs will be humanely removed and not returned to the participating facility, even if neutered.
- At hotels, outreach materials will be provided to inform staff and guests about the potential for nesting turtles. As many people as possible will be trained to recognize sea turtle tracks, and signs of nesting turtles. Outreach materials will discuss the timing of sea turtle nesting and hatching, other sea turtle behaviors that might be observed (e.g., basking), and laws protecting sea turtles while they are on land.
- All KSHCP participants/permittees will monitor for turtle nests if they have beachfront property with suitable habitat and visible light.
    - Surveys will be conducted between May 15 and December 15 of each year.
    - Surveys will include sandy areas of all suitable beachfront property, and consist of walking the area in the morning to look for evidence of nesting (turtle tracks, digging, presence of turtles etc.).
    - Surveys will be completed by staff or volunteers that have completed annual training provided by the Service or DLNR.

- Surveys will be completed at least once per week during the peak of the nesting season (May-July) and bi-weekly for the remainder of the nesting season (August-December).
- All sea turtle activity will be reported immediately to the Service and DLNR, and all potential nest sites shall be protected immediately using the following measures:
    - If an active turtle nest is found at a Participant facility, the permittee will turn off any lights that are visible from the nest site if possible.
    - If turning off lights is not possible:
        - Lights will be shielded so that they do not shine on the nests.
        - A temporary light-proof silt fence will be erected that will not further endanger the nest and hatchlings. "Light-proof fencing" is a temporary fence built from wooden stakes and opaque black silt fence fabric. KSHCP Participants will contact the National Oceanic and Atmospheric Administration (NOAA) Stranding Hotline and the KSHCP Prime Contractor to assist with installing the fence adjacent to nests. The fence will be tall enough to shield the visibility of lights at Participant facilities and placement will be approved by a qualified biologist (e.g., on staff at the Department of Aquatic Resources (DAR), NOAA, Division of Forestry and Wildlife (DOFAW), the Service, or a biological consultant or non-profit organization representative specified in the PIP).
    - Photographs and GPS coordinates of detected turtle nest(s) shall be documented and the fence shall be in place at least 7 days prior to the expected hatch date, or when a sandy depression develops within the defined nest area indicating that hatchling turtles are in the process of emerging. Photographs of areas around the nest site subject to night lighting shall be taken before and after the light-proof fencing is installed.
    - Active turtle nests (those at which eggs have been deposited or thought to have been deposited) will be monitored every 1-2 days.
    - Once the nest has been incubating for 45 days, monitors will begin checking the nest daily for signs of hatching to ensure that no obstacles inhibit hatchling movement from the nest to the ocean.
    - The fence will be in place and maintained daily prior to hatchling emergence to be effective. Adjustments to the fence may be made with approval of a qualified biologist.
    - After turtle hatchlings have emerged and entered the ocean, the fence shall be removed.
    - Areas seaward of the nest shall be maintained free of ocean debris and garbage on a daily basis.
    - Evidence of hatching shall be reported to the Service and DLNR within 24 hours. The Service, DLNR, or their designee, will then be responsible for final nest excavation to determine species, proportion of eggs that hatched and to send remaining eggs to NOAA for DNA analysis.
    - Nest excavations shall only be completed by the DLNR or the Service, or their designee.

- During nest surveys and nest monitoring the following data, at a minimum, shall be collected:
    - Maps of surveyed beaches which indicate:
        - The property and facilities of the Participant conducting the monitoring, and proximity to the beach that will be monitored;
        - Lights visible from the beach;
        - The general survey route along the beach;
        - Length of the beach monitored;
    - Date, names of personnel conducting the survey, time spent on the survey;
    - Outcome of the survey – the number of nests found;
    - Nests shall be mapped with a GPS unit;
    - Assessment of potential threats at the nest;
    - Status of protective measures installed (e.g., light exclusion fences) at all nests found;
    - Turtle hatching success and emergence success as determined by a final nest excavation.

To avoid and minimize the potential for adverse effects to Hawaiian forest birds, the following avoidance and minimization measures will be implemented at the Preserve:

- Pre-construction surveys will be conducted prior to installing fences, creating helicopter landing zones, installing social attraction equipment, trapping and baiting, and monitoring.
- A baseline survey will be completed to locate and document any Hawaiian forest bird nests during the breeding season January through June. These nests will be marked via GPS and identified on maps and the information transmitted to managers, other staff and the regulatory agencies.
- Any trees with Hawaiian forest bird nests along the proposed fence line will be marked and or fenced off (forest birds) and the fence re-routed to avoid impacts to the nests. Drop zones will be relocated if Hawaiian forest birds' nests are found to be within 50 meters.
- Workers will be required to know the location of marked and identified nests and maintain a 5-meter buffer around the nesting area for Hawaiian forest birds. Clearing and trimming activities will not occur within this area.
- A Prime Contractor staff member will be onsite at all time to monitor the immediate environs for Hawaiian forest bird nests, or breeding pairs in a territory. If nests are found, the tree will be flagged and no fence installation activities likely to disturb the nest will take place within a 100 meter buffer zone or until after fledging.

To avoid and minimize potential adverse effects to the Hawaiian hoary bat, the following measures will be implemented at the Preserve:

- Woody plants greater than 15 feet tall will not be disturbed, removed, or trimmed during the bat-birthing and pup-rearing season (June 1 through September 15).
- Where trees over 15 feet tall need to be removed for construction during the bat-birthing and pup-rearing season, a Fluke Ti400 thermal imager (or similar) will be used to scan

the tree or a contractor will be hired to perform an acoustic survey using bat detectors, and a visual survey to ensure that no bats with pups are present. If bats or pups are found, work will stop and the regulatory agencies will be consulted.
- No barbed wire will be used.

To avoid and minimize potential adverse effects to listed Hawaiian plants and designated critical habitats, the following measures will be implemented at the Preserve:

- Prior to fence alignment and sling-load drop zone creation, staff (including the fence contractors) will receive training from a botanist (either from the regulatory agencies or a consultant) on identification of rare plants in the area and be given oral and written instructions.
- Pre-construction baseline monitoring will be carried out to identify and or confirm all listed Hawaiian plants and their locations.
- A botanist or member of the Prime Contractor staff trained in plant identification for the localized area will be present at all times during alignment and sling-load drop zone discussions on-site as well as during construction.
- During pre-construction surveys, listed Hawaiian plants will be flagged, and staff will be provided with a map showing the location, as well as GPS points (these flags will not be left permanently as botanists are concerned that this will incite vandalism or theft, so after construction, nearby plants will be flagged instead to indicate to staff their location).
- If recommended by the Service and DOFAW, out-planting of propagules from the same population inside the fenced enclosure may occur under an approved ESA Recovery Permit.
- Prime Contractor staff and fence contractors will be required to carry, at all times, a map showing the location and or GPS points of listed plants. A 10-meter buffer zone around the plant or tree will be established, with no construction activities allowed in that area.
- If required, a culvert will be inserted into the fence in areas that might act as a watercourse during heavy rain, to avoid flooding which might wash out plants.
- Boots, clothes, packs, and gear will be cleaned between site visits to ensure that seeds are not carried from or to other areas and using a buddy system to ensure that this occurs.
- Soil and vegetation disturbance will be kept to a minimum.
- Invasive species monitoring and removal within the fence will happen on a quarterly basis with waste hauled off-site and destroyed.
- Staff will be trained to recognize invasive species and to report them to the project manager so that an action plan can be drawn up if new invasive species are encountered.
- Vehicles will be washed with soap after off-roading or after picking up mud from driving. A pressure washer with soap will be used to clean all soil off the tires and vehicle undercarriage to prevent introduction of invasive plant species.
- Tools used in other areas will be cleaned thoroughly before use in or around the site.
- Post-construction and during monitoring of the Preserve, listed Hawaiian plants will be marked and mapped. Staff will be required to carry a map and or GPS locations of the plants. If necessary, protective mini-fences will be placed around specimens to ensure that they are not accidentally trampled.

- In steep grade areas (more than 25 percent), invasive species removal and vegetation restoration will be conducted by hand rather than with machinery.
- Vegetation clearance will be timed for periods of good weather as far as practically possible.
- Re-vegetation will occur as soon as possible after clearing and within 3 months, using suitable native grass outside the fence.
- Clearing will not be conducted during heavy rain.
- If damage to vegetation and substrate are likely to occur during monitoring activities in certain areas, boardwalk sections will be placed over the area.
- Control of key seabird habitat modifiers (i.e., invasive species, especially in the maintenance phase, will be accomplished by mechanical means (i.e., physically removing) with hand tools over the use of herbicides where possible. Large patches of seabird habitat modifiers will not be removed all at once to avoid leaving large areas of bare soil. Where this is not possible, erosion and weed control cloths will be put down if appropriate.
- Where required, herbicides will be applied following instructions at minimum volumes, rather than broadcast, and during prolonged spells of dry weather and never during periods of heavy rainfall. Whenever possible (expected to be most cases), small volume bottle applicators, which delivers herbicide in very small quantities, will be used. These identified herbicides are classified as 'general use' and not 'restricted use' but will need to be applied under an herbicide application permit. Personnel conducting these activities will adhere to all label restrictions and guidelines. NOTE: Non-native vegetation removal Best Management Practices (BMPs) may be improved or adapted as new technologies become available.
- Where invasive species are within 10 meters of listed plant species, herbicides will not be used.
- The Prime Contractor staff will establish trails to and around sites occupied by listed plants to avoid adversely affecting them.

Green Sea Turtle

Green sea turtles may nest on any sandy beach area in the Pacific Islands. Nesting occurs on beaches from May through September, peaking in June and July, with hatchling turtles emerging through November and December. Optimal nesting habitat (at night-time) is a dark beach free of barriers that restrict sea turtle movement. Nesting turtles may be deterred from approaching or laying successful nests on beaches exposed to light at night or disturbance such as recreational activities. Turtles may become disoriented by artificial lighting, leading to exhaustion and placement of a nest in an inappropriate location (such as at or below the high tide line). Hatchlings that emerge from nests may also be disoriented by artificial lighting. Additionally, feral animals such as the Polynesian rat, dogs, and mongooses pose a severe threat to turtle nests and hatchlings. By implementing the above avoidance and minimization measures, it is not likely that turtles would be disoriented by nighttime lighting or subject to exposure to dogs or cats that would depredate nests or hatchlings. These measures have a track record of being effective (NMFS and Service 1998). For that reason, adverse impacts to the green sea turtle from PIP-based Covered Activities are considered to be discountable (extremely unlikely to occur) and not likely to adversely affect the green sea turtle.

Hawaiian Forest Birds

The current ranges of listed Hawaiian forest birds are predominately restricted to montane forests (above 3,500 feet in elevation) due to habitat loss and threats at lower elevations. Hawaiian forest bird habitat has been lost due to development, agriculture, grazing, wildfire, and spread of invasive habitat-altering species. Forest birds are also affected by mosquito-borne diseases. Mosquitoes are not native to Hawai‘i. Their chance of occurrence increases in areas where ungulate presence results in small pools of standing water. Actions such as road construction and development increase human access and result in increased wildfire and invasive species threats. Grazing results in reductions in woody vegetation and increased grass cover, which reduces forest habitat quality and results in increased wildfire risk on the landscape. Implementing the above avoidance and minimization measures in conjunction with activities covered under the KSHCP Preserve-based Covered Activities is likely to significantly reduce the chance of introducing invasive plant species that reach levels of abundance and distribution that degrade the capacity of forest habitats to support Hawaiian forest birds, facilitate the spread of mosquitos, or increase fire risk in areas subject to Preserve-based Covered Activities. These measures are tried and true in avoiding such outcomes (Paxton et al. 2018). On that basis, the Service concludes the proposed Preserve-based Covered Activities is not likely to adversely affect listed Hawaiian forest birds.

Hawaiian Hoary Bat

The Hawaiian hoary bat roosts in both exotic and native woody vegetation across all of the Hawaiian islands and will leave young unattended in trees and shrubs when they forage. If trees or shrubs 15 feet or taller are cleared during the pupping season, there is a risk that young bats could inadvertently be harmed or killed since they are too young to fly or may not move away from the disturbance. Additionally, Hawaiian hoary bats forage for insects from as low as 3 feet to higher than 500 feet above the ground and can become entangled in barbed wire used for fencing. By implementing the above avoidance and minimization measures, it is not probable that young bats in roost trees would be harmed by Preserve-based Covered Activities under the KSHCP during the pupping season. It is also not probable that bats would be entangled in barbed wire as a result of Preserve-based Covered Activities. These measures are tried and true in avoiding such outcomes (Service 1998). On that basis, the Service finds the proposed Preserve-based Covered Activities is not likely to adversely affect the Hawaiian hoary bat.

Listed Hawaiian Plants

Listed Hawaiian plant species face numerous threats, including: habitat destruction and modification by agriculture and development, nonnative ungulates, nonnative plants, fire, hurricanes, drought, disease and pathogens; herbivory by nonnative invertebrates, introduced small mammals and ungulates; and other factors such as small population size, reduced genetic variation, hybridization, the effects of climate change, and other stochastic factors. Preserve-based Covered activities under the KSHCP may affect listed plant species by causing physical damage to plant parts (roots, stems, flowers, fruits, seeds, etc.) as well as impacts to other life requisite features of their habitat which may result in reduction of germination, growth and/or reproduction. Cutting and removal of vegetation surrounding listed plants has the potential to

alter microsite conditions (e.g., light, moisture, and air and soil temperatures), increase the risk of invasion by nonnative plants which can result in higher incidence or intensity of fire. Activities such as grazing, use of construction equipment, vehicles, and increased human traffic (e.g., via use of trails, and monitoring activities) can cause ground disturbance, erosion, and/or soil compaction which decrease absorption of water and nutrients and damage plant root systems and may result in reduced growth and/or mortality of listed plants. Soil disturbance or removal has the potential to negatively impact the soil and seed bank of listed plant species if such species are present or historically occurred in the area subject to Preserve-based Covered Activities.

Under the proposed construction and operation of the Preserve, removal of ungulates is likely to improve soil stability as well as remove the threats of grazing and physical damage to plant parts. Also, re-vegetation with native species is expected to improve soil stability. Improved soil stability is expected to reduce erosion in the mitigation area which will reduce surface water runoff and water turbidity for Hawaiian plants located within and downslope of the Preserve. By implementing the above avoidance and minimization measures, it is not probable that: nonnative plants would be introduced; listed plant parts would be physically damaged; microsite conditions would be altered; human traffic would be increased; or ground disturbance, erosion, and or soil compaction would occur. These measures are tried and true in avoiding such outcomes (Service 2019). On that basis, the Service finds that the potential for adverse effects to listed Hawaiian plants to be caused by Preserve-based Covered Activities is discountable (extremely unlikely to occur).

<u>*Designated Critical Habitats*</u>

- Kaua‘i 11—*Euphorbia haeleeleana*—b: This unit provides habitat for two populations of 300 mature, reproducing individuals of the short-lived perennial *Euphorbia haeleeleana*, which is endemic to Kaua’i. At the time of designation, this unit supported over 120 plants of this listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species’ range and population. This site provides habitat for this species in the westernmost portion of its range. The habitat features contained in this unit that are essential for this species include, but are not limited to, lowland mixed mesic or dry *Diospyros* forest that is often co-dominated by *Metrosideros polymorpha* and *Alphitonia ponderosa*. This unit provides habitat for two populations within the multi-island historical range of this species. Protecting this habitat spreads the risk of all populations from being destroyed by one naturally-occurring catastrophic event.

- Kaua‘i 11—*Exocarpos luteolus*—c: This unit provides habitat for one population of 300 mature, reproducing individuals of the short-lived perennial *Exocarpos luteolus*. At the time of designation, this unit supported over 40 plants of this species. This unit is essential to the conservation of the taxon because it supports habitat that provides for a persistent colony of this species and includes habitat that is important for expansion of this population. The habitat features contained in this unit that are essential for this species include, but are not limited to, wet places bordering swamps or bogs; open or dry ridges in lowland or montane mesic *Acacia koa- Metrosideros polymorpha*-dominated forest communities with *Dicranopteris*. This unit is geographically separated from the

other four units designated as critical habitat for this Kaua‘i Island endemic species and spreads the risk of all populations being destroyed by one naturally-occurring catastrophe.

- Kaua‘i 11—*Gouania meyenii*—b: This unit provides habitat for two populations of 300 mature, reproducing individuals of the short-lived perennial *Gouania meyenii*. At the time of designation, this unit supported eight plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. This unit provides habitat for the westernmost portion of the species' range on Kaua‘i. The habitat features contained in this unit that are essential for this species include, but are not limited to, rocky ledges, cliff faces, and ridge-tops in dry shrubland or *Metrosideros polymorpha* lowland diverse mesic forest. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua‘i 11—*Hibiscadelphus woodii*—b: This unit provides habitat for two populations of 100 mature, reproducing individuals of the long-lived perennial *Hibiscadelphus woodii*. At the time of designation, this unit supported six plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. The habitat features contained in this unit that are essential for this species include, but are not limited to, basalt talus or cliff walls in *Metrosideros polymorpha* montane mesic forest. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua‘i 11—*Melicope pallida*—b: This unit provides habitat for two populations of 100 mature, reproducing individuals of the long-lived perennial *Melicope pallida*. At the time of designation, this unit supported 50 plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. This unit provides habitat for the westernmost portion of the species' range on Kaua‘i. The habitat features contained in this unit that are essential for this species include, but are not limited to, steep rock faces in lowland to montane mesic to wet forests or shrubland. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua‘i 11—*Myrsine linearifolia*—e: This unit is provides habitat for two populations of 100 mature, reproducing individuals of the long-lived perennial *Myrsine linearifolia*. At the time of designation, this unit supported 366 to 420 plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species. The habitat features contained in this unit that are essential for this species include, but are not limited to, diverse mesic or

wet lowland or montane *Metrosideros polymorpha* forest with *Cheirodendron* spp. or *Dicranopteris linearis* as co-dominant species. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua'i 11—*Nothocestrum peltatum*—c: This unit provides habitat for one population of 100 mature, reproducing individuals of the long-lived perennial *Nothocestrum peltatum*. At the time of designation, this unit supported five plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. The habitat features contained in this unit that are essential for this species include, but are not limited to, rich soil on steep slopes in mesic or wet forest dominated by *Acacia koa* or a mixture of *Acacia koa* and *Metrosideros polymorpha.* This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua'i 11—*Plantago princeps*—b: This unit provides habitat for one population of 300 mature, reproducing individuals of the short-lived perennial *Plantago princeps*. At the time of designation, this unit supported 18 plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. It provides habitat for the westernmost portion of the species' range on Kaua'i. The habitat features contained in this unit that are essential for this species include, but are not limited to, windswept areas near waterfalls in *Metrosideros polymorpha-Cheirodendron* montane wet forest with riparian vegetation or *Metrosideros polymorpha* lowland to montane transitional wet forest on cliffs and ridges, growing on rocky basalt outcrops. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua'i 11—*Poa mannii*—d: This unit provides habitat for two populations of 300 mature, reproducing individuals of the short-lived perennial *Poa mannii*. At the time of designation, this unit supported 205 plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. The habitat features contained in this unit that are essential for this species include, but are not limited to, cliffs or rock faces in lowland or montane mesic *Metrosideros polymorpha* or *Acacia koa-Metrosideros polymorpha* forest. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua'i 11—*Poa siphonoglossa*—a: This unit provides habitat for five populations of 300 mature, reproducing individuals of the short-lived perennial *Poa siphonoglossa*. At the time of designation, this unit supported 13 plants of the listed species. This unit is

essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. The habitat features contained in this unit that are essential for this species include, but are not limited to, shady banks on steep slopes in mesic *Metrosideros polymorpha-Acacia koa* forests. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua'i 11—*Pteralyxia kauaiensis*—e: This unit provides habitat for one population of 100 mature, reproducing individuals of the long-lived perennial *Pteralyxia kauaiensis*. At the time of designation, this unit supported 332 to 337 plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. The habitat features contained in this unit that are essential for this species include, but are not limited to, diverse mesic or *Diospyros sandwicensis* mixed mesic forests with *Pisonia* spp. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua'i 11—*Remya kauaiensis*—b: This unit provides habitat for one population of 300 mature, reproducing individuals of the short-lived perennial *Remya kauaiensis*. At the time of designation, this unit supported three plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. The habitat features contained in this unit that are essential for this species include, but are not limited to, steep, north- or northeast-facing slopes in *Acacia koa-Metrosideros polymorpha* lowland mesic forest. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua'i 11—*Remya montgomeryi*—c: This unit provides habitat for two populations of 300 mature, reproducing individuals of the short-lived perennial *Remya montgomeryi*, which is endemic to Kaua'i. At the time of designation, this unit supported 134 plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. The habitat features contained in this unit that are essential for this species include, but are not limited to, steep, north- or northeast-facing slopes or cliffs in transitional wet or *Metrosideros polymorpha*-dominated mixed mesic forest. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua'i 11—*Schiedea kauaiensis*—b: This unit provides habitat for two populations of 300 mature, reproducing individuals of the short-lived perennial *Schiedea kauaiensis*. At the time of designation, this unit supported five plants of the listed species. This unit is

essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. The habitat features contained in this unit that are essential for this species include, but are not limited to, steep slopes in diverse mesic to wet *Acacia koa-Metrosideros polymorpha* forest. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua'i 11—*Schiedea membranacea*—b: This unit provides habitat for one population of 300 mature, reproducing individuals of the short-lived perennial *Schiedea membranacea*. At the time of designation, this unit supported 24 plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. The habitat features contained in this unit that are essential for this species include, but are not limited to, cliffs or cliff bases of mesic or wet habitats, in lowland or montane shrubland, or forest communities dominated by *Acacia koa*, *Pipturus* spp. and *Metrosideros polymorpha* or *Urticaceae* shrubland on talus slopes. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua'i 11—*Solanum sandwicense*—a: This unit provides habitat for five populations of 300 mature, reproducing individuals of the short-lived perennial *Solanum sandwicense*. At the time of designation, this unit supported eight to nine plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. It provides habitat for the westernmost portion of the species' range on Kaua'i. The habitat features contained in this unit that are essential for this species include, but are not limited to, forest canopies in diverse lowland or montane *Acacia koa* or *Acacia koa-Metrosideros polymorpha* mesic or wet forests. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua'i 11—*Stenogyne campanulata*—a: This unit provides habitat for three populations of 300 mature, reproducing individuals of the short-lived perennial *Stenogyne campanulata*. At the time of designation, this unit supported 51 to 66 plants of the listed species. This unit is essential to the conservation of the taxon because it provides functional habitat sufficient to support a persistent colony of this species and provides for expansion of the species' range and population. The habitat features contained in this unit that are essential for this species include, but are not limited to, rock faces of nearly vertical, north facing cliffs in diverse lowland or montane mesic forest. This unit provides functional habitat that spreads the risk of all populations of the species from being destroyed by one naturally-occurring catastrophic event and allows for expansion of the species' distribution.

- Kaua‘i—Dry Cliff—Section 1: The entire section of this unit is within previously designated critical habitat and is State-owned; it falls within Critical Habitat Unit 11 of 50 CFR 17.99(a)(1), Map 67a. This section is occupied by the plants *Chamaesyce eleanoriae*, *Lysimachia scopulensis*, *Schiedea attenuata*, and *Stenogyne kealiae*. The primary constituent elements (PCEs) in the dry cliff ecosystem includes the dry cliffs (substrate of greater than 65 degree slope, rocky talus), the moisture regime (annual precipitation of less than 75 in), and subcanopy (consisting of one of more these associated native plant genus: *Antidesma*, *Chamaesyce*, *Diospyros*, and *Dodonaea*) and understory plant species (consisting of one or more of these associated native plant genus: *Bidens*, *Eragrostis*, *Melanthera*, and *Schiedea*).

- Kaua‘i—Montane Wet—Section 2, *Loxops caeruleirostris* Unit 5—Montane Wet, *Oreomystis bairdi* Unit 5—Montane Wet, and *Dropsphila sharpi* Unit 5—Montane Wet: The entire Kaua‘i—Montane Wet—Section 2 is within previously designated critical habitat, and is occupied by the plants *Chamaesyce remyi* var. *remyi, Dubautia kalalauensis*, *Labordia helleri, Melicope puberula*, *Platydesma rostrata, Psychotria grandiflora,* and *Tetraplasandra flynii*, and by the ‘akeke‘e (*Loxops caeruleirostris*). The PCEs in the montane wet ecosystem occur at 3,000-5,243 feet in elevation, includes forest and potentially some small scale boggy areas (substrate consisting of well-developed soils, montane bogs), the moisture regime (annual precipitation greater than 75 in), and canopy (consisting of one or more of these associated native plant genus: *Acacia*, *Charpentiera*, *Cheirodendron*, and *Metrosideros*), subcanopy (consisting of one or more of these associated native plant genus: *Broussaisia*, *Cibotium*, *Eurya*, *Ilex*, and *Myrsine*), and understory (consisting of one or more of these associated native plant genus: native ferns, *Carex*, *Coprosma*, *Leptecophylla*, *Oreobolus*, *Rhynchospora*, *Vaccinium*). The PCEs in this critical habitat also includes the arthropod prey identified as a species specific for the ‘akeke‘e. Although Montane Wet—Section 2 is not known to be occupied by the plants *Astelia waialeale, Dryopteris crinalis* var. *podosorus, Dubautia waialeale*, *Geranium kauaiense, Keysseria erici*, *Keysseria helenae, Labordia pumila*, *Lysimachia daphnoides, Melicope degeneri*, *Myrsine mezii*, and *Phyllostegia renovans*; by the ‘akikiki (*Oreomystis bairdi*); or by the picture-wing fly (*Drosophila sharpi*), it is essential for the conservation and recovery of these montane wet species because it provides the physical and biological features necessary for the reestablishment of wild populations within their historical range. This area also supports the arthropod prey identified as a PCE for the ‘akikiki, and the larval-stage host plants (*Cheirodendron* and *Tetraplasandra* spp.) identified as a PCE for the picture-wing fly. Due to the small numbers of individuals or low population sizes of each of these species, each requires suitable habitat and space for expansion or reintroduction to achieve recovery. For the plants, critical habitat falls within previously designated Critical Habitat Unit 11 of 50 CFR 17.99(a)(1), Map 64a. Maps of critical habitat for the ‘akeke‘e and ‘akikiki can be found at 50 CFR 17.95(b) (Unit 5—Montane Wet), and for the picture-wing fly *Drosophila sharpi* at 50 CFR 17.95(i) (Unit 5—Montane Wet).

Under the KSHCP Preserve-based Covered Activities, re-vegetation/monitoring/management of disturbed areas at the Preserve site with native species and removal of ungulates is expected to improve soil stability and to preclude infestations of exotic plants that impair or preclude the

critical habitat to properly function. Improved soil stability is expected to reduce erosion in the mitigation area which will reduce surface water runoff and water turbidity for designated critical habitats downslope of the Preserve. While some designated critical habitats are not within the Preserve project area, the potential for adverse effects to the PCEs associated with these units, as well as units within the Preserve, caused by Covered Activities is likely to be discountable because the proposed conservation measures are tried and true and are likely to avoid any measurable alterations of habitat that is necessary to support the life history requirements of listed Hawaiian plants (Service 2019). For these reasons, the Service has determined the proposed Preserve-based Covered Activities may affect, but is not likely to adversely affect designated critical habitats for listed Hawaiian plants.

Reinitiation of this consultation is required and shall be requested by the Service, where discretionary Federal involvement or control over the proposed actions has been retained or is authorized by law and:

1) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;
2) If the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered herein; or
3) If a new species is listed or critical habitat designated that may be affected by the proposed actions.

Literature Cited

[NMFS and Service] National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998. Recovery Plan for U.S. Pacific Populations of the Green Turtle (Chelonia mydas). National Marine Fisheries Service, Silver Spring, MD.

Paxton, E. H., Laut, M., Vetter, J. P., and Kendall, S. J. 2018. Research and management priorities for Hawaiian forest birds. *Condor* 120: 557-565.

[Service] U.S. Fish and Wildlife Service. 1998. Recovery Plan for the Hawaiian Hoary Bat. U.S. Fish and Wildlife Service, Portland, OR. 50 pp.

[Service] U.S. Fish and Wildlife Service. 2019. Draft Kaua‘i Islandwide Recovery Plan. U.S. Fish and Wildlife Service, Portland, OR. 43 pp.