Appendix H

Wildlife Surveys

Wildlife Survey – Honua‘ula

Wildlife Survey of Honua'ula (Wailea 670) Kīhei, Maui

Prepared for

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January 2009
Updated February 2010

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1.0 BACKGROUND AND PURPOSE OF THE STUDY

SWCA Environmental Consultants (SWCA) was tasked to conduct botanical and wildlife surveys within the 271 hectare (ha) or 670 acre (ac) Honua'ula (Wailea 670) Property (hereinafter referred to as the 'Property') in Kihei, Maui. This report documents the results of the wildlife surveys conducted by SWCA within the Property. Specific objectives include documenting the presence and relative abundance of birds, mammals, amphibians, and reptiles at the Property; and, determining the presence and abundance of any protected species including migratory shorebirds, waterbirds, federally and state listed endangered or threatened species, and 'species of concern'.

The study supplements prior surveys of the same parcel by Bruner (1988, 1993, and 2004), and satisfies Condition 9 of the Maui County Council for Project District II Zoning approval. This report also satisfies the requirements of Hawai'i Revised Statutes Chapter 343 for description of natural resources, and will be cited in the Environmental Impact Statement (EIS) being prepared for Honua'ula. A companion document addressing vegetation issues was prepared by SWCA and is being submitted under separate cover (SWCA 2009).

This report was authored by Ling Ong, Ph.D., Stephen M. Mosher, M.S., Tiffany Thair, (M.S. candidate), and Ryan Taira, B.A. of SWCA. Peer review was provided by Michelle Christy, Ph.D. and John Ford, M.S. of SWCA. Field work was conducted by Dr. Ong and Mr. Mosher with assistance from Dr. David Preston of the Bishop Museum Department of Entomology, Betsy Gagne of the Natural Area Reserve System, Hawai'i Department of Land and Natural Resources-Division of Forestry and Wildlife (DLNR-DOFAW), and biologist James Kwon of the U.S. Fish and Wildlife Service (USFWS) Division of Ecological Services, Honolulu.

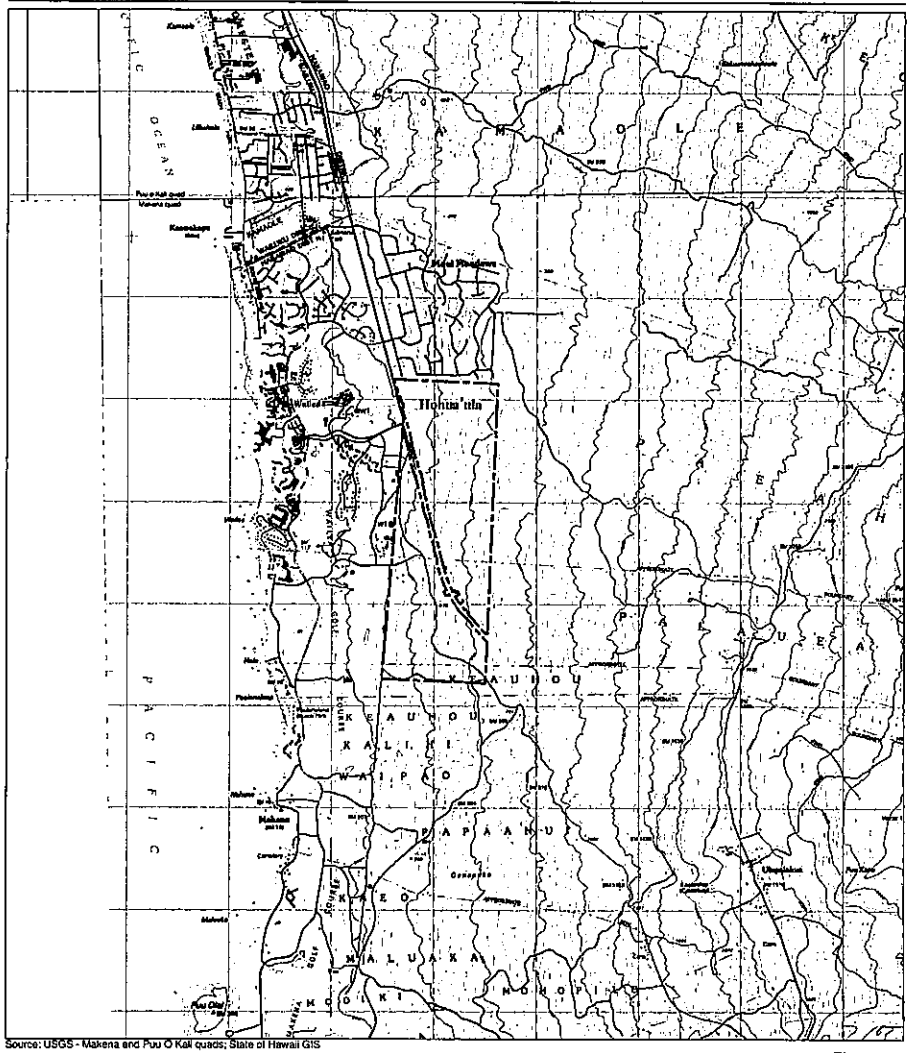
2.0 DESCRIPTION OF THE PROPERTY

Honua'ula (Wailea 670) encompasses 270 ha (670 ac) on the southeastern slope of Mt. Haleakalā, Maui, between approximately 89 m (290 ft) and 220 m (720 ft) elevation (Figure 1). Approximately 200 ha (500 ac) in the northern portion of the parcel is underlain by older lavas of the Kula Volcanic Series. The remaining 70 ha (170 ac) on the south side of the Property is underlain by relatively younger Hana Volcanic Series lavas. This area is characterized by an extremely rough surface composed of broken 'a'ā lava. Weathering led to the formation of a thin layer of soil over the northern 200 ha, but since the southern portion is derived from younger volcanic eruptions, less weathering of the 'a'ā in this region has led to presence of little or no soil (PBR Hawaii 1988).

Twenty-six (26) native plant species and 120 non-native plant species were described by SWCA (2009) and other investigators in three distinct vegetation types that provide habitat for wildlife within the Property (Figure 2). The three vegetation types within the Property are the *kiawe*-buffelgrass (*Prosopis pallida-Cenchrus ciliaris*) grassland, mixed gulch vegetation, and remnant mixed *kiawe-wiliwili* (*Prosopis pallida-Erythrina sandwicensis*) shrubland. About 75% of the northern portion of the Property is characterized by an extensive grassland comprised primarily of *kiawe* (*Prosopis pallida*) *and* buffelgrass (*Cenchrus ciliaris*).. The *kiawe*-buffelgrass grassland is bisected from east to west by several gulches that carry flood waters to the sea. The gulch vegetation is comprised of various species of ferns, native *Pili* grass (*Heteropogon contortus*), and other species. The third vegetation type is limited to the 'a'ā lava flow in the southern quarter of Property and consists of scattered groves of large-stature *wiliwili* (*Erythrina sandwicensis*) and co-dominant *kiawe* trees (*P. pallida*) (SWCA 2009).

Axis deer (Axis axis) and feral goats (Capra hircus hircus) have had unrestricted access throughout the Property and pose a serious threat to native plant species and to the integrity of the remnant mixed kiawe-wiliwili shrubland. Many of the wiliwili trees on the Property have been recently infested by the invasive gall wasp (Quadratichus erythrinae) which also threatens the entire ecosystem. Historically, the Property has been exposed to cattle grazing.

SWCA Inc. Honua'ula



Source: USGS - Makena and Puu O Kali quads; State of Hawaii GIS

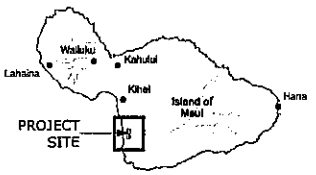
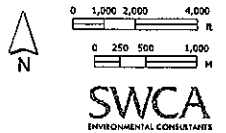


Figure 1
Location Map



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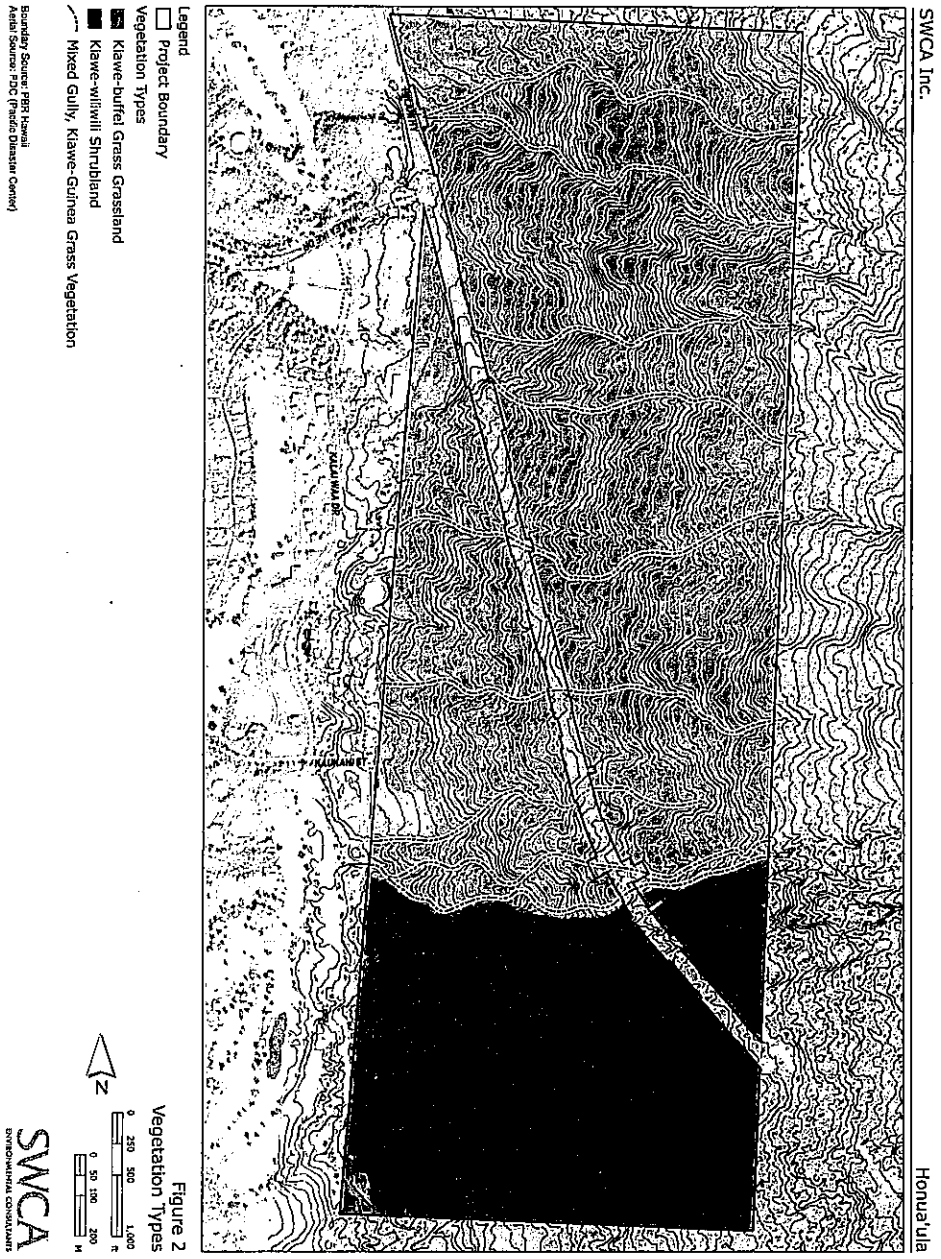

Figure 2
Vegetation Types

Small portions of the northern *kiawe*-buffelgrass grassland are infrequently grazed by cattle belonging to 'Ulupalakua Ranch under agreement with Honua'ula Partners, LLC. Honua'ula Partners, LLC constructed a cattle fence bisecting the parcel to prevent cattle from entering the remnant *kiawe-wiliwili* shrubland in the southern portion of the Property. There is no evidence of other agricultural activity having occurred previously (PBR Hawaii 1988); however, the area was used during the Second World War as a training and maneuver area for armored vehicles (Erdman, Ulupalakua Ranch, pers. comm.).

3.0 METHODS OF STUDY

SWCA initially conducted a literature review of natural resources within the region that encompasses the Property, and considered the comments and concerns expressed by resource agencies and the Maui County Council in prior correspondence.

3.1 Avian Survey Methods

Point count surveys were conducted by SWCA biologists Ling Ong, Ph.D. and Stephen Mosher, M.S. on May 27-29 and September 19-21, 2008. Twenty-eight (28) point count stations were established throughout the Property in all habitat types (Figure 3). The location of each point count site was confirmed with a GPS receiver and two observers were present at each point count. Visual observations of birds were conducted with 10 x 50 binoculars with a 6.5 degree field of vision; and aural observations were also conducted by listening for vocalizations.

The relative densities of species were estimated using five-minute 200 m (656 ft) radius point counts conducted during peak bird activity periods (0600 - 1100 and 1600 - 1900). Five minute point counts maximized the likelihood of detecting new species during the survey (Lynch 1995). Bird density data and species composition from the study were compared with the findings of Bruner (1988, 1993, and 2004). Mammals and reptiles seen or heard during the point count surveys were also recorded as incidental sightings. Rare or previously unrecorded bird, mammal, reptile, or amphibian species seen between count stations were also noted.

Line transect surveys were conducted by SWCA biologists Ling Ong, Ph.D. and Stephen Mosher, M.S. from September 19-21, 2008 to determine the presence and density of the two owl species known to inhabit the Property: the barn owl (*Tyto alba*) and the Hawaiian short-eared owl or pueo (*Asio flammeus sandwichensis*) (Figure 4). Twelve transects between 900-1000 m (2,952-3,280 ft) long were oriented east-west across the entire length of the parcel. These transects were at least 250 m (820 ft) apart. An additional eight transects of 250 m (820 ft) were oriented north-south at the eastern and western boundaries of the property. Total transect length in *kiawe*-buffelgrass grassland habitat was 8.6 kilometers (5.4 miles), and 5.0 kilometers (3.1 miles) in the remnant *kiawe-wiliwili* shrubland portion of the Property.

Two observers were present on each transect survey. Owls observed along transects were identified to species and recorded, along with perpendicular distance between transect and owl. The density of owls present on site was calculated using the DISTANCE 5.0 program. As the resulting sample size was small, data from both species were pooled to obtain a combined owl density. Pueo densities were calculated by determining the ratio of pueo to barn owl sightings and adjusting the calculated owl density from the DISTANCE 5.0 program proportionately. Due to habitat differences, owl densities within the *kiawe*-buffelgrass area were analyzed separately from the remnant *kiawe-wiliwili* shrubland habitat.

3.2 Nocturnal Surveys for Hawaiian Hoary Bats

Surveys for endangered Hawaiian hoary bats (*Lasiurus cinereus semotus*) were conducted at the Property between 1830 and 0000 from September 19-21, 2008 by SWCA biologists Dr. Ling Ong and Stephen Mosher. These surveys were conducted under ideal weather conditions using night vision goggles (Morovison PVS-7 Ultra) and an Anabat detector (Titley Electronics, NSW Australia).

Anabat detectors assist in the identification of bats by recording their echolocation calls. The device also produces real-time audible output for humans to hear of the ultrasonic sounds the bat generates. Bat point count stations were established at 14 locations at least 400 m (1,312 ft) apart on jeep roads within the Property, and surveyed for five minutes each (Figure 3). The detection distance for bats using night vision goggles was estimated to be 30 m (98 ft) radius at each point count station.

3.3 Surveys for the Blackburn's Sphinx Moth

Surveys for endangered Blackburn's sphinx moths (*Manduca blackburni*) were conducted within the Property on March 13, 2008, May 27-29, 2008, and November 11, 2008. The March and May surveys were conducted by Bishop Museum entomologist David Preston, Ph.D. and Betsy Gagné, M.S. of the Hawai'i Division of Forestry and Wildlife, accompanied by SWCA biologist John Ford, M.S. Dr. Preston and Ms. Gagné were accompanied by biologist James Kwon of the USFWS. These surveys focused on host plants used by the various life stages of Blackburn's sphinx moth (*Manduca blackburni*) that are known to occur within the Property. Leaves and stems were examined carefully for the presence or sign of moths, including frass (fecal matter), cut stems and leaves, and eggs.

4.0 RESULTS

4.1 Endangered Species

Although not detected during pervious wildlife surveys by Bruner (1988, 1993 and 2004), endangered Blackburn's sphinx moth (*Manduca blackburni*) caterpillars and sign, as well as a single endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), were found within the Property during this study. Details of the sightings are presented in the following sections.

4.1.1 Blackburn's Sphinx Moth (*Manduca blackburni*)

The Blackburn's sphinx moth (Family: Sphingidae) was listed as federally endangered in February 2000 and was the first Hawaiian insect to be listed as an endangered species. It is the largest native insect in Hawai'i, with a wing span of up to 120 millimeters (5 inches) and long, narrow forewings (Figure 5). It is primarily grayish brown, with black bands across the top margins of the hind wings and five orange spots along each side of the abdomen. The body is thick and spindle shaped, tapering at both ends (USFWS 2003, Black 2005, and USFWS 2005). The caterpillar has two color morphs: bright green (Figures 6) or gray. White speckles are scattered throughout the caterpillar's back and a horizontal white stripe is present on the side of each segment (Black 2005). Characteristic of other hornworms, the caterpillar has a horn-like protrusion on the last abdominal segment (USFWS 2005). The species is often confused with the non-native potato hornworm (*Agrius cingulata*) which has also been recorded in the Hawaiian Islands.

The Maui Nui Recovery Unit for the Blackburn's sphinx moth consists of seven management units comprising approximately 22,788 ha (56,305 ac; USFWS 2002, 2003, 2005). Of these, approximately 45,867 ha (18,564 ac) located in four units are on Maui. The closest management units to the Property are Pu'u O Kali (Unit 8) and the Ahihi-Kinau NAR – Ulupalakua – Auwahi – Kanaio Management Unit (Unit 9), located roughly 2.5 and 4 km (1.6 and 2.5 miles) from the Property, respectively (Figure 7).

On March 13, 2008 in the early afternoon, Dr. Preston found a small Blackburn's sphinx moth caterpillar feeding on leaves of a non-native tree tobacco (*Nicotiana glauca*) in the southeastern corner of the Property (Figure 8). On that same day, he found evidence of feeding (cut stems and leaves, and the presence of frass) by Blackburn's sphinx moth caterpillars on tree tobacco plants at numerous other locations within the Property (Figure 10), and recorded the location of each with a GPS receiver. No Blackburn's sphinx moth caterpillars were recorded during the May survey, however, grazing damage was evident and recorded (Figure 10).

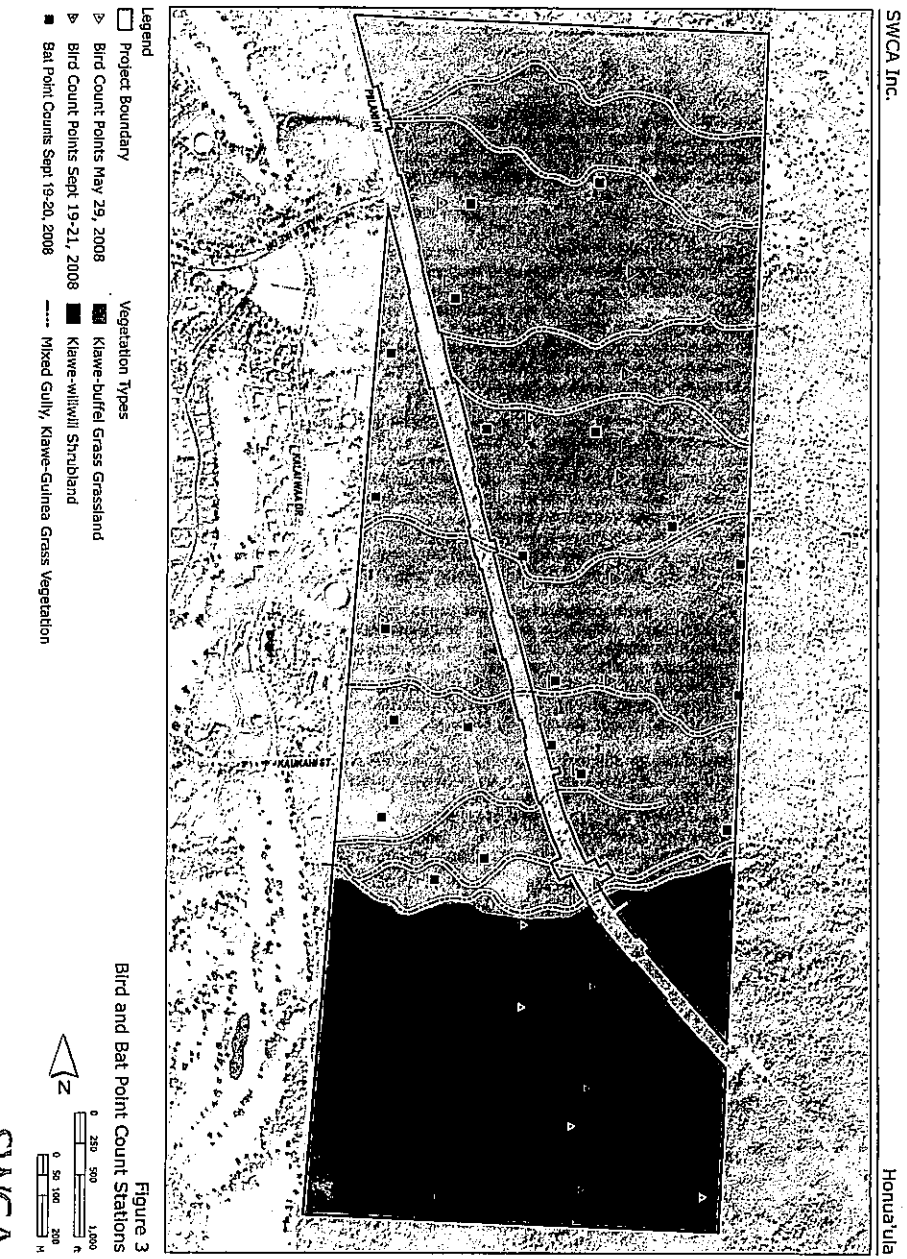

Figure 3
Bird and Bat Point Count Stations

Figure 5. An adult endangered Blackburn's sphinx moth. Photo by W.P. Mull.

Figure 6. This large green morph caterpillar of *M. blackburni* was photographed at Honua'ula on November 11, 2008 by SWCA staff.

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Honua'ula

Legend

Project Boundary

Transect

Vegetation Types

Kiawe-buffel Grass Grassland

Kiawe-wiliwili Shrubland

Mixed Gully, Kiawe-Guinea Grass Vegetation

Figure 4
Pueo Transects

0 250 500 1,000 ft

0 50 100 200 m

N

Boundary Source: PBR Hawaii
Aerial Source: Pacific Disaster Center (PDC)

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Figure 8. This young M. blackburni caterpillar was photographed by Dr. David Preston (Bishop Museum) feeding on a non-native tree tobacco leaf (Nicotiana glauca) on March 13, 2008 in the southeastern portion of the Property.

On November 11, 2008, two large Blackburn's sphinx moth caterpillars were observed on the stems of tree tobacco plants within the Property by Dr. Preston and Ms. Gagne. The larger of the two caterpillars, approximately 100 mm (4 in) in length, was found about 30 m (100 ft) inside the Property from the Diamond Resort gate. The smaller caterpillar, approximately 50 mm (2 in) in length, was seen near the southern boundary of the Property (Figure 11).

Other non-native host plants of the Blackburn's sphinx moth caterpillars include *Solanum melongena* (eggplant), *Lycopersicon esculentum* (tomato), and possibly *Datura stramonium* (Jimson weed). These species have not been found within the Honua'ula Property in any previous study (Char 1988, 1993, 2004; SWCA 2009). However, adult moths are known to feed on nectar of the native *koali awahia* (*Ipomea indica*), and *halapepe* (*Pleomele auwahiensis*) plants, and possibly upon the native *maiapilo* (*Capparis sandwichiana*) and *'ilie'e* (*Plumbago zeylanica*) (USFWS 2005). The native *koali awahia*, *maiapilo*, and *'ilie'e* are widespread throughout the Honua'ula Property (SWCA 2009).

4.1.2 Hawaiian Hoary Bat (*Lasiurus cinereus semotus*)

SWCA biologists Ong and Mosher sighted a single endangered Hawaiian hoary bat at the southern boundary of the Property flying seaward at 18:44 hours on September 19, 2008. A single call from this individual was simultaneously recorded on the Anabat detector. No other sightings of bats were made during the period of study. The location of the bat sighting is illustrated on Figure 10. *Kiawe* which is abundant on the Property has been documented as roost trees for the Hawaiian hoary bat, thus, while it was not observed, it is possible that Hawaiian hoary bats roost within the Property.

4.2 Endemic Birds

No Hawaiian short-eared owls or *pueo* (*Asio flammeus sandwichensis*) were recorded during the wildlife surveys by Bruner (1988, 1993, and 2004). However, pueo were observed within the Property during the line transect surveys (Figure 4 and Figure 10). Neither the *pueo* nor barn

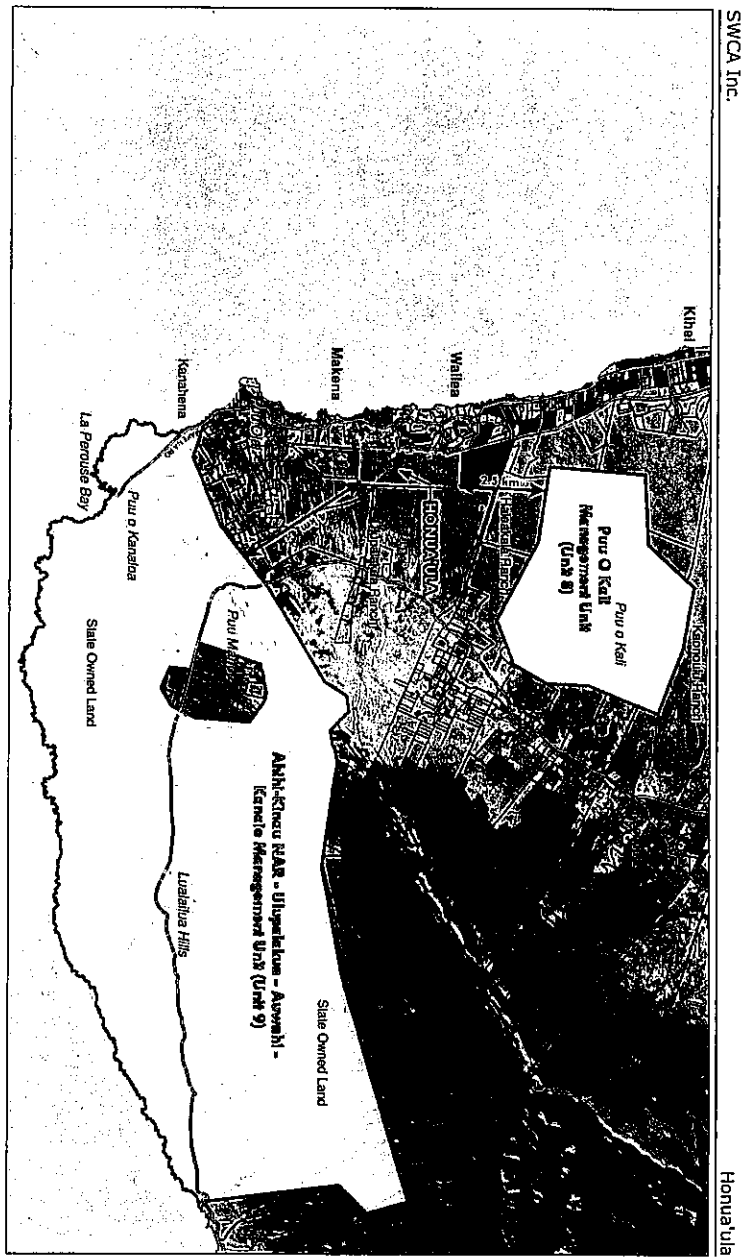

Figure 7
Management Units for Blackburn's Sphinx Moth in South Maui

owls were observed during the bird point counts. Twelve (12) barn owls, six *pueo*, and six other unidentified owls were sighted in grassland habitat. The ratio of barn owl sightings to *pueo* sightings in grassland was estimated at 2:1. No pueo or barn owls were sighted in the southern remnant *kiawe-wiliwili* shrubland portion of the Property. No owl nests were found. Based on these surveys, the estimated density of owls in the grassland was 13.3 ± 3.7 SE individuals per km^2 (or 34.5 ± 9.1 individuals/$mile^2$). The estimated number of owls property-wide was 26.0 ± 0.3 SE (95% confidence interval: 14 - 46 owls). This results in an estimate of eight individual pueo (95% confidence interval: 5 – 15 individuals) present on the Property. These individuals are likely to occur within the *kiawe*-buffelgrass grassland habitat. The grasslands present at the Honua'ula Property are likely to provide good foraging, and nesting habitat for *pueo*. However, these nesting habits increase the species vulnerability to predation by rats (*Rattus* spp.), cats (*Felis catus*), and the small Indian mongoose (*Herpestes auropunctatus*), all of which are present in the area.

4.3 Indigenous Birds

No confirmed sighting of native birds occurred within the Property during the point count or transects surveys. No native birds had been recorded in or flying over the Property during the wildlife surveys by Bruner (1988, 1993, and 2004). Hawai'i DLNR-DOFAW biologist Betsy Gagné and SWCA biologist John Ford sighted a native black-crowned night heron (*Nycticorax nycticorax hoactli*) roosting in and flying among *kiawe* trees adjacent to a jeep road near an elevation of 150 m (500 ft) on the southern border of the Property. On the same day, the biologists also observed a flock of perhaps five to seven great frigatebirds or 'iwa (*Fregata minor palmerstoni*) hovering above and swooping down to feed or drink in one of the golf course ponds at the Wailea Resort, immediately west of the Honua'ula Property boundary. This suggestive that the Honua'ula golf course, once completed, will also serve to attract additional bird species.

Seabirds forage over the ocean, but many species return to nest inland. Seabirds that may be seen over the Property during the day include the great frigatebird or 'iwa (*Fregata minor palmerstoni*) and tropic birds (*Phaethon* spp.). The USFWS suggested that seabirds may fly over the Property at night to and from nesting sites at higher elevations on the slopes of Haleakalā. These seabirds include the endangered Hawaiian petrel (*Pterodroma sandwichensis*) and threatened Newell's shearwater (*Puffinus auricularis newelli*). While seabirds may traverse the area at night, they do not nest on the Property. Neither of the latter two species was observed during any of the wildlife surveys cited herein.

4.4 Migratory Birds

SWCA biologists have seen Pacific golden plovers (*Pluvialis dominica*) on golf cart roads and greens on adjacent golf courses on several occasions during winter months in past years. Dr. Phil Bruner also recorded one Pacific golden plover within the Property during his February 1988 survey. Some migratory birds overwinter in Hawai'i, most appearing in late August or September and leaving in May (Hawaiian Audubon Society 2005).

In a chance sighting in March 2006, SWCA biologist John Ford, M.S. observed a Northern harrier (*Circus cyaneus*) flying east to west, then back again and low over *wiliwili* trees in the southern portion of the Honua'ula Property near an elevation of 150 m (500 ft). Sightings of this relatively recent arrival to the islands have also been reported by others near Hosmer's Grove and over the Pa'iku end of the Haleakalā Crater floor and the surrounding hills, on the Island of Hawai'i over the Saddle Road, and on Kawailoa Ridge above Hale'iwa, O'ahu. That no other migratory birds were observed during this study could be a result of surveying at the start of the migration season.

4.5 Alien or Introduced Birds

In his most recent survey of the Property, Bruner (2004) found Japanese white-eye (*Zosterops japonicus*), house finch (*Carpodacus mexicanus*), black francolin (*Francolinus francolinus*), and zebra dove (*Geopelia striata*) to be the most abundant non-native birds at Honua'ula, followed by the nutmeg manikin (*Lonchura punctulata*), northern cardinal (*Cardinalis cardinalis*). He reported

no substantive change in the composition or abundance of alien bird species he described from the Property over a span of 16 years (Bruner 1988, 1993, and 2004).

SWCA biologists observed 16 species of introduced birds within the Property during this study. Japanese white-eye (*Zosterops japonicus*), nutmeg manikin (*Lonchura punctulata*), zebra dove (*Geopelia striata*), and northern cardinal (*Cardinalis cardinalis*) were found to be the most abundant (Table 1). African silverbills (*Lonchura cantans*) and red-crested cardinals (*Paroaria coronata*) were common along the southern border of the Property. Four additional introduced birds not reported by Bruner (1988, 1993, and 2004) were recorded during this study. Cattle egrets (*Bubulcus ibis*) were seen flying overhead on several occasions. Mourning doves (*Zenaida macroura*) were only heard in the 'a'ā section of the Property. Chestnut munias (*Lonchura atricapilla*) were seen on one occasion and Erckel's francolin (*Francolinus erckelli*) were heard once.

Table 1. Bird species and relative abundance observed on the Honua'ula Property during bird surveys in May and September 2008.

Species	Common Name	Status	Birds per point count (n=30)	Abundance Rank
Asio flammeus sandwichensis	Pueo	N (NR)	x	-
Bubulcus ibis	Cattle Egret	I (NR)	x	-
Zenaida macroura	Mourning Dove	I (NR)	0.03	12
Francolinus erckelli	Erckel's Francolin	I (NR)	0.03	12
Francolinus pondicerianus	Gray Francolin	I	0.23	9
Francolinus francolinus	Black Francolin	I	0.73	5
Streptopelia chinensis	Spotted Dove	I	0.30	7
Geopelia striata	Zebra Dove	I	1.70	3
Tyto alba	Barn owl	I	x	-
Zosterops japonicus	Japanese White eye	I	3.50	1
Mimus polyglottos	Common Mockingbird	I	0.03	12
Acridotheres tristis	Common Myna	I	0.07	11
Cardinalis cardinalis	Northern Cardinal	I	1.3	4
Carpodacus mexicanus	House Finch	I	0.23	9
Lonchura punctulata	Nutmeg Mannikin	I	3.03	2
Lonchura atricapilla	Chestnut Munia	I (NR)	x	-
Lonchura cantans	African Silverbill	I	0.67	6

I = introduced, N = native NR = new record since 2004
X= observed outside point counts

4.6 Mammals

The Hawaiian hoary bat (see 5.1.2) was the only native mammal observed on the Property. The small Indian mongoose (*Herpestes javanicus*) was observed within the Property, but was uncommon. Small herds of four to 12 axis deer (*Axis axis*) were commonly seen. Deer scat, tracks, and evidence of buck rubs (rubbing of antlers on trees) were evident throughout the entire parcel. Mongoose and deer were previously reported by Bruner (1988, 1993 and 2004). Goats (*Capra hircus*) have also been seen by others in the Property; however, none were observed during this study.

Domestic cattle (*Bos taurus*) are grazed infrequently within the northern portion of the Property and regularly to the east on lands owned by 'Ulupalakua Ranch; however, no cattle or evidence of cattle were observed within the boundaries of the Property during this study.

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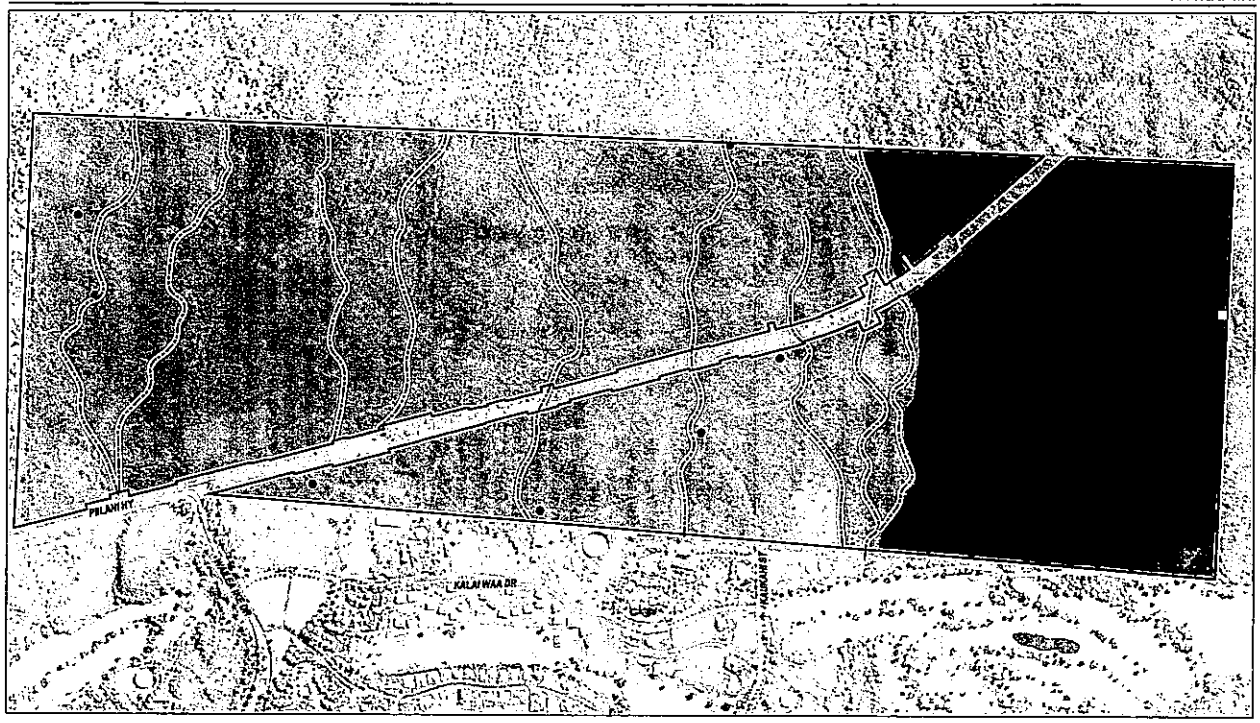
Honua'ula



Legend

- Project Boundary
- *Asio flammeus sandwichensis* (Pueo) Sighting
- *Lasiurus cinereus semotus* (Hoary Bat) Sighting

Vegetation Types

- Kiawe-buffel Grass Grassland
- Kiawe-wiliwili Shrubland
- Mixed Gully, Kiawe-Guinea Grass Vegetation

Figure 10
Pueo and Bat Sightings

0 250 500 1,000 ft
0 50 100 200 M

Boundary Source: PBR Hawaii
Aerial Source: Pacific Disaster Center (PDC)

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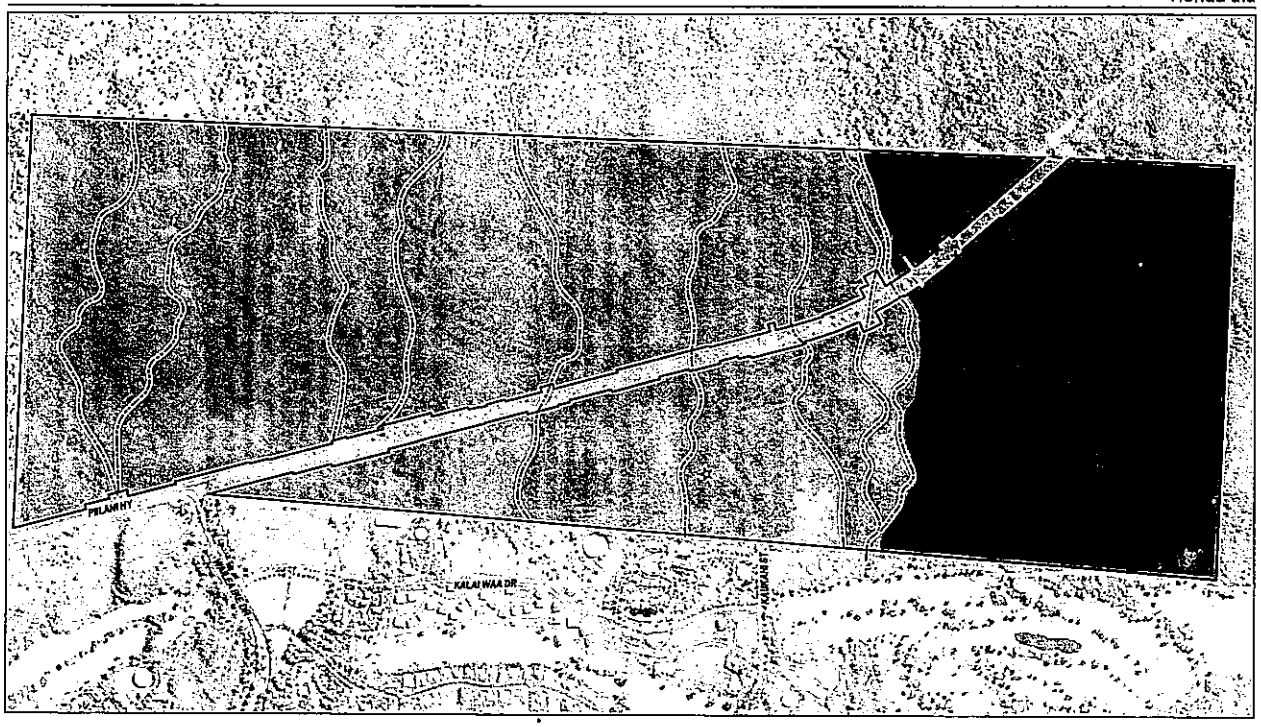

Legend

- Project Boundary
- ☆ *Manduca blackburni* (Blackburn's Sphinx Moth) Caterpillar Sighting March 13, 2008
- ☆ *Manduca blackburni* (Blackburn's Sphinx Moth) Caterpillar Sighting Nov 11, 2008
- \+ *Manduca blackburni* (Blackburn's Sphinx Moth) Sign Observed May 27-28, 2008

Vegetation Types

- Kiawe-buffel Grass Grassland
- Kiawe-wiliwili Shrubland
- Mixed Gully, Kiawe-Guinea Grass Vegetation

Figure 9
Locations of Blackburn Sphinx Moth Caterpillars and Sign Locations

0 250 500 1,000 ft
0 50 100 200 M

Boundary Source: PBR Hawaii
Aerial Source: Pacific Disaster Center (PDC)

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Following this study; however, cattle were allowed to graze within the northern *kiawe*-buffelgrass lands within the Property. Cats (*Felis catus*), rats (*Rattus* spp.) and mice (*Mus*), while not observed, are expected to be present within the Property due to its proximity to the Maui Meadows subdivision and the Wailea Resort. Rat and mouse remains were detected in owl pellets found on the Property.

4.7 Reptiles and Amphibians

There are no native reptiles or amphibians in Hawai'i (McKeown 1996). Geckos (Gekkonidae) were heard calling, but not seen during avian point counts. Geckos were also heard but not seen along jeep roads on the southern border of the Property. No skinks (Scincidae) were observed during avian point counts. No amphibians were seen within the Property.

5.0 DISCUSSION

Two endangered animal species and one species of concern have been documented by SWCA biologists on the Property: the endangered Blackburn's sphinx moth (*Manduca blackburni*), the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), and the pueo (*Asio flammeus sandwichensis*), respectively.

Of particular interest is the surprising number of endangered Blackburn sphinx moth (*Manduca blackburni)* sightings (caterpillars and sign) within the Property. All sightings were associated with non-native tree tobacco plants (*Nicotiana glauca*). These are aggressive weedy plants that grow opportunistically in open, arid, disturbed locations (Wagner et al 1999) and are commonly found along road grades in the northern portion of the Property and throughout the *kiawe-wiliwili* shrubland. The USFWS's Recovery Plan for this species (USFWS 2005) identified conservation and recovery activities, including protection, management, and restoration of habitat and the species' host plants, specifically the native *'aiea* (*Nothocestrum* spp.), and a captive breeding and translocation program. While *'aiea* is not found within the Property and is not known to thrive at low elevations in areas like Honua'ula, the non-native tree tobacco is common here and is apparently frequented by the moths. The removal of non-native tobacco plants during construction will likely result in the loss of non-native feeding habitat for the caterpillar. The potential loss of food plants for the adult moths also exists as some other native plants are removed in portions of the Property.

Three recovery units encompassing 13 management units were identified in the Blackburn Sphinx Moth Recovery Plan (USFWS 2005) as necessary for the long-term survival and recovery of the species. The Pu'u O Kali Management Unit (Unit 8) and the Ahihi-Kinau NAR – Ulupalakua – Auwahi – Kanaio Management Unit (Unit 9) in South Central Maui are closest to Honua'ula (Figure 8). Designated critical habitat is found within Units 8 and 9, and within Kanaha Pond – Spreckelsville Management Unit (Unit 7) located near the Kahului Airport on Maui's north central coastline.

The pueo is most likely to be affected during the construction phase of the project on the site. Construction through grassland habitat will potentially disturb roosting and nesting pueo and is likely to permanently displace pueo from the Property due to the loss of grassland habitat.

No evidence of roosting or foraging by endangered Hawaiian hoary bats was observed by Bruner (1988, 1993, 2004) or SWCA (2009). Definitive conclusions about habitat use cannot be made on existing evidence. The removal of *kiawe* trees during construction may result in the loss of roosting habitat; however, many large stature trees suitable for roosting will be preserved and others propagated for landscaping as the site is developed.

Upon construction of the residential community and golf course at Honua'ula, water features and open fairways associated with the golf course will attract a number of endangered species to the Property. These include the *koloa* (*Anas wyvilliana*), *ae'o* (*Himantopus mexicanus knudseni*), 'alae ke'oke'o (*Fulica alai*), *'alae 'ula* (*Gallinula chloropus sandvicensis*), and *nēnē* (*Branta sandvicensis*).

In addition, there is the potential for lighting present on the Property to present an attraction hazard to juveniles of the threatened Newell's shearwater (*Puffinus auricularis newelli*) and endangered Hawaiian petrel (*Pterodroma sandwichensis*).

The native migratory *kolea* (*Pluvialis fulva*) which are protected under the Migratory Bird Species Act, frequently uses roads and open spaces when over-wintering in Hawai'i and may be displaced if construction occurs during the migratory season. However, it is anticipated that the construction of open spaces, gardens and lawns on the Property will provide additional habitat that kolea can utilize.

6.0 PROPOSED MITIGATION MEASURES

The Maui County Council promulgated 28 specific conditions in granting a Phase I project district zoning approval. Their specific conditions related to wildlife within the Property include:

> *7. That Honua'ula Partners, LLC, its successors and permitted assigns, shall prepare an animal management plan that shall be submitted during Project District Phase II processing and approved by the Department of Land and Natural Resources prior to submittal of Project District Phase III processing. Said plan shall include procedures for the management of animal intrusions including, but not limited to, construction of boundary or perimeter fencing, wildlife control permits, and rodent and feral cat control.*
>
> *Honua'ula Partners, LLC, its successors and permitted assigns, shall implement the approved animal management plan. The Department of Land and Natural Resources may require periodic updates of the plan.*
>
> *9. That Honua'ula Partners, LLC, its successors and permitted assigns, shall prepare an assessment of the owl (Pueo or Hawaiian Short-eared Owl) and the Hawaiian Hoary Bat in coordination with the Department of Land and Natural Resources, and, if appropriate, mitigative measures shall be incorporated into Kihei-Makena Project District 9. Said assessment shall be prepared prior to submittal of Project District Phase II processing.*

Honua'ula Partners, LLC is proposing to implement the following measures to conserve elements of the remnant *kiawe-wiliwili* shrubland and to protect the native plants and animals within the Property.

- To help provide habitat for Blackburn sphinx moths (*Manduca blackburni*), a Native Plant Preservation Area encompassing a contiguous area within the remnant *kiawe-wiliwili* shrubland will be dedicated in perpetuity to protect as much of the remnant *kiawe-wiliwili* shrubland plant community as possible. The protected area will meet the 7.3-52.6 ha (18-130 ac) directive imposed by the Maui County Council, and will ultimately be subject to approval by the Council. The Native Plant Preservation Area will encompass the highest densities of the rarest elements of the native vegetation within the project parcel. The only non-native species that will be allowed to remain in this area will be the tree tobacco (*Nicotiana glauca*) so as to provide food and habitat for endangered Blackburn's sphinx moths (*Manduca blackburni*). This may enhance the geographic connectivity between the two recovery units; and may also provide a source of sphinx moth caterpillars for the translocation program which has been identified as a desirable recovery activity (USFWS 2005).

- Conversely, non-native tree tobacco (*Nicotiana glauca*) plants will be removed from the property outside the Native Plant Preservation Area prior to construction. This will be done in consultation with biologists from DLNR-DOFAW and the USFWS to prevent accidental take of the Blackburn's sphinx moth (*Manduca blackburni*) caterpillar.

- Construction operations will be closely monitored to prevent accidental take of the various Blackburn's sphinx moth (*Manduca blackburni*) life stages. Should sphinx moths be found,

host plants will be marked for protection and not removed until deemed appropriate by DLNR-DOFAW and USFWS biologists.

- Upon completion of the proposed project, restrictions on landscaping and gardening will be enacted to prevent propagation of any plant in the Solanaceae (Nightshade) family that may attract Blackburn's sphinx moths (*Manduca blackburni*).
- A translocation program for Blackburn's sphinx moth (*Manduca blackburni*) caterpillars will be developed and implemented through preparation of a Habitat Conservation Plan (HCP), particularly for caterpillars found in landscaped areas of the Property, in consultation with DLNR-DOFAW and the USFWS.
- Intensive wildlife surveys will be continued from November – May through construction of the proposed project to look for signs of endangered Blackburn sphinx moths (*Manduca blackburni*) within the Property, to distinguish any signs found as the Blackburn sphinx moth (*Manduca blackburni*) and not other more common horn worm species, and to protect individual moths from destruction.
- Additional Hawaiian hoary bat (*Lasiurus cinereus semotus*) point count surveys will be conducted prior to construction to document the changes in abundance and determine habitat utilization of these species during the wet and dry seasons.
- A qualified wildlife biologist will monitor the Property for bats (*Lasiurus cinereus semotus*) during construction. Should bats (*Lasiurus cinereus semotus*) be found at the site during construction, assistance will be requested from the USFWS office in Honolulu.
- Clearing of habitat during construction will be monitored to reduce the potential take of non-volent juvenile bats (*Lasiurus cinereus semotus*) (Hart 2003).
- Propagation of native tree species will be conducted during landscaping to provide suitable bat (*Lasiurus cinereus semotus*) roosting habitat to mitigate for the loss of possible roosting trees during construction.
- Potential impacts to seabirds will be minimized by shielding outdoor lights in compliance with Chapter 20.35 (Outdoor Lighting) of the Maui County Code, avoiding night-time construction, and providing all project staff with information regarding seabird fallout. All project lights will be shielded so the bulb can only be seen from below. This is a common and successful mitigation measure employed throughout the Hawaiian Islands.
- Construction around areas found with pueo (*Asio flammeus sandwichensis*) nests will be delayed until the chicks have fledged.
- The entire perimeter of the Property has already been fenced to discourage feral ungulates and grazing cattle from entering the remnant *kiawe-wiliwili* shrubland; however, the fence is porous. Fencing requirements will be reviewed and updated as establishment of the Native Plant Preservation Area construction begins. An animal management plan will be implemented by the Natural Resource Manager to insure that goats, deer, pigs, and stray cattle are removed in a human manner from the proposed for native plant protection on the Property
- A Natural Resource Manager will be employed by Honua'ula Partners, LLC to develop and implement specific conservation programs to help insure the protection of native plants and animals within the Native Plant Preservation Area and other areas designated for native plant protection on the Property.
- An Animal Management Plan is being prepared under separate cover in cooperation with DLNR-DOFAW and USFWS during Project District Phase II processing.

- A Conservation and Stewardship Plan is also being prepared under separate cover to implement a natural resource management plan for the Native Plant Preservation Area and other areas designated for native plant protection on the Property.
- Finally, a multi-species Habitat Conservation Plan (HCP), to include the candidate endangered *'āwikiwiki* (*Canavalia pubescens*) is being prepared under Section 10(a)(1)(B) of the Endangered Species Act and in collaboration with DLNR and USFWS.

Taken together with the mitigation measures identified in the Botanical Survey of Honua'ula (Wailea 670) (SWCA 2009), these actions fully satisfy the objectives and the intent of the special Project District Phase II conditions promulgated by the Maui County Council.

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Wildlife Survey – Wastewaterline

Wildlife Survey of Wailea 670 Alternative Wastewater Alignments, Wailea, Maui

Prepared for

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November 2008

1.0 INTRODUCTION

As part of development efforts for Honua'ula (Wailea 670), Honua'ula Partners LLC is required to develop a strategy for site wastewater collection, treatment and disposal. Makena Resort, located south and adjacent to the project site has a fully developed wastewater treatment facility which will be used to treat wastewaters from the Honua'ula development. Three alternative sewer line routes between the project site and the treatment facility were proposed for the conveyance of wastewater and return of treated, non-potable water for irrigation use (Figure 1). In April 2008, R.M. Towill Corporation conducted a feasibility study for conveyance of wastewater from Honua'ula to the existing Makena Resort Wastewater Reclamation Facility (MRWRF), for treatment and disposal. This study by R. M. Towill investigated the following four alternative wastewater conveyance routes from Honua'ula to MWWRF on the Makena property.

Alternative A – pump directly to MWWRF
Alternative B – pump to a high point and gravity flow to MWWRF
Alternative C – gravity flow to MWWRF
Alternative D- gravity flow to the Makena Wastewater Pump Station (MWWPS) "MU"

R. M. Towill Corporation determined that Alternative C was infeasible because the elevation difference did not allow for gravity flow from the Project Site to the MRWRF (R. M. Towill Technical Memorandum, 2008). SWCA conducted wildlife surveys along the three feasible alternative routes A, B and D between the Project site and MRWRF for the conveyance of wastewater and the return of treated water for non-potable re-use at Honua'ula. This report summarizes the findings of a two-day (August 14-15, 2008) wildlife survey performed by SWCA of the Wailea 670 alternative wastewater alignments, Wailea, Maui, Hawai'i. The main objectives of this wildlife survey were to:

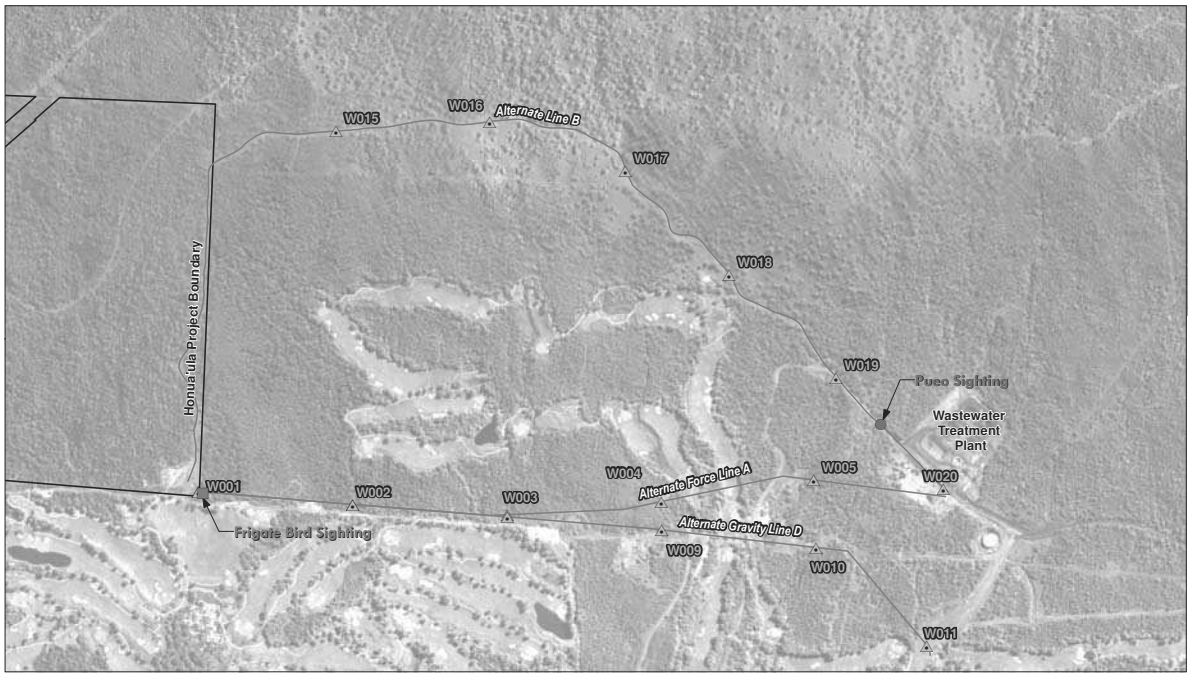
- To identify and document the wildlife species found within a 20 m-wide corridor along the three alternative wastewater line alignments;
- To map any State or Federally listed candidate, threatened or endangered species, species of concern and/ or rare (either locally or Statewide) species within the study area.
- To recommend mitigation measures as appropriate to minimize impacts to wildlife.

1.1. General Site Description

The three alternative wastewater line alignments extend south from the southern boundary of the Honua'ula (Wailea 670) Property across similar terrain to the existing Makena Wastewater Treatment Facility. One line parallels the boundary between the Makena and Wailea Resorts, another passes the northern portion of the Makena golf course, and a third lies between the two (Figure 1). Kiawe (*Prosopis pallida*) was the dominant canopy species along all three alternative routes. Some of the common herbs and shrubs included golden crown beard (*Verbesina encelioides*), *Bidens* species, false ragweed (*Parthenium hysterophorus*), klu (*Acacia farnesiana*), sweet basil (*Ocimum basilicum*), koa haole (*Leucena leucocephala*) and tree tobacco (*Nicotiana glauca*). Common grasses found across the alternative conveyance routes include buffel grass (*Cenchrus ciliaris*), guinea grass (*Panicum maximum*), natal red top (*Melinus repens*) and sour grass (*Digitaria insularis*). A detailed vegetation survey of the alternative wastewater alignments was prepared by SWCA (2008).

2.0 METHODS

Three wastewater alignment alternatives were surveyed 'Alternate "B" route', 'Alternate "A" force main' and 'Alternate "D" gravity line'. Weather during the wildlife survey was warm and sunny with temperatures ranging from 73 to 90 °F and winds from the northeast at average speeds of 10-16 mph. Field observations of birds were made with 8 x 42 (6.3°) binoculars, and by listening for vocalizations. The relative densities of species were estimated using a total of 14 five-minute 200 m radius point counts conducted during peak bird activity periods from 6 - 11 AM and 4 - 7 PM (Figure 2). Points were at least 400 m apart to avoid recounting of the same individuals, and of five-minute duration to maximize the likelihood of detecting new species during the survey (Lynch 1995).



Legend
- Project Boundary
- Wastewater Alignment Bird & Bat Point Counts

Figure 2
Wasterater Alignment Alternatives and Location of Point Counts

0 250 500 1,000 ft
0 50 100 200 M

N

SWCA ENVIRONMENTAL CONSULTANTS

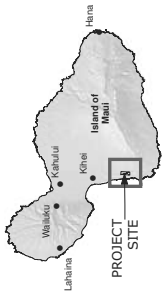
Boundary Source: PBR Hawaii
Wastewater Alternatives Source: R.M. Towill Corporation
Aerial Source: PDC (Pacific Disaster Center)

Figure 1
Location of Honua'ula Project Site

0 1,000 2,000 4,000 ft
0 250 500 1,000 M

N

SWCA ENVIRONMENTAL CONSULTANTS



Gecko abundance (visual observations and listening for vocalizations) was also recorded during the point count sessions. Six point count stations were located on each wastewater alignment alternative. Between count stations, rare or previously unrecorded bird, mammal, reptile or amphibian species were also noted. Mammals were recorded using visual observations, listening for vocalizations as well as evidence in the form of tracks and scat. No attempts were made to trap mammals to obtain data on their relative abundance. SWCA biologists searched for the Hawaiian hoary bat (*Lasiurus cinerus semotus*) along the wastewater alignment alternatives on the evening of 14 August, 2008 (between 7 pm and 12 am). The same point count stations for the avian fauna survey were used and each count station sampled for five minutes. The 50 m radius point counts were surveyed visually for hoary bats using night vision goggles (Morovison PVS-7 Ultra) and an Anabat SD1 ultrasonic bat detector, simultaneously, to detect bats. Non-native tree tobacco plants (*Nicotiana glauca*) found along the wastewater alignment alternatives were also examined for cut stems, frass, eggs, and caterpillars of the endangered Blackburn's sphinx moth (*Manduca blackburni*).

3.0 RESULTS

3.1 Endemic Birds

One pueo or Hawaiian short-eared owl (*Asio flammeus sandwichensis*) was observed at 11:00 PM, standing on the roadside along wastewater alignment alternative "B" approximately 70 m north-west of the Makena Wastewater Reclamation Facility (waypoint W020). The pueo is an endemic subspecies of the globally distributed short-eared owl (*Asio flammeus flammeus*) and is listed by the US Fish and Wildlife Service (USFWS) as a 'species of concern'. This endemic subspecies occurs on all main Hawaiian Islands, but is most common on Kauaʻi, Maui, and Hawaiʻi. It is also listed as by the State of Hawaiʻi as endangered on Oʻahu (Mounce 2008). The most common prey of the pueo includes mice, birds and rats (Mounce 2008); large insects are also taken (Snetsinger et al. 1994; Mostello 1996). Pueo occupy a variety of habitats, including wet and dry forests, but are most common in open habitats such as grasslands, shrublands, and montane parklands, including urban areas and those actively managed for conservation (Mitchell et al. 2005). Little is known about the breeding biology of the ground nesting Hawaiian short-eared owl, but it is believed to nest throughout the year. Nests are constructed by females and consist of simple scrapes in the ground lined with grasses and feather down (Mitchell et al. 2005). The grasslands around wastewater alignment alternative "B" are likely to provide good foraging, and nesting habitat for the pueo. However, these nesting habits make them increasingly vulnerable to predation by rats (*Rattus* spp.), cats (*Felis catus*), and the small Indian mongoose (*Herpestes auropunctatus*), all of which are present in the surrounding area (see below).

3.2 Native Birds

One great frigate bird or ʻiwa (*Fregata minor*) was seen soaring above point count W01 (Figure 1). The location of this point count is along the shared wastewater alignment alternative of "A" and "D". Greater frigate birds forage over the ocean, but nest in colonies on trees as much as 5-8 km inland (Metz and Schreiber 2002). However, it is unlikely that construction along the wastewater alignment will affect habitat of the great frigate bird.

3.3 Migratory Birds

Numerous migratory shorebirds winter in Hawaiʻi from August until April or May. The Pacific golden plover or kolea (*Pluvialis fulva*) is expected to occur on all three wastewater alignment alternatives during the migratory season. None were observed within the alignments during our study; however, some were seen elsewhere within South Kīhei. Habitat utilized by kolea are varied and can include cultivated fields, beaches, grassy borders of airport runways, parks, residential lawns, golf courses, roadsides, wetlands, open pastures and clearings (Mitchell et al. 2005). Kolea show high site fidelity to winter feeding grounds (Johnson et al. 1981, 1989, Johnson and Connors 1996) and probably return yearly to the same area. The Pacific golden plover feeds primarily on terrestrial invertebrates (Johnson and Connors 1996).

3.4 Introduced Birds

Sixteen species of introduced birds were recorded on the three wastewater alignment alternatives (Table 1). The most abundant birds on all three wastewater alignment alternatives were the zebra dove (*Geopelia striata*) and common myna (*Acridotheres tristis*). Black francolin (*Francolinus francolinus*) were locally common around wastewater alignment alternative "B", while African silverbills (*Lonchura cantans*) were common around wastewater alignment alternatives "A" and "D". The red crested cardinal (*Paroaria coronata*) was also common on the wastewater alignment alternative "D". From previous surveys in similar habitat in Wailea, other species not recorded but could occur in the area include wild turkey (*Meleagris gallopavo*), ring-necked pheasant (*Phasianus colchicus*), Erckel's francolin (*Francolinus erckelli*), mourning doves (*Zenaida macroura*) and chestnut munias (*Lonchura atricapilla*) (Bruner 2004, SWCA 2008).

3.5 Mammals

Axis deer (Axis axis) and rats (*Rattus* spp.) were observed on site, as well as deer scat. Feral goats (*Capra hircus*) have also been observed from time to time within the area encompassed by the wastewater alignments. The small Indian mongoose (*Herpestes javanicus*) and feral cats (*Felis catus*) were also observed along the shared wastewater alignment alternative of "A" and "D". Rats, mongoose, and cats are potential predators of the eggs and nestlings of the ground-nesting native pueo. Axis deer were also observed and heard in nearby areas. All these species probably are present on all wastewater alignment alternatives. No sightings of the Hawaiian hoary bat (*Lasiurus cinereus semotus*) were recorded at any of the point count stations along all the wastewater alignment alternatives. Kepler and Scott (1990) suggested that bats found on Oʻahu, Maui, and Molokaʻi may be migrant or vagrant individuals; however, more recent data suggest that bats are resident on Maui (Duvall and Gassmann-Duvall 1991). Bats are also regularly seen at Haleakala National Park (NPS 2008). It is possible that hoary bats occur in the general area of the wastewater alignment alternatives as recent sightings of bats on Maui (1976-1996) have included areas around Wailea (USFWS 1998).

3.6 Reptiles and Amphibians

There are no native reptiles or amphibians in Hawaiʻi (McKeown 1996). Geckos (Family Gekkonidae) were heard calling but not seen during avian point counts and were present along all wastewater alignment alternatives (Table 1). No skinks (Family Scincidae) were observed during avian point counts. No amphibians were seen and are unlikely to occur at due to the lack of permanent sources of freshwater.

3.7 Blackburn's Sphinx Moth (*Manduca blackburni*)

No Blackburn's sphinx moths or their caterpillars or eggs were found on any of the wastewater alignment alternatives. Tree tobacco (*Nicotiana glauca*), a favored host plant of larval Blackburn's sphinx moths (USFWS 2005), were found at waypoint W020, along wastewater alignment alternative "B" westward of waypoint W015 and westward of W03 along the shared wastewater alignment alternative of "A" and "D". Only tree tobacco plants westward of W03 showed substantial leaf damage that could be possibly attributed to the Blackburn's sphinx moth caterpillar (Preston pers. comm.). Maiapilo (*Capparis sandwichiana)*, presumed to be a host plant for adult Blackburn's sphinx moths, were also seen between waypoints W01 and W03. Blackburn's sphinx moth caterpillars have been recorded feeding on tree tobacco in Wailea, Maui (SWCA 2008) and it is possible that all tree tobacco plants along the wastewater alignment alternatives are potential food sources for the Blackburn's sphinx moth caterpillar.

4.0 CONCLUSIONS

The area encompassed by the alternative alignments for the sewerline from Honuaʻula (Wailea 670) all lie within heavily disturbed shrublands that have been altered by invasive non-native vegetation,

decades of cattle grazing, former military activities during WWII, and unrestricted grazing by deer and goats. The areas are characterized by non-native species. Migratory kolea may frequent roads and open areas as over-wintering habitat in Hawai'i and may be displaced if construction occurs during the migratory season. The construction of the wastewater alignment however, may result in the increase in open spaces, which may provide additional habitat that kolea can utilize post-construction. It is also expected that pueo will return to the area once construction is completed.

Table 1. Bird Species Observed During Survey

Species Name	Common Name	Biogeographic Status	Birds/Point Count (n=14)	Abundance Rank
Fregata minor	Greater Frigate bird	Native	0.07	15
Bubulcus ibis	Cattle Egret	Introduced	0.50	12
Francolinus pondicerianus	Gray Francolin	Introduced	1.71	5
Francolinus francolinus	Black Francolin	Introduced	0.86	9
Pluvalis fulva	Pacific Golden Plover	Migratory	-	-
Streptopelia chinensis	Spotted Dove	Introduced	1.07	8
Geopelia striata	Zebra Dove	Introduced	5.43	1
Tyto alba	Barn Owl	Introduced	-	-
Asio flammeus sandwichensis	Pueo	Native	-	-
Zosterops japonicus	Japanese White eye	Introduced	2.29	3
Mimus polyglottos	Common Mockingbird	Introduced	0.21	14
Acridotheres tristis	Common Myna	Introduced	2.43	2
Cardinalis cardinalis	Northern Cardinal	Introduced	1.14	7
Paroaria coronata	Red crested Cardinal	Introduced	1.43	6
Carpodacus mexicanus	House Finch	Introduced	0.29	13
Lonchura punctulata	Nutmeg Manikin	Introduced	0.79	10
Lonchura atricapilla	Chestnut Munia	Introduced	-	-
Passer domesticus	House sparrow	Introduced	0.57	11
Lonchura cantans	African Silverbill	Introduced	2.00	4
Gallus gallus	Domestic Chicken	Introduced	0.07	15

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