# Appendix C

Faunal Surveys Conducted for the Keālia Properties Project Rana Biological Consulting April 5, 2017

Faunal Surveys Conducted for the Sewage Line, Keālia Properties Project Rana Biological Consulting December 2018 Faunal Surveys Conducted for the Keālia Properties Project, (TMK # (4) 4-7-004 por.1.), Līhu'e District, Island of Kaua'i, Hawai'i



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April 5, 2017

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# Introduction and Background

Kealia Properties, LLC is proposing to develop a 235-lot residential subdivision, with lots ranging from 5,600 square feet to 7,300 square feet. Total project area is about 50 acres (including drainage detention basins). The proposed subdivision will be adjacent to an existing 36-lot subdivision at Keālia, Kaua'i. The property is currently designated within State and County agricultural districts, and will require an amendment to the State Land Use District Boundary and County Zoning District, followed by a County subdivision approval. The parcel of land identified as, Tax Map Key (TMK):(4) 4-7-004 por. 1. (Figure 1).

This report describes the methods used and the results of the avian and terrestrial mammalian surveys conducted on the project site as part of the environmental disclosure process associated with the proposed project.

The primary purpose of the surveys was to determine if there are any avian or terrestrial mammalian species currently listed, or proposed for listing under either federal or State of Hawai'i endangered species statutes within or adjacent to the study area. We were also asked to evaluate the potential impacts that the development of the project might pose to any sensitive or protected native avian or mammalian species, and to propose appropriate minimization measures that could be implemented to reduce or eliminate any such impacts. The federal and State of Hawai'i listed species status follows species identified in the following referenced documents, (Department of Land and Natural Resources (DLNR) 1998, U. S. Fish & Wildlife Service (USFWS) 2016). Fieldwork was conducted on April 1, 2017.

Hawaiian and scientific names are italicized in the text. A glossary of technical terms and acronyms used in the document are included at the end of the narrative text.

# General Project and Site Description

The proposed Project will be located on an approximately 50-acre portion of a larger lot. Kūhio Highway abuts the site to the east, and Ka'ao Subdivision to the south. Undeveloped lands abut the site to the north and west (Figure 1).

The project area was historically used for sugar cane production. Since the cessation of sugar cane production in the general Līhu'e area the project site has been leased to various tenants for ranching and diversified agricultural operations, most recently those activities have been centered on pasturage for cows.

Vegetation on the site is best categorized as an alien dominated, Guinea grass (*Megathyrsus maximus*) pasture with denser woody vegetation abutting two sides of the property and an existing subdivision on the south side of the property (Figures 2 &3). For a detailed description of the floristic make up of the site please see LeGrande, 2017.







Figure 2 – Typical view of the Guinea grass pasture covering most of the site, looking northwest from the southwest corner of the site



Figure 3 – Project site looking southeast showing heavily grazed vegetation typical of a about a half of the site as well as the existing Ka'ao Road Subdivision to the right of the frame

# Methods

# Avian Survey Methods

A total of five avian point count stations were sited approximately equidistant from each other within the project site. Eight-minute point counts were made at each of the count stations. Each station was counted once. Field observations were made with the aid of Leica 8 X 42 binoculars and by listening for vocalizations. Point counts were concentrated during the early morning hours, the peak of daily bird activity. Time not spent counting point count stations was used to search the remainder of the project site for species and habitats that were not detected during count sessions.

The avian phylogenetic nomenclature used in this report follows the *AOU Check-List of North American Birds* (American Ornithologists' Union, 1998), and the 42nd through the 57th supplements to the Check-List (American Ornithologists' Union, 2000; Banks et al., 2002, 2003, 2004, 2005, 2006, 2007, 2008; Chaser et al., 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016). Place names follow (Pukui et al., 1976).

# Mammalian Survey Methods

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or '*ōpe'ape'a* as it is known locally, all terrestrial mammals currently found on the Island of Kaua'i are alien species, and most are ubiquitous. The survey for terrestrial mammalian species was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all terrestrial vertebrate mammalian species detected within the project area during time spent within the project site. Mammalian species scientific names follow (Wilson and Reeder, 2005).

# Results

# Avian Survey Results

A total of 250 individual birds of 15 species, representing 12 separate families, were recorded during station counts (Table 1). All 15 avian species recorded on the property are alien to the Hawaiian Islands (Table 1).

No avian species currently proposed for listed, or listed as endangered or threatened under either federal or state of Hawai'i endangered species statutes, was recorded during the course of this survey (DLNR 1998; USFWS 2016).

Avian diversity was in keeping with the location of the property, and the degraded habitat present on the site. Three species, Cattle Egret (*Bubulcus ibis*), Red Junglefowl (*Gallus gallus*) and Western Meadowlark (*Sturnella neglecta*), accounted for 54% of all birds recorded during station counts. The most commonly recorded species was Cattle Egret, which accounted for 28 percent of the total number of individual birds recorded.

Table 1 – Avian Species Detected Keālia Properties Site April 2017				
Common Name	Scientific Name	ST	RA	
	PHASIANIDAE - Pheasants & Partridges Phasianinae - Pheasants & Allies			
Red Jungletowl	Gallus gallus	A	8.00	
Ring-necked Pheasant	Phasianus colchicus	A	0.40	
Cattle Egret	PELECANIFORMES ARDEIDAE - Herons, Bitterns & Allies Bubulcus ibis	А	14.20	
Spotted Dove Zebra Dove	COLUMBIFORMES COLUMBIDAE - Pigeons & Doves Streptopelia chinensis Geopelia striata	A A	1.40 3.80	
PSITTACULIDAE - Lorie	PSITTACIFORMES s, Lovebirds, and Indomalayan and Papua-Australasia	n Parro	ots	
Rose-ringed Parakeet	Psittacula krameri	A	0.60	
Japanese White-eye	PASSERIFORMES ZOSTEROPIDAE - White-eyes Zosterops japonicus TIMALIIDAE - Babblers MIMIDAE - Mockingbirds & Thrashers	A	3.00	
Northern Mockingbird	Mimus polyglottos STURNIDAE - Starlings	А	1.40	
Common Myna	Acridotheres tristis THRAUPIDAE - Tanagers	A	2.80	
	Thraupinae - Core Tanagers			
Red-crested Cardinal	Paroaria coronata	Α	2.40	
	CARDINALIDAE - Cardinals & Allies			
Northern Cardinal	Cardinalis cardinalis	A	0.20	
Western Meadowlark	Sturnella neglecta	А	5.00	
Cardualinae - Carduline Einches and Hawaiian Honoversoners				
House Finch	Haemorhous mexicanus ESTRILDIDAE - Estrildid Finches	A	3.40	
Red Avadavat	Amandava amandava	А	2.00	
Chestnut Munia	Lonchura atricapilla	А	1.40	

### Legend to Table 2

**ST** = Status

A = Alien – Introduced to the Hawaiian Islands by humans

**RA** = Relative Abundance - Number of birds detected divided by the number of count stations (5)

# Mammalian Survey Results

We recorded three terrestrial mammalian species while on the site. There was a herd of  $\geq$  cattle (*Bos taurus*) on the site including one large Black Angus bull. Tracks and scat of pigs (*Sus scrofa*) were encountered along dirt roads within and adjacent to the project site. Dogs (*Canis familiaris*) were heard barking from sites to the west and south of the site, additionally; tracks of this species were also encountered along dirt roads within the site.

No mammalian species proposed for listing, or listed as endangered or threatened under either federal or state of Hawai'i endangered species statutes, was recorded during the course of this survey (DLNR 1998; USFWS 2016).

# Discussion

# Avian Resources

The findings of the avian survey are consistent with the location of the property, and the heavily degraded nature of the vegetation on the site. The findings of this survey were similar to results of at least one other faunal survey conducted in the general project area in recent years (David and Guinther, 2005).

During the course of this survey we recorded 15 avian species during point counts, no additional species were recorded during the time we were present on the site. All of the avian species detected are alien to the Hawaiian Islands (Table 2).

No avian species currently proposed for listed, or listed as endangered or threatened under either federal or state of Hawai'i endangered species statutes, was recorded during the course of this survey (DLNR 1998; USFWS 2016).

Although not detected during this survey, the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened endemic Newell's Shearwater (*Puffinus newelli*) have been recorded over-flying the general project area between April and the end of November each year (David, 1995, 2014; Morgan et al., 2003, 2004; David and Planning Solutions 2008). Additionally, the Save Our Shearwaters Program has recovered both species from the general Keālia area over the past three decades (Morgan et al., 2003, 2004; David and Planning Solutions, 2008; Save our Shearwater Program, 2016).

The petrel is listed as endangered, and the shearwater as threatened under both Federal and State of Hawai'i endangered species statutes. The primary cause of mortality in both Hawaiian Petrels and Newell's Shearwaters is thought to be predation by alien mammalian species at the nesting colonies (USFWS 1983, Simons and Hodges 1998, Ainley et al., 2001). Collision with man-made structures is considered to be the second most significant cause of mortality of these seabird species in Hawai'i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds can collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Hadley 1961; Telfer 1979; Sincock 1981; Reed et al., 1985; Telfer et al., 1987; Cooper and Day, 1998; Podolsky et al. 1998; Ainley et al., 2001; Hue et al., 2001; Day et al 2003).

### Mammalian Resources

The findings of the mammalian survey are consistent with the location of the property and the habitat currently present on the site. We did not record Hawaiian hoary bats overflying the site. Hawaiian hoary bats are widely distributed in the low to mid-elevation areas on the Island of Kaua'i, and have been documented in and around almost all areas that still have some dense vegetation (Tomich, 1986; USFWS 1998, David, 2016).

No rodent species were detected during this survey it is probable that one or more of four established alien muridae found on Kaua'i, European house mice (*Mus musculus domesticus*), roof rat (*Rattus rattus*), brown rat (*Rattus norvegicus*), and possibly Polynesian rats (*Rattus exulans hawaiiensis*) use various resources found within the general project area. All of these introduced rodents are deleterious to native ecosystems and the native faunal species dependent on them

# Potential Impacts to Protected Species

### Nēnē

Although no Nēnē were recorded during the course of the avian surveys conducted on the property, there is the potential depending on how tall the grass is that Nēnē could use resources on the site on a seasonal basis. The principal potential impact that construction of the proposed subdivision poses to Nēnē would be during clearing and grubbing phases of the project, clearing vegetation, has the potential to disturb nesting Nēnē nests, eggs and young. Nēnē disturbed when nesting may abandon their nest, eggs and to a lesser degree chicks. Increased vehicular traffic associated with construction activities also increases the risk of birds being run over or hit by vehicles, within the project site.

### Seabirds

The principal potential impact that construction of the proposed subdivision poses to protected seabirds is the increased threat that birds will be downed after becoming disoriented by lights associated with the project during the nesting season. The two main ways that outdoor lighting could pose a threat to these nocturnally flying seabirds is if, 1) during construction it is deemed expedient, or necessary to conduct nighttime construction activities, and 2) following build-out, the potential operation of streetlights or other security lighting.

# Hawaiian hoary bats

It is likely that Hawaiian hoary bats overfly the project area on a seasonal basis. The principal potential impact that the development of the site poses to bats is during the clearing and grubbing phases of construction as vegetation is removed. The removal of vegetation within the project site has the potential to temporarily displace individual bats, which may use the vegetation as a roosting location. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season, females carrying their pups may be less able to rapidly vacate a roost site as the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage. Very small pups may be unable to flee a tree that is being felled. Potential adverse effects from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 4.6 meters (15-feet), between June 1 and September 15, the period in which bats are potentially at risk from vegetation clearing. With that said, there are no suitable roost trees within the proposed project site, thus it is not expected that the project will result in deleterious impacts to this listed mammalian species.

# Recommendations

During the construction phase of the project we recommend the following minimization measures and training be implemented to ensure that construction activities do not result in deleterious impacts to the listed faunal species that may be encountered during construction.

• If nighttime construction activity or equipment maintenance is proposed during the construction phases of the project, all associated lights should be shielded, and when large flood/work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly at the ground.

At the time that the subdivision is operational we recommend the following.

• If streetlights or exterior facility lighting is installed in conjunction with the project, it is recommended that the lights be shielded to reduce the potential for interactions

of nocturnally flying seabirds with external lights and man-made structures (Reed et al., 1985; Telfer et al., 1987).

# Critical Habitat

There is no federally delineated Critical Habitat for any species present on, or adjacent to the project area. Thus the development and operation of the proposed project will not result in impacts to federally designated Critical Habitat. There is no equivalent statute under State law.

# Glossary

Alien – Introduced to Hawaiʻi by humans

- Commensal Animals that share human's food and lodgings, such as rats and mice.
- Crepuscular Twilight hours
- Endangered Listed and protected under the Endangered Species Act of 1973, as amended (ESA) as an endangered species
- Endemic Native to the Hawaiian Islands and unique to Hawai'i
- Muridae Rodents, including rats, mice and voles, one of the most diverse families of mammals

Nocturnal – Night-time, after dark

- '*Ōpe'ape'a* Endemic endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*)
- Pelagic An animal that spends its life at sea in this case seabirds that only return to land to nest and rear their young
- Phylogenetic The evolutionary order that organisms are arranged by
- Sign Biological term referring to tracks, scat, rubbing, odor, marks, nests, and other signs created by animals by which their presence may be detected
- Threatened Listed and protected under the ESA as a threatened species.

DLNR – Hawai'i State Department of Land & Natural Resources

DOFAW – Division of Forestry and Wildlife

ESA – Endangered Species Act of 1973, as amended

TMK – Tax Map Key

USFWS – United State Fish & Wildlife Service

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# Faunal Surveys Conducted for the Sewage Line, Keālia Properties Project, Līhu'e District, Island of Kaua'i, Hawai'i



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# Introduction and Background

Kealia Properties, LLC is proposing to develop a 235-lot residential subdivision, with lots ranging from 5,600 square feet to 7,300 square feet. Total project area is about 50 acres (including drainage detention basins). The proposed subdivision will be adjacent to an existing 36-lot subdivision at Keālia, Kaua'i. The Proposed Action includes installation of utility infrastructure (e.g., drinking water, drainage, wastewater, electrical power, and telecommunications systems) and transportation improvements to serve the new subdivision. Improved, construction-ready house lots will available for sale to the public.

This report describes the methods used and the results of the avian and terrestrial mammalian surveys conducted on the proposed sewer line route and the roundabout intersection proposed at the intersection of Kūhiō Highway, and Keālia Road (Figures 1 and 2). Avian and terrestrial mammalian surveys were conducted on the subdivision site in April 2017 (David, 2017).

The primary purpose of the surveys was to determine if there are any avian or terrestrial mammalian species currently listed, or proposed for listing under either federal or State of Hawai'i endangered species statutes within or adjacent to the study area. We were also asked to evaluate the potential impacts that the development of the project might pose to any sensitive or protected native avian or mammalian species, and to propose appropriate minimization measures that could be implemented to reduce or eliminate any such impacts. The federal and State of Hawai'i listed species status follows species identified in the following referenced documents, (Department of Land and Natural Resources (DLNR) 1998, U. S. Fish & Wildlife Service (USFWS) nd). Fieldwork was conducted on November 27, 2018.

Hawaiian and scientific names are italicized in the text. A glossary of technical terms and acronyms used in the document are included at the end of the narrative text.

# General Project and Site Description

Improvements to the two-lane Keālia Road are needed to accommodate the increase in vehicular traffic associated with the project, and improvements shall be in accordance with the County's Complete Streets Policy. Improvements are proposed to approximately 2,650 linear feet of Keālia Road, extending from the Hopoe Road intersection to the Kūhiō Highway intersection (Figure 1).

At the intersection of Keālia Road and Kūhiō Highway, a roundabout will be constructed to mitigate the increase in traffic due to the project, and to improve intersection safety. The roundabout was identified by the County of Kaua'i as their preferred alternative and is presented as part of the proposed action (Figure 1).



Figure 1 – Location Map Kealia Properties Sewer Line Route

A new sanitary sewer main will be needed from the Petition Area to a lift station along Kūhiō Highway, and then to an existing municipal sewer manhole near the Kaiakea Fire Station, nearly one mile away. A new sewer pump station will also be constructed.

# Methods

### Avian Survey Methods

Nine avian point count stations were sited approximately equidistant from each other along the proposed sewer line route. Eight-minute point counts were made at each of the count stations. Each station was counted once. Field observations were made with the aid of Leica 8 X 42 binoculars and by listening for vocalizations. Point counts were concentrated during the early morning hours, the peak of daily bird activity. Additionally, a single 30-minute time dependent waterbird count was conducted from the center of the Keālia River Bridge. Time not spent counting point count stations was used to search the remainder of the corridor for species and habitats that were not detected during count sessions.

The avian phylogenetic nomenclature used in this report follows the *AOU Check-List of North American Birds* (American Ornithologists' Union, 1998), and the 42nd through the 57th supplements to the Check-List (American Ornithologists' Union, 2000; Banks et al., 2002, 2003, 2004, 2005, 2006, 2007, 2008; Chaser et al., 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018). Place names follow (Pukui et al., 1976).

### Mammalian Survey Methods

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or '*ōpe'ape'a* as it is known locally, all terrestrial mammals currently found on the Island of Kaua'i are alien species, and most are ubiquitous. The survey for terrestrial mammalian species was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all terrestrial vertebrate mammalian species detected within the project area during time spent within the project site. Mammalian species scientific names follow (Wilson and Reeder, 2005).

# Results

### Avian Survey Results Point counts

A total of 392 individual birds of 26 species, representing 19 separate families, were recorded during station counts (Table 1). No additional species were detected while transiting the corridor between count stations. Three of the species detected, Nēnē (*Branta sandvicensis*), Hawaiian Coot (*Fulica alai*), and black-necked Stilt (*Hemantopus mexicanus knudseni*), are endemic species listed as endangered under both federal and state of Hawai'i endangered species statutes (DLNR, 1998; USFWS, nd). Two species recorded Pacific-Golden Plover (*Pluvialis fulva*) and Red-footed Booby (*Sula sula*), are indigenous to the Hawaiian Islands, the former is a migratory shorebird species and the later is a resident

seabird species. The remaining 21 species recorded during point counts are established alien species (Table 1).

Avian diversity was in keeping with the location of the alignment and the habitats present along the corridor. Four species, Common Myna (*Acridotheres tristis*), Zebra Dove (*Geopilia striata*), Red Junglefowl (*Gallus gallus*) and House Finch (*Haemorhous mexicanus*) accounted for 56% of all birds recorded during station counts. The most commonly recorded species was Common Myna, which accounted for 18 percent of the total number of individual birds recorded.

Common Name	Scientific Name	ST	RA
	ANSERIFORMES		
	ANATIDAE - Ducks, Geese & Swans		
	Anserinae - Geese & Swans		
Hawalian Goose	Branta sandvicensis	EE	0.22
	PHASIANIDAE - Pheasants & Partridges		
	Phasianinae - Pheasants & Allies		
Red Junglefowl	Gallus gallus	А	5.33
Ring-necked Pheasant	Phasianus colchicus	А	0.11
	PELECANIFORMES		
	ARDEIDAE - Herons, Bitterns & Allies		
Cattle Egret	Bubulcus ibis	А	1.00
	COLUMBIEORMES		
	COLUMBIDAE - Pigeons & Doves		
Rock Pigeon	Columba livia	А	0.22
Spotted Dove	Streptopelia chinensis	А	1.67
Zebra Dove	Geopelia striata	А	7.11
	GRUIFORMES		
	RALLIDAE - Rails. Gallinules and Coots		
Hawaiian Coot	Fulica alai	EE	0.11
	CHARADRIEORMES		
	RECLIBVIROSTRIDAE - Stilts & Avocets		
Black-necked Stilt	Himantonus mexicanus knudseni	EE	0.33
	CHARADRIIDAE - Lapwings & Plovers		0.00
	Charadriinae - Plovers		
Pacific Golden-Plover	Pluvialis fulva	IM	0.22

Table 1 continued.

Common Name	Scientific Name	ST	RA
	SULIFORMES		
Ded fested Desku	SULIDAE - Boobles	10	0.11
Red-tooted Booby		IR	0.11
	PASSERIFURMES		
	ZOSTEROPIDAE - White-eyes	-	
Japanese White-eye	Zosterops japonicus	A	4.33
	TIMALIIDAE - Babblers		
Chinese Hwamei	Garrulax canorus	А	0.44
	TURDIDAE - Thrushes		
White-rumped Shama	Copsychus malabaricus	А	0.78
	MIMIDAE - Mockingbirds & Thrashers		
Northern Mockingbird	Mimus polyglottos	А	0.22
	STURNIDAE - Starlings		
Common Myna	Acridotheres tristis	А	7.89
	FRINGILLIDAE - Fringilline and Carduline Finches &		
	Allies		
	Carduelinae - Carduline Finches and Hawaiian		
	Honeycreepers		
House Finch	Haemorhous mexicanus	А	4.11
	PASSERIDAE - Old World Sparrows		
House Sparrow	Passer domesticus	А	0.11
·	ICTERIDAE - Blackbirds		
Western Meadowlark	Sturnella nealecta	А	1.00
	CARDINALIDAE - Cardinals & Allies		
Northern Cardinal	Cardinalis cardinalis	А	0.89
	THRAUPIDAE - Tanagers		0.00
	Thrauninae - Core Tanagers		
Red-crested Cardinal	Paroaria coronata	Δ	3 00
Red crested cardinar	ESTRIL DIDAE - Estrildid Einches	~	5.00
Common Waxhill	Estrilda astrild	٨	0.22
		A 	0.22
Java Sparrow		A _	0.55
Scary-preasted Wunia	Lonchura atricanilla	A	0.44
Chestnut Munia	נסחכחערם מגרוכמסווומ	A	3.11

Legend to Table 1

**ST** = Status

EE	= Endangered Endemic – a species which is native and unique to the Hawaiian	Islands and is
	also listed as endangered	

A = Alien – Introduced to the Hawaiian Islands by humans

IM = Indigenous Migratory – a species which is native to Hawaii but is also found elsewhere, and migrates through the Hawaiian Islands but does not breed in the state.

IB = Indigenous Breeder – a species which is native to the Hawaiian Islands but is also found

elsewhere and does breed in the state.

**RA** = Relative Abundance - Number of birds detected divided by the number of count stations (9)

### Time Dependent Waterbird Count

A single 30-minute time dependent waterbird count was conducted from the center of the Keālia Stream Bridge. A lone Common Gallinule (*Gallinula galeata sandvicensis*) was seen moving in and out of the California grass (*Brachiaria mutica*), on the *mauka* side of the stream. Common Gallinules are listed as endangered species under both federal and State of Hawaii endangered species statutes (DLNR, 1998; USFW, nd).

### Mammalian Survey Results

We recorded four terrestrial mammalian species while on the site. Several dogs (*Canis familiaris*), were seen being walked on leashes along the bikeway on the *makai* site of Kūhiō Highway, additionally several dogs were heard barking from within properties along Keālia Road. Two cats (*Felis catus*) were seen along the survey corridor. Cows (*Bos taurus*) were recorded within a corral on the *mauka* side of Keālia Road, as were several horses (*Equus cabbalus*).

No mammalian species proposed for listing, or listed as endangered or threatened under either federal or state of Hawai'i endangered species statutes, was recorded during the course of this survey (DLNR, 1998; USFWS, nd).

# Discussion

# Avian Resources

The findings of the avian survey are consistent with the location of the survey corridor, and the heavily degraded nature of the vegetation on the site. As previously mentioned we recorded 26 avian species during the course of the point counts, an additional species, Common Gallinule was recorded during the time-dependent waterbird count conducted at the Keālia Stream (Table 1). Four of the avian species detected during the course of this survey are listed as endangered species under both federal and state of Hawaii endangered species statutes (DLNR, 1998; USFW, nd).

Two Nēnē were seen at the northwest corner of the Saint Katherine Cemetery, the female bird appeared to be gravid; I would suspect that they will nest in that general area. Hawaiian Coots and Black-necked Stilts were heard calling from wetlands located to the west of Keālia Road, and a lone Common Gallinule was seen within Keālia Stream.

Although not detected during this survey, the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened endemic Newell's Shearwater (*Puffinus newelli*) have been recorded over-flying the general project area between April and the end of November each year (David, 1995, 2014; Morgan et al., 2003, 2004; David and Planning Solutions

2008). Additionally, the Save Our Shearwaters Program has recovered both species from the general Keālia area over the past three decades (Morgan et al., 2003, 2004; David and Planning Solutions, 2008; Save our Shearwater Program, 2018).

The petrel is listed as endangered, and the shearwater as threatened under both Federal and State of Hawai'i endangered species statutes. The primary cause of mortality in both Hawaiian Petrels and Newell's Shearwaters is thought to be predation by alien mammalian species at the nesting colonies (USFWS 1983, Simons and Hodges 1998, Ainley et al., 2001). Collision with man-made structures is considered to be the second most significant cause of mortality of these seabird species in Hawai'i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds can collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Hadley 1961; Telfer 1979; Sincock 1981; Reed et al., 1985; Telfer et al., 1987; Cooper and Day, 1998; Podolsky et al. 1998; Ainley et al., 2001; Hue et al., 2001; Day et al 2003).

# Mammalian Resources

The findings of the mammalian survey are consistent with the location of the survey corridor and the habitat currently present along the sides of the roads that were surveyed. We did not record Hawaiian hoary bats overflying the site. Hawaiian hoary bats are widely distributed in the low to mid-elevation areas on the Island of Kaua'i, and have been documented in and around almost all areas that still have some dense vegetation (Tomich, 1986; USFWS 1998, David, 2018).

No rodent species were detected during this survey it is probable that one or more of four established alien muridae found on Kaua'i, European house mice (*Mus musculus domesticus*), roof rat (*Rattus rattus*), brown rat (*Rattus norvegicus*), and possibly Polynesian rats (*Rattus exulans hawaiiensis*) use various resources found within the general project area. All of these introduced rodents are deleterious to native ecosystems and the native faunal species dependent on them

# Potential Impacts to Protected Species

# Nēnē & Waterbirds

Given the locations that listed waterbirds were recorded it is not expected that the construction of the sewer line and the roundabout intersection will result in deleterious impacts to listed waterbirds, beyond those risks currently present along the route.

# Seabirds

The principal potential impact that construction of the proposed sewer line and roundabout intersection poses to protected seabirds is the increased threat that birds will be downed

after becoming disoriented by lights associated with the project during the nesting season. The two main ways that outdoor lighting could pose a threat to these nocturnally flying seabirds is if, 1) during construction it is deemed expedient, or necessary to conduct nighttime construction activities, and 2) following build-out, the potential operation of streetlights.

### Hawaiian hoary bats

It is likely that Hawaiian hoary bats overfly the project area on a seasonal basis. The principal potential impact that the development of the sewer line and roundabout intersection poses to bats is during the clearing and grubbing phases of construction as vegetation is removed. The removal of vegetation within the project site has the potential to temporarily displace individual bats, which may use the vegetation as a roosting location. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season, females carrying their pups may be less able to rapidly vacate a roost site as the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage. Very small pups may be unable to flee a tree that is being felled. Potential adverse effects from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 4.6 meters (15-feet), between June 1 and September 15, the period in which bats are potentially at risk from vegetation clearing.

The only portion of the propose project that contains suitable bat roost trees is along Keālia Road down to the intersection with Kūhiō Highway. There are no suitable roost trees within the roundabout intersection or from there to the southern terminus of the sewer line.

# Recommendations

During the construction phase of the project we recommend the following minimization measures and training be implemented to ensure that construction activities do not result in deleterious impacts to the listed faunal species that may be encountered during construction.

- Potential adverse impacts to pupping bats can be avoided or minimized by not clearing woody vegetation taller than 4.6 meters (15-feet), along Keālia Road between June 1 and September 15, the period in which bats are potentially at risk from vegetation clearing.
- If nighttime construction activity or equipment maintenance is proposed during the construction phases of the project, all associated lights should be shielded, and when large flood/work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly at the ground.

• If streetlights or exterior facility lighting is installed in conjunction with the project, it is recommended that the lights be shielded to reduce the potential for interactions of nocturnally flying seabirds with external lights and man-made structures (Reed et al., 1985; Telfer et al., 1987).

# Critical Habitat

There is no federally delineated Critical Habitat for any species present on, or adjacent to the project area. Thus the development and operation of the proposed project will not result in impacts to federally designated Critical Habitat. There is no equivalent statute under State law.

# Glossary

Alien – Introduced to Hawai'i by humans Commensal – Animals that share human's food and lodgings, such as rats and mice. Crepuscular – Twilight hours Endangered – Listed and protected under the Endangered Species Act of 1973, as amended (ESA) as an endangered species Endemic – Native to the Hawaiian Islands and unique to Hawai'i *mauka* – Upslope, towards the mountains makai – Down-slope, towards the ocean Muridae – Rodents, including rats, mice and voles, one of the most diverse families of mammals Nocturnal – Night-time, after dark *'Ope'ape'a* – Endemic endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) Pelagic – An animal that spends its life at sea – in this case seabirds that only return to land to nest and rear their young Phylogenetic – The evolutionary order that organisms are arranged by Sign – Biological term referring to tracks, scat, rubbing, odor, marks, nests, and other signs created by animals by which their presence may be detected Threatened – Listed and protected under the ESA as a threatened species. DLNR – Hawai'i State Department of Land & Natural Resources DOFAW - Division of Forestry and Wildlife ESA – Endangered Species Act of 1973, as amended USFWS – United State Fish & Wildlife Service

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