

Appendix D

Biological Surveys Conducted for the Proposed New Kīhei High School Kīhei, Maui

Rana Biological Consulting, Inc. – December 2009

Biological Surveys Conducted for the Proposed New Kīhei High School, Kīhei, Maui

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December 4, 2009

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Introduction

The State of Hawai‘i Department of Education (DOE) proposes to develop a new high school in Kīhei on an approximately 77-acre site located *mauka* of Pi‘ilani Highway between Kūlanihāko‘i and Waipu‘ilani Gulchs (Figure 1). The lands surveyed are identified as TMK: 2-2-002: 054 (por.); 2-2-002: 015 (por.)

The primary purpose of these surveys was to determine if there were any botanical, avian or mammalian species currently listed, or proposed for listing as endangered or threatened under either the federal or the State of Hawai‘i’s endangered species programs on, or within the immediate vicinity of the project depicted on Figure 1. Federal and State of Hawai‘i listed species status follows species identified in the following referenced documents (Division of Land and Natural Resources (DLNR) 1998, Federal Register 2005, U. S. Fish & Wildlife Service (USFWS) 2005, 2009). Fieldwork was conducted on November 17 and 18, 2009.

Avian phylogenetic order and nomenclature follows *The American Ornithologists’ Union Check-list of North American Birds 7th Edition* (American Ornithologists’ Union 1998), and the 42nd through the 50th supplements to *Check-list of North American Birds* (American Ornithologists’ Union 2000; Banks et al. 2002, 2003, 2004, 2005, 2006, 2007, 2008, Chesser et al., 2009). Mammal scientific names follow *Mammals in Hawaii* (Tomich 1986). Plant names follow *Manual of the Flowering Plants of Hawai‘i* (Wagner et al., 1990, 1999) for native and naturalized flowering plants, and *A Tropical Garden Flora* (Staples and Herbst, 2005) for crop and ornamental plants. Place names follow *Place Names of Hawaii* (Pukui et al., 1974).

Hawaiian and scientific names are italicized in the text. A glossary of technical terms and acronyms used in the document, which may be unfamiliar to the reader, are included at the end of the narrative text.

General Site and Project Description

The school and associated infrastructure is being planned to accommodate an enrollment of up to 1,650 students in grades 9-12. The DOE is planning on building general use and specialty classrooms, library, auditorium, cafeteria, an administration building, industrial arts building, ROTC facility, central plant, physical education and athletic buildings for locker/shower facilities, gymnasium, swimming pool and bleachers.

Access to the high school campus will be gained via a new right-in right-out access road off of Pi‘ilani Highway. The new road will be a *mauka* extension of the existing Kūlanihāko‘i Street in the Pi‘ilani Village subdivision. The new road will serve as a connector to the master planned communities *mauka* of the school site. Other anticipated circulation improvements include on-site roadways, parking areas, parking lighting, emergency access requirements and traffic signalization.



Location
Kihei High School

The site is currently being used for cattle pasturage and is highly degraded as is graphically illustrated in Figures 2 and 3. The vegetation on the site is best described as a savanna: grassland with scattered trees.

There are ample signs of past wildfires on the site. Additionally there are numerous unimproved roads; firebreaks and what appear to be bulldozed roads used by the geotechnical-drilling rig during geotechnical studies of the site.



Figure – 2 Kīhei HS site looking northwest showing buflegrass/kiawe habitat taken from southeast corner of the site

Botanical Survey Methods

The botanical survey was undertaken on November 17 and 18, 2009 utilizing wandering transects that traversed all parts of the subject parcel. The route of the botanical survey was recorded (November 17 only) using GPS so that coverage could be assessed as the survey progressed. The survey was conducted early in the wet season and it was apparent that this part of Maui had seen little or no rainfall in the preceding weeks. Therefore some plants occurring on the site, especially annuals were likely not observed. In particular, dried remnants of grasses and herbs were noted that could not be identified or were just barely recognizable. At highly disturbed lowland sites, such as these pasture properties, missed species due to seasonal constraints are expected to be introduced (non-native), weedy species.



Figure-3 Northern portion of the site taken from the center of the Kaonoulu Ranch property showing ungulate grazing damage

Botanical Survey Results

A plant checklist (Table 1) was compiled from the field observations, with entries arranged alphabetically under plant family names (standard practice). Included in the list are scientific name, common name, and status (whether native or non-native) for each species observed on the property. Species status given in **bold** indicates a plant of some interest to the Hawaiian Islands flora. In addition to identifying the plants present within the study site, qualitative estimates of plant abundance were made. These are coded in the table as explained in the Legend to Table 1 and apply to observations made during the present survey.

The project area supports two basic vegetation types: 1) grassland; and 2) savanna. The difference between grassland and savanna is the density of the trees present, but there is no fully accepted definition of a savanna. Definitions range from scattered trees on grassland to open forest with dense, grassy undergrowth. Here, the pasture (on the less grazed southern parcel) is a buffleggrass/lovegrass (*Cenchrus ciliaris*/*Eragrostis pectinacea*) grassland. This parcel merges into a buffleggrass/kiawe (*Cenchrus ciliaris*/*Prosopis pallida*) savanna towards Waipu‘ilani Gulch along the southern boundary. The northern parcel is essentially all a buffleggrass/kiawe savanna in the project area.

Abundance ratings in Table 1 are given for the entire project area, but are skewed to the only live grass observed: buffelgrass. It was apparent that much a smaller lovegrass (*Eragrostis* cf. *pectinacea*) was also abundant in many areas, but no live plants were seen. A third grass (*Chloris* sp.) may also be abundant, but its distribution was difficult to ascertain from the dried remnants encountered.

Table 1 - Checklist of Plant Species Observed at the Proposed Kīhei High School Site

<i>Species listed by family</i>	<i>Common name</i>	Status	Abundance	Notes
FUNGI				
LYCOPERDACEAE				
<i>Vascellum</i> sp. or <i>Bovista</i> sp.	puffball fungus	Nat	R	
FLOWERING PLANTS				
DICOTYLEDONES				
EUPHORBIACEAE				
<i>Chamaesyce hyssopifolia</i> (L.) Small	---	Nat	--	<1>
FABACEAE				
<i>Acacia farnesiana</i> (L.) Willd.	<i>klu</i>	Nat	O	
<i>Indigofera hendecaphylla</i> Jacq.	prostrate indigo	Nat	--	<1>
<i>Leucaena leucocephala</i> (Lam.) de Wit	<i>koa haole</i>	Nat	--	<1>
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	<i>kiawe</i>	Nat	AA	
MALVACEAE				
<i>Gossypium tomentosum</i> Nutt. ex Seem.	<i>ma'ō</i> , Hawaiian cotton	End	--	<1>
<i>Sida rhombifolia</i> L.	---	Nat	--	<1>
STERCULIACEAE				
<i>Waltheria indica</i> L.	<i>'uhaloa</i>	Ind.	O	
MONCOTYLEDONES				
POACEAE				
<i>Cenchrus ciliaris</i> L.	buffelgrass	Nat	AA	
<i>Chloris</i> sp.	finger grass	Nat	A	<2>
<i>Cynodon dactylon</i> (L.) Pers.	Bermuda grass	Nat	--	<1>
<i>Eragrostis pectinacea</i> (Michx.) Nees	Carolina lovegrass	Nat	AA	<2>

Legend to Table 1

STATUS = distributional status for the Hawaiian Islands:

End = Native only to the Hawaiian Islands.

Ind = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.

Nat = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.

ABUNDANCE = occurrence ratings for plants by area:

R - Rare seen in only one or perhaps two locations.

O - Occasional seen with some regularity

A - Abundant found in large numbers; may be locally dominant.
AA - Very abundant abundant and dominant; defining species for vegetation type.

NOTES:

<1> Observed only outside the property along the highway verge fronting the site .
<2> Specimens encountered lacked fruit or flowers; dead material; species determination uncertain.

Excluding the observation of a fungal fruiting body, the total number of species recorded for the property (all flowering plants) was six. This is an astoundingly low number for the size of the property and the number of hours spent conducting the survey. Only *'uhaloa* (*Waltheria indica*) counted as a native species, but the low number of all species results in a respectable (for lowland, disturbed sites) ratio of natives of 17%!

Although the survey area was considered to be *mauka* of the fence along the highway and back away from the upper margins of the gulches on the north and south, the land between the fence and the highway was surveyed on the premise that the project could have some impacts in this area, even if limited to access roadways. This area added an additional six species of plants to the listing in Table 1 (see Note <1>). These are, with one exception, ruderal weeds typical of a highway verge. The exception is Hawaiian cotton or *ma'ō* (*Gossypium tomentosum*). *Ma'ō* is an endemic species. It is widespread in drier areas of the Islands, but numbers of plants tend to be low in most places where it is found. Combining the surveys yields a total of 12 recorded flowering plants (still a very low number), no ferns, and including one each of indigenous and endemic Hawaiian plant species (17% native)

Avian Survey Methods

Nine avian count stations were sited approximately 300-meter apart along three transects that ran from east-to-west within the proposed development site. Eight-minute point counts were made at each of the nine count stations. Each station was counted once. Field observations were made with the aid of Leica 10 X 42 binoculars and by listening for vocalizations. Counts were concentrated between 06:30 a.m. and 10:00 a.m., the peak of daily bird activity. Additionally, the zoologist walked the site in a similar fashion as the botanist, to ensure that no additional species or habitats not encountered during the time dependant avian counts were present on the site.

Avian Survey Results

A total of 168 individual birds of 11 different species, representing eight separate families, were recorded during station counts (Table 2). One of the species recorded, Pacific Golden-Plover (*Pluvialis fulva*), is an indigenous migratory shorebird species that nests in the high Arctic during the late spring and summer months, returning to Hawai'i and the Tropical Pacific to spend the fall and winter months each year. They usually leave Hawai'i for their trip back to the Arctic in late April or the very early part of May each year. The remaining 10 species detected are all considered to be alien to the Hawaiian Islands. No avian species currently listed, or proposed for

listing under either the federal or State of Hawai'i endangered species statutes was detected during the course of this survey.

Avian diversity and densities were low, though in keeping with the xeric habitat present within the project site and its current usage for pasturage. Two species: Zebra Dove (*Geopelia striata*) and House Finch (*Carpodacus mexicanus*) accounted for slightly less than 48 percent of the total number of birds detected. The most common avian species recorded was Zebra Dove, which accounted for slightly more than 27 percent of the total number of individual birds recorded. An average of 19 individual birds was recorded per station count.

Table 2 – Avian Species Detected Within the Proposed Kihei High School Site

<i>Common Name</i>	<i>Scientific Name</i>	<i>ST</i>	<i>RA</i>
GALLIFORMES			
PHASIANIDAE - Pheasants & Partridges			
Phasianinae - Pheasants & Allies			
Gray Francolin	<i>Francolinus pondicerianus</i>	A	1.78
Black Francolin	<i>Francolinus francolinus</i>	A	1.22
Red Junglefowl	<i>Gallus gallus</i>	A	0.22
CHARADRIIFORMES			
CHARADRIIDAE - Lapwings & Plovers			
Charadriinae - Plovers			
Pacific Golden-Plover	<i>Pluvialis fulva</i>	IM	0.78
COLUMBIFORMES			
COLUMBIDAE - Pigeons & Doves			
Spotted Dove	<i>Streptopelia chinensis</i>	A	0.67
Zebra Dove	<i>Geopelia striata</i>	A	5.11
PASSERIFORMES			
ZOSTEROPIDAE - White-eyes			
Japanese White-eye	<i>Zosterops japonicus</i>	A	1.89
STURNIDAE - Starlings			
Common Myna	<i>Acridotheres tristis</i>	A	1.00
CARDINALIDAE - Cardinals & Allies			
Northern Cardinal	<i>Cardinalis cardinalis</i>	A	0.67
FRINGILLIDAE - Fringilline and Carduleline Finches & Allies			
Carduelinae - Carduline Finches			
House Finch	<i>Carpodacus mexicanus</i>	A	3.78
ESTRILDIDAE - Estrildid Finches			
Estrildinae - Estrildine Finches			
Nutmeg Mannikin	<i>Lonchura punctulata</i>	A	1.56

Key to table 2

ST Status

A Alien – Introduced to the Hawaiian Islands by humans

IM Indigenous Migratory Species – Native to Hawai‘i, but also found elsewhere naturally, does not nest in Hawai‘i

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

Mammalian Survey Methods

With the exception of the endangered Hawaiian hoary bat (*Lazarus cinereus semotus*), or ‘ōpe‘ape‘a as it is known locally, all terrestrial mammals currently found on the Island of Maui are alien species. Most are ubiquitous. The survey of mammals 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 vertebrate species observed and heard within the project area.

Mammalian Survey Results

Seven mammalian species were detected during the course of this survey (Table 3). Only two of these: humans (*Homo sapiens*) and Axis deer (*Axis axis*) were seen alive. We encountered humans driving trucks within the northern portion of the site. A herd of approximately 10 Axis deer was seen running out of the site and into Kūlanihāko‘i Gulch. We encountered one relatively recently dead cow (*Bos taurus*) on the northern portion of the site. Additionally, we encountered skeletal remains of several other cows within the area surveyed, as well as tracks, sign and scat of dog (*Canis f. familiaris*), cat (*Felis c. catus*), horse (*Equus c. caballus*), pig (*Sus s. scrofa*), Axis deer and cattle throughout the site.

Table 3 – Mammalian Species Detected Within the Kīhei High School Site

<i>Common name</i>	<i>Scientific Name</i>	<i>Detection Type</i>
PRIMATES – LEMURS, LORISIDS, GALAGOS, TARSIIERS MONKEYS & ALLIES		
Hominidae – Great Apes & Humans		
Human	<i>Homo sapiens</i>	V, A, Si
CARNIVORA- FLESH EATERS Canidae - Wolves, Jackals & Allies		
Domestic dog	<i>Canis f. familiaris</i>	A, T, Si
Felidae- Cats		
House cat	<i>Felis catus</i>	T, Si
PERISSODACTYLA - ODD-TOED UNGULATES Equidae - Horses, Asses & Zebras		
Domestic horse	<i>Equus c. caballus</i>	T, Si
ATRIODACTYLA - EVEN-TOED UNGULATES Suicidae - Old World Swine		
Pig	<i>Sus s. scrofa</i>	T, Si

Table 2 continued

Common name		Scientific Name	Detection Type
Axis deer	<i>Axis axis</i>	Cervidae - Antlered Ruminants	V, A, Si,
Domestic cattle	<i>Bos taurus</i>	Bovidae- Hollow-horned Ruminants	Sk, T, Si

Key to table 3

Detection Type

V	Visual – at least one live animal was seen
A	Audio – animals were heard
Si	Sign – rubbing, rut marks, dust wallows were seen on the site
T	Tracks – foot prints were seen
Sk	Skeletal – skeletal remains were encountered on the site

Discussion

Botanical Resources

The entire project site is highly disturbed from a natural vegetation perspective, strongly influenced by low amounts of rainfall and grazing by deer and pasture animals.

Avian Resources

The findings of this survey are consistent with the extremely xeric nature and the habitat present on the site. During the course of this survey a total of 11 avian species were recorded during the time spent within the project area (Table 2). One of the species recorded, Pacific Golden-Plover is a native species. Pacific Golden-Plover is indigenous migratory shorebird species that nests in the high Arctic during the late spring and summer months, returning to Hawai'i and the Tropical Pacific to spend the fall and winter months each year. One species detected Red Junglefowl (*Gallus gallus*), is a domesticated alien species. Red Junglefowl are currently not considered to be established in the wild on the island of Maui, so the two birds heard were likely domestic birds, which may have escaped from their owners. The remaining nine species detected are considered to be alien to the Hawaiian Islands (Table 2). Avian diversity and densities were in keeping with the habitat present within the project area, and its location. No species currently listed, or proposed for listing under either the federal or the State of Hawai'i endangered species programs were detected during the course of this survey.

Although not detected during this survey, it is possible that small numbers of the endangered endemic Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened Newell's Shearwater (*Puffins auriculars newelli*), over-fly the project area between the months of May and November (Banko 1980a, 1980b, Harrison 1990). Recent surveys using ornithological radar have recorded these species flying inland along Maui's southern and western facing shores (Cooper and Day 2003, 2004, Day and Cooper 1999, Denis and Hamer 2007). There is no suitable nesting habitat within or close to the proposed project site for either of these pelagic seabird species.

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 often 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 this survey are consistent with the habitat present on the site, and its location on Maui, and its current usage as cattle pasturage.

Although no rodents were detected during the course of this survey it is probable that one or more of the four established alien rodents known from the Island of Maui; roof rat (*Rattus r. rattus*), Norway rat (*Rattus norvegicus*), Polynesian rat (*Rattus exulans hawaiiensis*), and European house mice (*Mus musculus domesticus*), use resources within the project site on occasion.

All of the other mammalian species recorded during the course of this survey are commonly occurring species in pastures in the Kīhei area. All of the quadrupeds recorded are considered to be alien to the Hawaiian Islands, and none are protected under either state or the federal endangered species statutes.

Potential Impacts to Protected Species

The development and operation of the proposed school is not expected to result in deleterious impacts to any botanical, avian or mammalian species currently listed or proposed for listing under either the federal or state of Hawai'i endangered species statutes.

Botanical Resources

No plants of interest or concern were observed on the property. However, two specimens of Hawaiian cotton or *ma'o* were observed along the top of the road cut fronting the property. These are in a location unlikely to be used for construction access. *Ma'o* was at one time considered for listing as an endangered species by the USFWS, but this status was downgraded (candidate status withdrawn) when it was established that the species was more widespread than originally believed. Presently the plant has no status under the endangered species act (USFWS, 2009).

Hawaiian Petrel and Newell's Shearwater

The principal potential impact that construction and operation of the new school poses to Hawaiian Petrels and Newell's Shearwaters 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 areas 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, 2) following build-out the potential operation of streetlights and athletic field lighting.

Recommendations

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 facility lighting is installed in conjunction with the school, it is recommended that lights be shielded to reduce the potential for interactions of nocturnally flying Hawaiian Petrels and Newell's Shearwaters with external lights and man-made structures (Reed et al. 1985, Telfer et al. 1987). This minimization measure would serve the dual purpose of minimizing the threat of disorientation and downing of Hawaiian Petrels and Newell's Shearwaters, while at the same time complying with the Maui County Code § 20.35 *et seq.* that requires that exterior lights on Maui be shielded.

Replant where appropriate and practicable, with native, xeric tolerant species. *Gossypium tomentosum* is able to survive here without supplemental care of any kind (other than protection from ungulates) and is a type of hibiscus with landscape value in xeric settings (Rauch et al., 1993, Staples and Herbst 2005).

Glossary:

Alien – Introduced to Hawai‘i by humans

Endangered – Listed and protected under the Endangered Species Act of 1973, as amended as an endangered species.

Indigenous – Native to the Hawaiian Islands, but also found elsewhere naturally

Mauka – Upslope, towards the mountains

Nocturnal – Night-time, after dark

‘Ōpe‘ape‘a – Hawaiian hoary bat

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

Ruderal – Disturbed, rocky, rubbishy areas, such as old agricultural fields and rock piles

Sign – Biological term referring 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

Xeric - Extremely dry conditions or habitat

ASL – Above mean sea level

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

DOE - Hawai‘i State Department of Education

GPS – Global Positioning System, an accurate worldwide navigational and surveying facility based on the reception of signals from an array of orbiting satellites

TMK – Tax Map Key

USFWS – United State Fish & Wildlife Service

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