

FAUNA SURVEY AND HABITAT ASSESSMENT (Winter Survey)

Lots 8 & 11 CP860464

CURTIS ISLAND, QUEENSLAND



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All work conducted as part of this survey was conducted under the EHP Scientific Purposes Permit number WISP 10189211 and DEEDI Animal Ethics Committee number SA 2015/02/501 and in accordance with the relevant regulations.

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1.0 INTRODUCTION

Native Foresters has been commissioned by QRE to conduct a fauna survey and habitat assessment for fauna species occurring within Lots 8 and 11 CP860464 on Curtis Island in Queensland. It is proposed to construct a resort development on the site with preliminary clearing works for stage 1 of the project completed. The survey was designed to provide an inventory of fauna species occurring across the property. The requirement to provide a comprehensive assessment of the fauna species occurring over the site requires two seasonal surveys to be conducted (winter and summer) in order to provide a complete evaluation of fauna utilising the area. This report provides the results for the winter component of the survey.

1.1 OBJECTIVES

The objectives of the report are as follows:

1. To determine the fauna species present on the survey site.
2. To provide an ecological assessment of habitat values on the site for fauna species.

1.2 SITE DESCRIPTION

The survey site encompasses two parcels of leasehold land (Lots 8 & 11 CP860464) comprising a total area of 713 hectares located on Curtis Island, immediately south of the Tropic of Capricorn, within the Burnett-Curtis Hills and Ranges subregion of the South-east Queensland bioregion. The property and adjacent marine and terrestrial areas fall within the Great Barrier Reef World Heritage Area. There are a number of Queensland conservation estate areas in the immediate vicinity of the site, with Curtis Island National Park bordering the property to the north and south. The property is bordered to the west by State Forest. Refer **Figure 1** for site location.

Topography over the site varies from coastal cliffs and headlands through to areas of undulating woodlands. Soils over the site are generally shallow, acid yellow – mottled duplex soils derived from the metasediments of the Wandilla and Shoalwater formations (EMP, 2009). There is one permanent watercourse on the property (Hobble Creek) as well as an estuarine wetland area located on the coastline just north of Black Head. There are a number of ephemeral drainage lines draining into Hobble Creek or to the estuarine area adjacent to the coast.

The property contains a relatively diverse range of vegetation types dependent upon topography and proximity to the coastline. There are areas of remnant vegetation and cleared areas of non-remnant vegetation associated with the proposed resort development. The Regional Ecosystems (RE) occurring over the site are described in **Table 1**.

The property is considered to be in moderate ecological condition. Historically the area has been used for cattle grazing and wild cattle and horses continue to utilise the area with resultant impacts to the vegetation understorey composition and soil compaction. There is evidence of historical fire events through the property which may have been used to control vegetation regrowth when the area was part of a wider cattle station. The cleared areas of the property are being actively managed to limit native regrowth and there are weed species occurring within and adjacent to these cleared areas. The remnant forested parts of the property are providing good opportunities for native fauna species.



Figure 1: Locality map for Curtis Island survey site

Table 1: Regional Ecosystems occurring on site

Regional Ecosystem Type (RE)	Description	VMA Class	Biodiversity Status
12.1.2	Saltpan vegetation including grassland, herbland and sedgeland on marine clay plains	Least concern	No concern at present
12.1.3	Mangrove shrubland to low closed forest on marine clay plains and estuaries	Least concern	No concern at present
12.3.6	<i>Melaleuca quinquenervia</i> ± <i>Eucalyptus tereticornis</i> , <i>Lophostemon suaveolens</i> open forest on coastal alluvial plains	Least concern	No concern at present
12.3.7	<i>Eucalyptus tereticornis</i> , <i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> ± <i>Melaleuca</i> spp. fringing woodland	Least concern	No concern at present
12.3.11	<i>Eucalyptus tereticornis</i> ± <i>Eucalyptus siderophloia</i> , <i>Corymbia intermedia</i> open forest on alluvial plains usually near coast	Of concern	Of concern
12.11.2	<i>Eucalyptus saligna</i> or <i>E. grandis</i> , <i>E. microcorys</i> , <i>Lophostemon confertus</i> tall open forest on metamorphics ± interbedded volcanics	Least concern	No concern at present
12.11.6	<i>Corymbia citriodora</i> subsp. <i>variegata</i> , <i>Eucalyptus crebra</i> woodland on metamorphics ± interbedded volcanics	Least concern	No concern at present
12.11.7	<i>Eucalyptus crebra</i> woodland on metamorphics ± interbedded volcanics	Least concern	No concern at present
12.11.14	<i>Eucalyptus crebra</i> , <i>E. tereticornis</i> , <i>Corymbia intermedia</i> woodland on metamorphics ± interbedded volcanics	Of concern	Of concern
12.11.18	<i>Eucalyptus moluccana</i> woodland on metamorphics ± interbedded volcanics	Least concern	No concern at present
12.11.20	<i>Corymbia intermedia</i> , <i>Lophostemon suaveolens</i> woodland on metamorphics ± interbedded volcanics	Of concern	Of concern
12.11.21	<i>Allocasuarina luehmannii</i> , <i>Melaleuca nervosa</i> woodland on metamorphics ± interbedded volcanics	Of concern	Of concern
12.12.19	Vegetation complex of rocky headlands on Mesozoic to Proterozoic igneous rocks	Of concern	Of concern

2.0 METHODOLOGY

2.1 *Desktop and literature review*

A desktop review was undertaken to assist in determining the site's ecological attributes prior to conducting the field survey. The review consisted of searches of Local, State and Commonwealth Government planning instruments and databases, as well as relevant academic literature. Sources of information included:

- Essential Habitat Mapping Mapping (DNRM, 2015)
- Wildlife Online Database (Queensland Government, 2015)
- EPBC Protected Matters Search Tool (DEnv, 2014)

All other relevant information relating to the subject site and the survey was reviewed, where available, including the results of the Curtis Island Environmental Management Plan, Ecology, Environment and Heritage Study prepared by GHD in 2009. A thorough desktop review was undertaken to assist in identifying potential native fauna occurring in the area and to provide a background to the survey methodology undertaken onsite. This review also assisted in determining survey strategies and sampling locations within the survey area.

2.2 *Selection of sampling locations*

Four sampling locations were selected within the survey area (sites A – D). Sampling locations were located in proximity to the proposed development areas and with reference to the different regional ecosystem types as defined by Regional Ecosystem Mapping. A description of the sampling locations is provided in **Table 2** and their location within the survey area is shown in **Figure 2**. Site selection within these defined areas was determined by the survey team in order to achieve optimum capture, including determining the most suitable trap configuration; landscape location and other biophysical and biological preferences of fauna species. The listed mammal and reptile species identified in the desktop survey were actively targeted, with survey site selection based on consideration of their preferred habitat characteristics.

2.3 *Survey timing and weather observations*

It is determined that two seasonal surveys should be conducted (winter and summer) in order to provide a complete evaluation of fauna utilising the area. This allows for the identification of fauna species (particularly reptiles and amphibians) which are temperature dependant and may not be detected during the colder winter months. This seasonal replication ensures that any variation in mammal and reptile population assemblages are adequately captured in the inventory.

This winter survey was conducted from the 15th to 20th June 2015. A moderate rainfall event occurred one day prior to the survey which resulted in ponded water in pools and in drainage lines through the site and moist soil conditions. A further rainfall event occurred mid-way through the survey. The weather conditions were generally mild and were suitable for the detection of many of the reptile and amphibian species potentially occurring onsite. The presence of a new moon through the survey period assisted in the detection of arboreal mammals during active nocturnal searches and spotlighting activities. Refer to **Table 3** for a summary of weather conditions over the survey period.

Table 2: Description of sampling locations

Site	RE type	GPS location centred on	Site description
A	Non – remnant area in proximity to 12.11.6 12.11.18 12.11.21	-23.68106 151.21960	Cleared area surrounded by open woodland. Cleared area intersected by rocky creekline with intermittent pools. 2-3 year regrowth saplings dominated by Eucalypt and Acacia species. Understorey of native and exotic grasses. Degraded ecological condition. Area surrounded by open woodland with mature Eucalypt dominated overstorey. Understorey of native grasses with <i>Xanthorrhoea spp.</i> prominent.
B	12.3.7 12.3.11 12.11.2 12.11.6	-23.67980 151.22403	Open woodland. <i>Eucalyptus tereticornis</i> , <i>Casuarina cunninghamiana subsp. cunninghamiana</i> ± <i>Melaleuca spp</i> ± <i>Eucalyptus siderophloia</i> , <i>Corymbia intermedia</i> open forest on alluvial plains. <i>Eucalyptus saligna</i> or <i>E. grandis</i> , <i>E. microcorys</i> , <i>Lophostemon confertus</i> tall open forest on metamorphics ± interbedded volcanic. <i>Corymbia citriodora subsp. variegata</i> , <i>Eucalyptus crebra</i> woodland on metamorphics ± interbedded volcanic. Generally good ecological condition with limited weeds present. Hollow bearing trees. Scattered ground debris present. Understorey of native grasses with <i>Xanthorrhoea spp.</i> prominent. Ephemeral drainage lines present.
C	12.1.2 12.1.3	-23.66679 151.26776	Mangrove dominated estuarine ecosystem adjacent to cleared area with scattered trees retained. Saltpan vegetation including grassland, herbland and sedgeland on marine clay plains. Mangrove shrubland to low closed forest on marine clay plains. Marine couch present. Cleared headland area with retained Ironbark and Livistonia palms adjacent to sheltered beach with estuarine waterway entering marine zone. Limited weeds present, some <i>Lantana camara</i> . Moderate ecological condition although narrow mangrove system is intact. Rocky outcrops present – limited ground cover and vegetal debris.
D	12.12.19	-23.66683 151.27218	Closed woodland adjacent to exposed headland cliffs. Vegetation complex of rocky headlands on Mesozoic to Proterozoic igneous rocks. Closed canopy of Acacia, Lophostemon and Corymbia species. Growth form influenced by proximity to saltspray from adjacent headland area resulting in low growth form. Low presence of weed species. Ridges and gullies present. Good ecological condition. Groundcover composition influenced by fire activity with <i>Xanthorrhoea spp.</i> prominent. Vegetal debris and cover present.



<p>Curtis Island Fauna and Flora Survey</p>	<p>Whilst due care is taken to ensure accuracy, Native Foresters makes no warranty in relation to the reliability, accuracy or completeness of the data or information contained in this product. Appropriate advice should be sought prior to taking any action based on the data or information contained within. Data source: Queensland Government, Native Foresters.</p>
<p> Survey area</p>	<p> Native Foresters Natural Resource Management Consultants</p>

Figure 2: Sampling locations across site

Table 3: Weather conditions over the survey period

	Date	Temp_Min (°C)	Temp_Max (°C)	Rainfall (mm)	Max. Wind Gust		Cloud Conditions	Moon Phase
					Direction	Speed km/h		
Winter 2015	15/6/2015	17.7	25.0	0.2	ESE	44	Fine	New Moon 16/6/15
	16/6/2015	17.3	25.5	0.4	ESE	35	Fine	
	17/6/2015	18.7	25.7	0	NNW	43	Fine	
	18/6/2015	15.6	24.5	14.8	ENE	26	Overcast	
	19/6/2015	16.3	23.8	0.2	WSW	24	Becoming fine	

Source: Gladstone Station No 039123 <http://www.bom.gov.au/climate/data/>

2.4 Survey methodology

The survey techniques utilised for the project were based on the results of the desktop survey, identification of habitat features suitable for listed species and seasonal considerations associated with survey timing. The differing habits of the targeted species necessitated that surveys be carried out in both day and night periods and were carried out by personnel with experience in fauna survey techniques. The survey methodology used for the project was generally consistent with the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* (DSITIA, 2012).

Fauna trapping for the survey included Elliott traps and camera traps. Bat call detection using echolocation recorders was undertaken in each of the four representative survey sites A-D. Opportunistic observations (active and passive search) and nocturnal spotlighting were undertaken across the entire survey area.

The location of sampling sites, traps and species of conservation significance was recorded using a handheld GPS (Garmin Etrex 10). Survey methods and sampling effort at each of the sampling locations are summarised in **Table 4**.

2.4.1 Active and passive search

Active and passive search was deployed at each of the four representative sites as well as more generally over the property when the opportunity arose as follows:

- Actively looking for animals through the site by searching for fauna under logs, rocks, leaf litter and decorticating bark. Conducted in both day and night periods.
- Passive search - identifying species both visually and aurally whenever the opportunity arises while onsite.
- Tracks and scats - Signs of an animal's presence, such as footprints, are interpreted. This procedure was generally opportunistic and used whenever specimens, scats or tracks were located.
- Nocturnal searches (spotlighting) for arboreal mammals and reptiles in selected habitats. Spotlighting was undertaken for an average of 3 hours each evening.
- Aural survey – Actively listening for male frog calls in appropriate habitats.

Table 4: Survey methods and sampling effort

Targeted Species / Groups	Methodology	Minimum Survey Time	Survey Effort
Birds	Active and Passive Search	Opportunistic over survey.	2 people
Terrestrial Mammals	Active and Passive Search	Daylight search – 4 hours for 4 days Spotlighting – 3 hours for 4 nights	2 people
	Elliot t Traps – T formation	10 baited traps at 5m spacing, checked each morning and evening – 3 nights	2 people
	Camera Traps	8 baited camera traps for 3 days /nights	192 hours
Arboreal Mammals	Active and Passive Search	Daylight search – 4 hours for 4 days Spotlighting – 3 hours for 4 nights	2 people
	Camera Traps	8 baited camera traps for 3days/nights	192 hours
Bats	Bat Call Detection	4 Anabat Express detectors left in place for 3 nights	192 hours
Reptiles	Active and Passive Search	Daylight search – actively looking under habitat – 4 hours for 4 days	2 people
Amphibians	Active and Passive Search	Daylight search – actively looking under habitat – 4 hours for 4 days	2 people
	Aural Search	Daylight and nocturnal survey – actively listening in appropriate habitats – 4 hours for 4 days	2 people
General diurnal observations	Opportunistic observations conducted during general fauna survey and checking of traps.	At least 4 hours for 4 days	2 people

2.4.2 Elliott traps

Elliott traps were used for small ground-dwelling (rodents and marsupials) at each of the four representative survey sites.

- The collapsible aluminium traps were baited with a combination of peanut butter and oats and deployed in a transect line with 10 traps spaced at 5m intervals in habitat suitable for the target species. The transect line was GPS marked and arranged in T formation to maximise coverage of habitat and topographic variability.
- The transect line was then checked each morning and evening. Captured individuals were released and each trap was rebaited, until day 4 of the survey when the traps were removed.

2.4.3 Bat call detection and acoustic analysis

Bat calls were recorded using four Anabat Express detectors. The detectors were deployed and GPS marked at strategic positions within each of the four representative survey sites. Detectors were placed at four sites on the edge of fly-ways through vegetation, approximately 1-1.5m above ground level, and left in place for three nights. Each detector was set up to record from sunset to sunrise every night; with start and finish times determined by the built in GPS functions in the detector. Recorded data was saved as a separate zero-crossing analysis (ZCA) file for each night.

Bat calls were processed and identified by Balance Environmental and Native Foresters. The ZCA files were converted to Anabat sequence files using *AnalookW* Version 4.1j (Corben 2014).

Sequence files were then analysed using *AnalookW*, with species identification achieved manually by comparing the *AnalookW* call sonograms with those of reference calls from southern Queensland and/or with published call descriptions (Reinhold et al. 2001; Pennay et al. 2004). Calls with fewer than four clearly-defined, non-fragmented pulses were excluded from the identification process. Species' identities were refined by considering probability of occurrence based on general distribution information (e.g. Churchill 2008; van Dyck et al. 2013) and/or records obtained from the Atlas of Living Australia (www.ala.org.au) or Wildlife Online (www.ehp.qld.gov.au/wildlife/wildlife-online).

A count of bat calls attributable to each species (or species complex, where species cannot be differentiated) was provided as an indication of relative activity levels within each site. The format and content of the results in this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003). Species nomenclature follows van Dyck *et al.* (2013).

2.4.4 Remote camera traps

Remote camera traps were deployed with two cameras per sampling location.

- Camera traps were set for 3 days and nights with each camera visited daily to conduct rebaiting if required.

- The camera trap sites were baited with either a chicken frame or a combination of peanut butter and oats which act as a fauna attractant for the purpose of camera fauna detection.
- In areas of dense vegetation, the vegetation between the camera and bait was cleared by hand to increase the field of view and minimise the chance of wind-blown vegetation triggering the sensor.

2.5 Habitat condition assessment methodology

A fauna habitat condition assessment was undertaken during the site surveys. This assessment was based on the habitats present, the listed species known to occur or potentially occurring within the locality and the occurrence of specific habitat features appropriate for these species. Habitat features that were considered significant for assessing breeding and feeding habitat value of target species, following the Habitat Hectares approach described in Parkes et al (2003), included:

- *Presence of large trees*: Large trees can be a dominant feature of remnant native vegetation and are a difficult habitat feature to replace once lost. They provide hollows for nesting and food sources. Their influence for wide-ranging species can extend over a considerable distance from their location.
- *Canopy cover*: The uppermost stratum of woody vegetation that forms the canopy functions as habitat for birds and arboreal mammals, provides food and resources, and determines the degree of light penetration and heat reaching the lower strata and ground detrital layer.
- *Weed cover*: Weeds can dominate and suppress native plant growth which affects the diversity of food sources; they can change the fuel or litter characteristics of a site, thereby altering the fire regime, and also prevent recruitment and succession of native vegetation.
- *Understorey components*: The shrub and herb strata generally contain the greatest plant species richness and can be a useful indicator of disturbance and changes in condition.
- *Organic litter, fallen timber and rocks*: Litter cover (both fine and coarse), can be indicative of the degree of disturbance of a site, and can be an important determinant of species recruitment. It will influence soil microclimates, structure and composition, and provide refugia for invertebrates, reptiles, amphibians and ground dwelling mammals.
- *Recruitment*: Recruitment of plant species, particularly woody perennials, within all strata reflects the site's long-term viability. In many of our Eucalypt dominated ecosystems, the absence of fire and traditional burning practices has interfered with succession and the result is a transition to closed forest and loss of grasslands, with detrimental effects for koalas and other mammals.
- *Landscape context*: The size of a patch size, its connectivity and distance to a core area of vegetation (ie: greater than 50 hectares) can affect both its regenerative capacity and long-term viability. Species–area relationships suggest that large areas tend to support more species and populations than smaller ones thus retaining greater genetic variability and providing refuge for species susceptible to disturbances.

Each survey site was assessed during the survey and a review of habitat features was undertaken.

3.0 RESULTS

3.1 *Desktop results*

3.1.1 Essential habitat designation

Essential Habitat is a vegetation ecotype that is considered by DEHP to form potential habitat to a species that is listed as; Endangered, Vulnerable, Rare or Near Threatened by Schedules 2-5 of the *Nature Conservation Regulation (2006)*. Essential Habitat mapping is provided in conjunction with Regulated Vegetation Management Mapping (RVMM) (DNRM, 2015). The survey area contains three areas of mapped Essential Habitat as shown in **Figure 3**. It also contains an area of designated wetland on the vegetation management wetlands map. The Essential Habitat designation within 5km of the property is associated with the species shown in **Table 5** which are listed under the *NC Act (1992)*.

3.1.2 Wildlife online mapping

DEHP has compiled a database of wildlife sightings and listings for all flora and fauna species within a designated area. A database search was conducted for all rare and endangered native species that have been identified within 5 km of the survey area. One bird species was listed on Wildlife Online as shown in **Table 5**.

3.1.3 EPBC Protected Matters

A search using the EPBC Act Protected Matters Search Tool shows that there is potential for 29 threatened fauna species to occur within 15km of the site. These include 13 birds, 7 mammals and 9 reptiles. Two of these species are exclusively marine in nature and have therefore been omitted from the list of species that can potentially occur on the site which is shown in **Table 5**.

3.2 *Winter Survey results*

3.2.1 Active, aural and passive search results

A number of native and exotic fauna species were identified within each survey location over the course of the winter survey either during active or passive searching, spotlighting or through observation of tracks and scats. 32 bird species, 9 reptiles, 4 native mammals, 6 amphibians, 1 invertebrate and 5 feral fauna species were identified as shown in **Tables 6 – 11**.

3.2.2 Elliott trap results

No fauna species were located using Elliot traps during the survey.

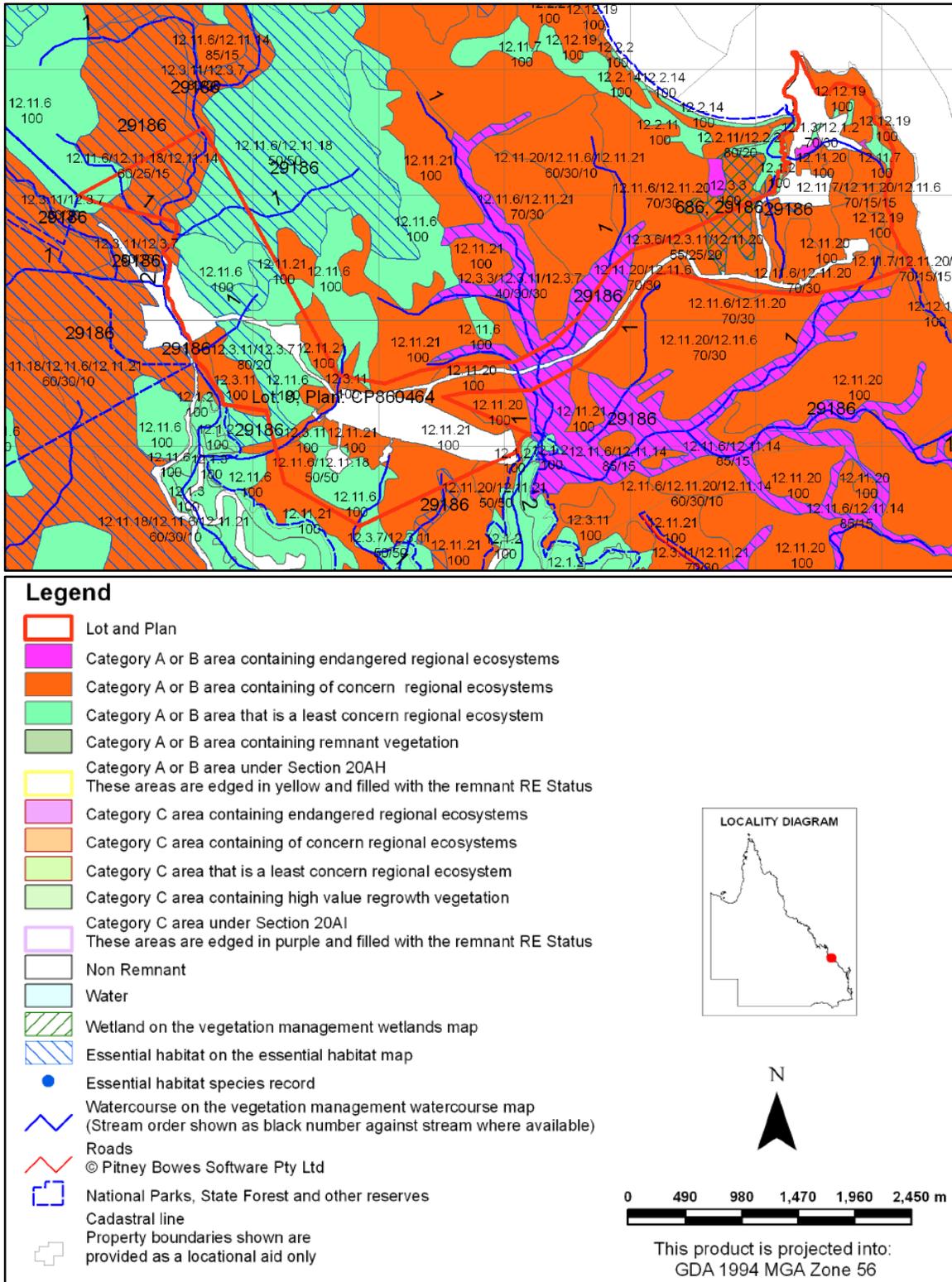


Figure 3: Essential Habitat Mapping for the site (Source: DNRM, 2015)

Table 5: Listed fauna species identified by desktop research (Essential Habitat Mapping, Wildlife Online and EPBC Protected Matters Search Tool within 15km of site).

Scientific Name	Common Name	EPBC status
<i>Botaurus poiciloptilus</i>	Australian Bittern	Endangered
<i>Cyclopsitta diophthalma coxeni</i>	Coxens Fig-Parrot	Endangered
<i>Epthianura crocea macgregori</i>	Yellow Chat	Critically endangered
<i>Erythrotriorchis radiatus</i>	Red Goshawk	Vulnerable
<i>Fregetta grallaria grallaria</i>	White bellied Storm Petrel	Vulnerable
<i>Geophaps scripta scripta</i>	Squatter Pigeon	Vulnerable
<i>Macronectes giganteus</i>	Southern Giant Petrel	Endangered
<i>Neochmia ruficauda ruficauda</i>	Star Finch	Endangered
<i>Poephila cincta cincta</i>	Black-throated Finch	Endangered
<i>Pterodroma neglecta neglecta</i>	Kermadec Petrel	Vulnerable
<i>Rostratula australis</i>	Australian Painted Snipe	Endangered
<i>Thalassarche melanophris impavida</i>	Campbell Albatross	Vulnerable
<i>Turnix melanogaster</i>	Black-breasted Button-quail	Vulnerable
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Vulnerable
<i>Dasyurus hallucatus</i>	Northern Quoll	Endangered
<i>Phascolarctos cinereus</i>	Koala	Vulnerable
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable
<i>Xeromys myoides</i>	Water mouse	Vulnerable
<i>Caretta caretta</i>	Loggerhead Turtle	Endangered
<i>Chelonia mydas</i>	Green Turtle	Vulnerable
<i>Delma torquata</i>	Collared Delma	Vulnerable
<i>Dermochelys coriacea</i>	Leatherback Turtle	Endangered
<i>Egernia rugosa</i>	Yakka Skink	Vulnerable
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	Vulnerable
<i>Furina dunmalli</i>	Dunmall's Snake	Vulnerable
<i>Lepidochelys olivacea</i>	Olive Ridley Turtle	Endangered
<i>Natator depressus</i>	Flatback Turtle	Vulnerable

Table 6: Bird species identified using active search and passive search

SCIENTIFIC NAME	COMMON NAME	LOCATION
<i>Alectura lathamii</i>	Brush Turkey	D
<i>Aquila audax</i>	Wedge-tailed Eagle	A
<i>Ardea pacifica</i>	Pacific Heron	A
<i>Burhinus grallarius</i>	Bush Stone Curlew	D
<i>Chenonetta jubata</i>	Wood Duck	D
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	Between B & C
<i>Corcorax melanorhamphos</i>	White-winged Chough	B
<i>Corvus orru</i>	Torresian Crow	A, B, C, D
<i>Cracticus nigrogularis</i>	Pied Butcherbird	B, C
<i>Dacelo novaeguineae</i>	Kookaburra	A, B, C
<i>Dicrurus bracteatus</i>	Spangled Drongo	A, B, C, D
<i>Egretta sacra</i>	Eastern Reef Egret	C
<i>Egretta novaehollandiae</i>	White faced Heron	A, C
<i>Entomyzon cyanotis</i>	Blue-faced honeyeater	C
<i>Falco berigora</i>	Brown Falcon	A, B
<i>Falco peregrinus</i>	Peregrine Falcon	C, D
<i>Geopelia humeralis</i>	Bar shouldered Dove	A, B, C, D
<i>Geopelia striata</i>	Peaceful Dove	A, B, C, D
<i>Gymnorhina tibicen</i>	Australian Magpie	C, D
<i>Haematopus longirostris</i>	Pied Oystercatcher	C
<i>Haliastur sphenurus</i>	Whistling Kite	A, D
<i>Haliastur indus</i>	Brahminy Kite	C, D
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	A, C, D
<i>Hirundo neoxena</i>	Welcome Swallow	A, B, C, D
<i>Merops ornatus</i>	Rainbow Bee-eater	Between B & C
<i>Ninox novaeseelandiae</i>	Southern Boobook	D
<i>Pandion haliaetus</i>	Osprey	C, D
<i>Philemon citreogularis</i>	Little Friarbird	A, B, C
<i>Podargus strigoides</i>	Tawny Frogmouth	C
<i>Rhipidura leucophrys</i>	Willy Wagtail	C
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	A, B, C, D
<i>Vanellus miles</i>	Masked Lapwing	A, C, D

Table 7: Reptile species identified using active search

SCIENTIFIC NAME	COMMON NAME	LOCATION
<i>Carlia schmeltzii</i>	Schmeltz's Rainbow Skink	D
<i>Carlia vivax</i>	Lively Rainbow Skink	C
<i>Concinnia martini</i>	Martin's Skink	A, B
<i>Cryptoblepharus pulcher</i>	Elegant Snake-eyed Skink	A, B, C, D
<i>Ctenotus robustus</i>	Eastern Striped Skink	C
<i>Dendrelaphis punctulata</i>	Green Tree Snake	D
<i>Gehyra dubia</i>	Dubious Dtella	A
<i>Heteronotia binoei</i>	Bynoe's Gecko	A, B, C, D
<i>Lygisaurus foliorum</i>	Tree-base Litter Skink	B

Table 8: Mammal species identified using active search

SCIENTIFIC NAME	COMMON NAME	LOCATION
<i>Macropus giganteus</i>	Eastern Grey Kangaroo	D
<i>Petauroides volans</i>	Greater Glider	B
<i>Petaurus breviceps</i>	Sugar Glider	A
<i>Petaurus norfolcensis</i>	Squirrel Glider	Between B & C

Table 9: Amphibian species identified using active and aural search

SCIENTIFIC NAME	COMMON NAME	LOCATION
<i>Litoria fallax</i>	Eastern Sedge Frog	A, B
<i>Litoria inermis</i>	Bumpy Rocket Frog	A
<i>Litoria nasuta</i>	Striped Rocket Frog	A, B
<i>Platyplectrum ornatum</i>	Ornate Burrowing Frog	D
<i>Pseudophryne major</i>	Great Brown Brood Frog	A, B, C
* <i>Rhinella marina</i>	Cane Toad	A, B, C, D

*Non-native species

Table 10: Invertebrate species identified using passive search

SCIENTIFIC NAME	COMMON NAME	LOCATION
<i>Cherax depressus</i>	Orange-fingered yabby	A

Table 11: Feral species identified using active search

SCIENTIFIC NAME	COMMON NAME	LOCATION
<i>Bos taurus</i>	Cow	C
<i>Canis sp</i>	Dingo / Wild Dog	C - Track
<i>Equus caballus</i>	Horse	A, B, D
<i>Rattus rattus</i>	Black Rat	D
<i>Sus scrofa</i>	Pig	C - Track

3.2.3 Microbat acoustic analysis results

The confirmed and probable bat species identified using Anabat Express detectors and acoustic call analysis are shown in **Table 12**. Nine microbat species were positively identified from the winter survey. At least five other species may be present over the site, however their calls have similar characteristics and could not be reliably attributed to single species.

Table 12: Microbat acoustic analysis results

SCIENTIFIC NAME	COMMON NAME	LOCATION
Vespertilionidae (evening bats)		
<i>Chalinolobus gouldii</i>	Gould's wattled bat	A, B, C, D
<i>Chalinolobus nigrogriseus</i>	Hoary wattled bat	C
<i>Chalinolobus picatus*</i>	Little pied bat	B
<i>Nyctophilus species*</i>	Long-eared bat	B
<i>Scotorepens balstoni*</i>	Western broad-nosed bat	A
<i>Scotorepens greyii</i>	Little broad-nosed bat	B, C
<i>Vespadelus troughtoni</i>	Eastern cave bat	C
Miniopteridae (bent-wing bats)		
<i>Miniopterus australis</i>	Little bent winged bat	A, B, C, D
<i>Miniopterus orianae oceanensis</i>	Easter bent winged bat	B
Molossidae (free tailed bats)		
<i>Mormopterus lumsdenae</i>	Northern free tailed bat	A, B
<i>Micronomus norfolkensis*</i>	East coast free tailed bat	A, B, C
<i>Mormopterus ridei</i>	Eastern little free-tailed bat	A, B, C
Emballonuridae (sheath-tailed bats)		
<i>Saccolaimus flaviventris</i>	Yellow-bellied sheath-tailed bat	B, C
<i>Taphozous georgianus*</i>	Common sheath-tailed bat	C, D

*Species are probably present but not reliably identified

3.2.4 Remote digital camera trap results

The fauna species identified using remote digital camera traps in the winter survey are shown in **Table 13**.

Table 13: Fauna species identified using remote digital camera traps

SCIENTIFIC NAME	COMMON NAME	BAIT TYPE C = CHICKEN P = PEANUT & OAT	SITE
* <i>Rattus rattus</i>	Black rat	C	A
* <i>Vulpes vulpes</i>	Fox	C	D
<i>Corvus orru</i>	Torresian crow	C, P	A, B, D
<i>Dacello novaeguineae</i>	Kookaburra	C	B
<i>Haliastur sphenurus</i>	Whistling kite	C	A, B

*Non-native species

3.2.5 Significant species records

No EVNT listed species were found during the course of the winter survey.

3.3 *Habitat condition assessment results*

Based on the habitats present, the listed species known to occur or potentially occurring and specific habitat features appropriate for these species, the survey area has been assessed as having good habitat values within the remnant vegetation areas of the property, moderate habitat values in the cleared areas in the eastern coastal areas of the property and poor habitat values within the cleared areas in the western parts of the property.

The remnant vegetation areas onsite are structurally complex and floristically diverse. The property has good connectivity to large tracts of native vegetation in the surrounding areas of National Park and State Forest. Habitat opportunities for native fauna exist in the form of fallen logs, stones, bark, leaf litter, as well as vegetation cover throughout the survey area. Medium to large native trees (>500mm DBH) predominate the bushland area in the western part of the property. There are a significant number of large “habitat trees” exhibiting a range of hollow sizes. Whilst large hollow bearing trees are needed for breeding, high quality habitat is also defined by its regenerative capacity (recruitment and succession). The survey area displays a range of vegetation age classes.

In the bushland areas of the site the canopy, which is semi closed, has created areas of woody debris and leaf litter underneath with sufficient light penetration to provide suitable microhabitat conditions for many native reptile species. The habitat assessment of the survey sites is presented below in **Table 14**.

Table 14: Habitat Condition Assessment

Site	Habitat Features for Survey Sites
A	<p>Cleared area surrounded by open woodland.</p> <ul style="list-style-type: none"> • Large trees absent, some acacia species to 5m in riparian zone. • Canopy absent. • Semi-dense understorey of regenerating <i>Eucalypt spp</i> and <i>Acacia spp</i>, grasses and herbs. • Weeds present. Decreasing as canopy returns in adjacent forested areas. • No hollow bearing trees. • Ground debris present in the form of large log piles associated with clearing works. • Recruitment associated with vegetation regrowth. • Connectivity with adjacent bushland areas.
B	<p>Open woodland</p> <ul style="list-style-type: none"> • Semi-closed canopy approximately 18m in height. • Open mid-strata. • Understorey of native grasses and herbs, <i>Xanthorrhoea spp</i> prominent. • Limited weeds present. • Hollow bearing trees including some large hollows. • Scattered ground debris present. • Good recruitment. • Ephemeral drainage lines and ponding present. • Evidence of fire. • Good connectivity with adjacent bushland areas.
C	<p>Mangrove dominated estuarine ecosystem adjacent to cleared area with scattered trees retained.</p> <ul style="list-style-type: none"> • Low closed canopy in mangrove areas. • Dense mid strata. • High tidal range (<5m) forming dynamic estuarine zone. • Good ecological condition but narrow extent, only 10 metres wide. • Limited weeds present. • Large hollow bearing trees absent. • Good recruitment. • Good connectivity with adjacent bushland areas.
D	<p>Closed woodland adjacent to exposed headland cliffs.</p> <ul style="list-style-type: none"> • Low closed canopy with mature trees to 6 m in height. • Open mid strata. • Understorey of grasses and herbs providing cover for ground dwelling species. • <i>Xanthorrhoea spp</i> prominent. • Limited weeds present - lantana. • Evidence of fire. • Hollow bearing trees absent. • Woody debris present. • Good recruitment. • Good connectivity with adjacent bushland areas.

3.4 Survey limitations

Fauna species that have large home ranges and/or exhibit transient space utilisation are likely to exhibit seasonal variation within areas of suitable habitat. The repetition of the survey in winter and summer seasons attempts to minimise the effect of this limitation on the survey results.

Emphasis was placed on the use of appropriate survey methods to target listed threatened ecological communities, populations and species that are considered likely to occur within the site to enable an accurate assessment of the occurrence and distribution of the target species. With respect to trapping and opportunistic observations, the possibility exists that certain species may not have been detected during field investigations due to:

- seasonal inactivity during field survey;
- species present within micro-habitats not surveyed;
- cryptic species able to avoid detection;
- transient wide-ranging species not present during survey period.

The lack of observational data on some species should therefore not be taken as necessarily indicating that a species is absent from the site.

4.0 SUMMARY

4.1 *Mammals*

4.1.1 Arboreal mammals

Three arboreal mammals were located during the course of the winter survey. The Greater Glider, Squirrel Glider and Sugar Glider were all detected using active search and spotlighting in the open eucalypt forest area in the west of the property. The presence of suitable habitat hollow trees in the Western part of the property is continuing to provide suitable conditions for these species with the presence of scats and scratches on trees indicating use of this site by arboreal mammals.

4.1.2 Terrestrial mammals

The program of Elliot trapping over the site did not determine the presence of any small terrestrial mammals (Dasyurids) in any of the four survey areas. It is also noted that GHD undertook an Elliot trapping program on an adjacent property in 2004 with no Dasyurids, Bandicoots or Rodents detected. One feral species of Black Rat was detected onsite by camera trapping. No evidence of Bandicoot digs were observed onsite. It is considered likely that these species are locally extinct or in very low numbers, as there are a high number of feral predators in the area that predate on these small, ground dwelling species (see exotic mammal section). These species are also naturally subject to population irruptions and crashes (EMP, 2009).

The only large native mammal detected onsite was the Eastern Grey Kangaroo which is considered to be maintaining a viable population over the area. There are good habitat opportunities for large mammals, including eucalypt forest, woodlands, shrublands, grasslands and swamplands. The connectivity to adjacent bushland also provides good habitat for medium to large mammals.

4.1.3 Introduced mammals

Feral pigs, feral horses (brumbies), wild dogs, feral cats, foxes and stray stock are considered to be the main feral species impacting on conservation values on Curtis Island (Melzer et al., 2007) and these were all detected during the survey. The fox, feral cat, feral dog and in some situations the feral pig are all predatory and have an adverse effect on native fauna and may account for the apparent absence of small and medium size native fauna species over the site. The black rat is also present, with this species competing with native rodents.

4.1.4 Bats

Nine microbat species were positively identified from the winter survey data. At least five other species may also be present in the survey area. The variety and structural diversity of vegetation communities in the survey area provide a wide range of foraging niches and habitat opportunities for microbats. The bat species richness and relative activity levels detected in the survey are comparable to other sites in Queensland with a similar suite of habitat types.

4.2 Reptiles

The survey identified nine reptiles including eight lizards and one snake. The low diversity of snakes identified is likely to be a result of the winter survey timing. The habitat condition for reptiles across the reserve are considered to be moderate to good with adequate coarse woody debris and litter present across the site.

4.3 Amphibians

The survey identified 5 native frog species and the pest species Cane toad occurring onsite. This represents a reasonable diversity of frog species. The presence of rain and the resultant ephemeral ponding over the site was conducive for the detection of frogs.

The Cane toad was found in large numbers onsite. Cane toad tadpoles prey on the tadpoles of native amphibian species. In addition, cane toads are considered likely to cause declines in faunal biodiversity through competition for food with other carnivores, predation upon small vertebrates (such as skinks) and by causing intoxication among larger predators such as goannas (*Varanus spp.*) and raptors (DEC, 2008b).

4.4 Birds

The diversity of topography and vegetation types occurring over the property provides multiple habitat opportunities for a range of bird species. The winter survey located 7 birds of prey, 5 shorebirds, 1 waterbird and 17 landbirds over the site.

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