

Djarindjin Junction

Detailed flora and vegetation survey and fauna habitat assessment

Prepared for Right Foot Forward Australia by Strategen

June 2019



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1. Introduction

This report presents the findings of a detailed flora and vegetation survey and fauna habitat survey undertaken for Right Foot Forward Australia (RFF Australia).

1.1 Background

Tourism WA and Djarindjin Aboriginal Corporation require environmental advice for a Pre-Feasibility Study/Business Case for the development of the 'Djarindjin Junction' precinct, on the Dampier Peninsula.

Djarindjin is an Aboriginal community located approximately 170 km to the north of Broome, along the Dampier Peninsula. It owns and operates the Djarindjin Roadhouse, one of the only fuel supplies on the Cape Leveque Road, which also offers some basic donga style accommodation used primarily for service workers. The Project Area, including the roadhouse and adjoining vacant lot to the north, is approximately 4.5 ha in size and is bounded on all four sides by sealed roads (Figure 1).

The proposed works may impact native vegetation and as such, a flora, vegetation and fauna habitat survey was deemed necessary to determine the environmental values of the Survey Area (all vegetated areas within the Project Area; Figure 1).

1.2 Scope

The scope of this flora and vegetation survey was to undertake a desktop assessment and field assessment within the Survey Area (Figure 1).

The objectives were to:

- conduct a desktop survey for Threatened and Priority flora identified as being present in or around the Survey Area
- conduct a desktop survey for Threatened and Priority fauna identified as being present in or around the Survey Area
- collect and identify the vascular plant species present within the Survey Area
- search areas of suitable habitat for Threatened and/or Priority flora
- define and map the native vegetation communities present within the Survey Area
- define and map the native fauna habitat present within the Survey Area
- map vegetation condition within the Survey Area
- provide recommendations on the local and regional significance of the vegetation communities
- prepare a report summarising the findings.





Figure 1: Survey Area



Consume 2018/HFHHFHEF18658/01_GIS_documents/ArcMap_d

2. Context

2.1 Legislative context

Flora and fauna in WA is protected formally and informally by various legislative and non-legislative measures, which are as follows:

- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Australian Government
- Biodiversity Conservation Act 2016 (BC Act) State
- Environmental Protection Act 1986 (EP Act) State
- Biosecurity and Agriculture Management Act 2007 (BAM Act) State.

Non-legislative measures:

- WA Department of Biodiversity, Conservation and Attractions (DBCA) Priority lists for flora, ecological communities and fauna
- Weeds of National Significance
- recognition of locally significant populations by the DBCA.

A short description of each legislative measure is given below. Other definitions, including species conservation categories, are provided in Appendix 1.

2.1.1 EPBC Act

The EPBC Act aims to protect matters of national environmental significance, which are detailed in Appendix 1. Under the EPBC Act, the Commonwealth Department of the Environment and Energy (DEE) lists protected species and Threatened Ecological Communities (TECs) by criteria set out in the Act. Species are conservation significant if they are listed as Threatened (i.e. Critically Endangered, Endangered and Vulnerable) or Migratory.

Bird species protected as Migratory under the EPBC Act include those listed under international migratory bird agreements relating to the protection of birds which migrate between Australia and other countries, for which Australia has agreed. This includes the Japan-Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Some marine fauna or terrestrial fauna that use marine habitats are listed as Marine under the EPBC Act. These species are only considered conservation significant when a proposed development occurs in a Commonwealth marine area (i.e. any Commonwealth Waters or Commonwealth Marine Protected Area). Outside of such areas, the EPBC Act does not consider these species to be matters of national environmental significance so are not protected under the Act.

2.1.2 BC Act

DBCA lists taxa (flora and fauna) under the provisions of the BC Act as protected and are classified as according to their need for protection (see Appendix 1). The BC Act makes it an offence to 'take' threatened species without an appropriate licence. There are financial penalties for contravening the BC Act.



2.1.3 EP Act

Threatened flora, fauna (and significant habitat necessary for the maintenance of indigenous fauna) and Threatened Ecological Communities (TECs) are given special consideration in environmental impact assessments and have special status as Environmentally Sensitive Areas (ESAs) under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004.* Exemptions for a clearing permit do not apply in an ESA.

2.1.4 BAM Act

The BAM Act provides for management and control of listed organisms, including introduced flora species (weeds). Species listed as declared pests under the BAM Act are classified under three categories:

- C1 Exclusion: Pests assigned under this category are not established in Western Australia, and control measures are to be taken to prevent them entering and establishing in the State
- C2 Eradication: Pests assigned under this category are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility
- C3 Management: Pests assigned under this category are established in Western Australia, but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area that is currently free of that pest.

Under the BAM Act, land managers are required to manage populations of declared pests as outlined under the relevant category.

2.2 Environmental setting

2.2.1 Soils and topography

The survey area is located within the Pindanland (DAL02) subregion of Western Australia (Graham G 2001).

There are three basic geological components to the subregion, as follows:

- quaternary sandplains overlying Jurassic and Mesozoic sandstones with Pindan
- quaternary marine deposits on coastal plains
- quaternary alluvial plains associated with the Permian and Mesozoic sediments of Fitzroy Trough (Graham G 2001).

Beard (1990) described the Dampierland region as comprising quaternary sandplains overlying Jurassic sandstones, with quaternary marine deposits on the coastal plains. Devonian reef limestones and extensive alluvial river plains are also characteristic of the region.

An assessment of land systems provides an indication of the occurrence and distribution of fauna habitats and vegetation within the Survey Area (Schoknecht & Payne 2011). The entire Survey Area falls within the Yeeda Land System, which covers an overall area throughout the Kimberley region of 21 308 km². The Yeeda Land System comprises sandplains of deep red and yellow sands, supporting pindan and tall woodlands (Schoknecht & Payne 2011).





YEEDA SYSTEM





REEVES SYSTEM

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2.2.2 Climate

The climate of the Pindanland subregion is dry hot tropical and semi-arid with summer rainfall. The average annual rainfall is between 450 – 700 mm.

The nearest Bureau of Meteorology (BoM) weather station at Cygnet Bay (Station No. 003057) provides average monthly climate statistics for the Djarindjin locality (Figure 3).

Average annual rainfall recorded at Cygnet Bay since 1963 is 790.4 mm (BoM 2019). Rainfall may occur at any time of year; however, most occurs over summer in association with the wet season, occurring between October and April. Highest temperatures occur in November and December, with average monthly maximums reaching approximately 35°C (BoM 2019). Lowest temperatures occur in July and August, with average monthly minimums reaching approximately 15°C (BoM 2019).

The Djarindjin locality experienced below average rainfall for the 2018 – 2019 wet season up to 19 March 2019 (Figure 4).



Figure 3: Mean monthly climatic data (temperature and rainfall) for Cygnet Bay







2.2.3 Hydrology

The Survey Area is located within the Timor Sea Catchment Division, in the Cape Leveque Coast drainage basin, in the Basin Cape Leveque Coast sub-catchment.

No wetlands, water bodies or drainage channels are present within the Survey Area.

2.2.4 Conservation areas

The Survey Area does not occur within or adjacent to any nature reserves or conservation areas.

2.2.5 Land use

The primary land uses within the Pindanland subregion are agriculture (cattle grazing), conservation, Aboriginal communities, Unallocated Crown Land, and infrastructure. The Survey Area currently contains a roadhouse (fuel station and shop), private residences and temporary accommodation (dongas).

2.2.6 Regional vegetation

Beard (1990) Botanical Subdistrict

The survey area occurs within the Dampier Botanical District which is characterised by tree savanna of *Chrysopogon-Dichanthium* with scattered *Eucalyptus microtheca* and *Lysiphyllum cunninghamii* on river plains and pindan on sandplains. Pindan is described as a three-layered community, an open upper stratum of low trees, a closed middle layer of *Acacia* and an open ground layer of curly spinifex, with scattered trees over hummock grassland on uplands.

IBRA subregion

IBRA describes a system of 85 'biogeographic regions' (bioregions) and 403 subregions covering the entirety of the Australian continent (Thackway & Cresswell 1995). Bioregions are defined on the basis of climate, geology, landforms, vegetation and fauna.



The Survey Area occurs in the Pindanland IBRA subregion which is characterised by multiple vegetation types including:

- mangroves
- coastal dune communities
- ephemeral herblands and/or grasslands with scattered low trees
- mixed species tussock grasslands or sedgelands +/- emergent *Pandanus* spp. (screw palm)
- *Eucalyptus tectifica* (Darwin box), *Corymbia flavescens* woodland with *Acacia tumida* (pindan wattle) open-scrub and *Chrysopogon* spp. (ribbon grass) and *Triodia bitextura* grasses
- Eucalyptus tetrodonta (Darwin stringybark), Eucalyptus miniata (Darwin woollybutt) +/- Eucalyptus spp. +/- Livistona spp. (fan palms) woodland with a ground layer of tussock grasses and Triodia bitextura
- *Melaleuca* spp. (paperbark) low woodland with sparse *Chrysopogon fallax* (golden beard grass) tussock grasses (Graham G 2001).

Vegetation system association

Vegetation occurring within the region was initially mapped at a broad scale (1: 1 000 000) by Beard during the 1970s. This dataset formed the basis of several regional mapping systems, including the biogeographical region dataset (Interim Biogeographic Regionalisation for Australia) for Western Australia (DEE 2017), physiographic regions defined by Beard (1981).

The Survey Area comprises one Beard (1981) vegetation association, 750: shrublands and pindan woodlands; *Acacia tumida* shrubland with *Eucalyptus* & *Corymbia* woodlands over ribbon grass (*Chrysopogon* spp.) & curly spinifex (*Triodia bitextura*), of which 99.56% of the pre-European extent remains (GoWA 2018a).





Figure 5: Regional vegetation



Conconsult2018/HFHHFH8558/01_GIS_documents/ArcMap_do

Service Layer Credits: Source: Esri, DigitalGiobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community Client: RFF Australia. Site data 4/2019. Created by: c.thatcher

3. Methods

3.1 Desktop assessment

Database searches were undertaken to generate a list of vascular flora and vertebrate fauna previously recorded within, and nearby the project with an emphasis on species of conservation significance and introduced species (Table 1). Five database searches were conducted around a central coordinate (UTM Zone 51K, 490968 mE, 8173714 mN). Search buffers differed due to the technical capabilities of individual databases as well as ecological features surrounding the Survey Area relevant to different species groups.

Custodian	Database	Taxonomic group	Reference	Buffer (km)
DEE	Protected Matters	Flora, vegetation and fauna	DEE 2019a	5
DBCA	NatureMap	Flora and fauna	DPaW 2007-	20
DBCA	Threatened and Priority Ecological Communities	Vegetation	DBCA 2019a	50
DBCA	Threatened and Priority Flora	Flora	DBCA 2019b	50

Table 1: Database searches conducted for the desktop assessment

3.2 Field assessment

The field survey was conducted by a Senior Ecologist from Strategen on 19 March 2019 (Table 2). All plants collected were taken under flora collecting permits listed in Table 2, pursuant to WC Act Section 23C and Section 23F.

Table 2: Personnel

Name	Role	Flora collection permit
Robyn Chesney	Planning, fieldwork, plant identification, data	SL012341
Senior Ecologist	interpretation and report preparation	

3.2.1 Flora and vegetation

Quadrats were sampled to characterise vegetation types and condition, and ensure appropriate representation of the flora and vegetation present. Indicative site locations were identified prior to commencement of the field survey using aerial photography, topographic maps and existing vegetation maps, to ensure that all broad vegetation types and landforms within the project area would be sampled. A total of eight quadrats were surveyed within the project area.

At each quadrat the following information was recorded:

- GPS co-ordinates (recorded in GDA94 UTM 51K)
 - photograph of the vegetation
- photograph of any fauna habitat elements (e.g. fallen logs, leaf litter)
- vegetation condition
- brief vegetation description
- vascular flora taxa present (with average height and total percentage foliage cover of each taxon)
- topography (landform type and aspect)
- soil type and colour
- geology (type, size and cover of any rocks, stones, gravel or outcropping)
- average percentage cover of leaf litter and bare ground



• disturbance details including fire history (time since last fire), and physical disturbance including evidence of erosion, grazing and weed invasion.

Any flora taxa observed opportunistically around quadrats or while traversing on foot within the project area were also recorded. For any populations of taxa known to be conservation significant or introduced flora observed, a GPS location and a count of the individuals present, or percentage foliar cover for a given area, were recorded.

Prior to the survey, a list of conservation significant flora with the potential to occur within the Survey Area was compiled. Field personnel familiarised themselves with photographs, reference samples and descriptions of these taxa before conducting the survey and once on the ground actively searched for them around quadrats, while traversing on foot within the project and in known locations or preferred habitat encountered in the field.

All plant specimens collected during the field surveys were identified using appropriate reference material or through comparisons with pressed specimens housed at the Western Australian Herbarium where necessary. Nomenclature of the species recorded is in accordance with Western Australian Herbarium (1998-).

Vegetation condition was recorded at all quadrats, and opportunistically within the project area during the field assessment where required. Vegetation condition was described using the vegetation condition scale for the Northern Botanical Province adapted from Keighery (1994) and Trudgen (1998) (Table 3), as defined in Table 2 of EPA (2016). Vegetation condition polygon boundaries were developed using this information in conjunction with aerial photography interpretation, and were digitised as for vegetation type mapping polygon boundaries.

Condition rating	Description					
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.					
Very Good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.					
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.					
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.					
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.					
Completely Degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.					

 Table 3: Vegetation condition scale for the Northern Botanical Province

Vegetation types were delineated using a combination of results site observations and cluster analysis. Aerial photography interpretation and field notes taken during the survey were then used to develop VT mapping polygon boundaries over the Survey Area. These polygon boundaries were then digitised using Geographic Information System (GIS) software.

VT descriptions (though floristic in origin) have been adapted from the National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual Version 6.0 (ESCAVI 2003), a system of describing structural vegetation units (based on dominant taxa). This model follows nationally-agreed guidelines to describe and represent vegetation types, so that comparable and consistent data is produced nation-wide. For the purposes of this report, a VT is considered equivalent to a NVIS sub-association as described in ESCAVI (2003).



An averaged randomised Species Accumulation Curve, based on accumulated species compared against sites surveyed was used to provide an indication as to the level of adequacy of the survey effort. As the number of survey sites, and correspondingly the size of the area surveyed increases, there should be a diminishing number of new species recorded. At some point, the number of new species recorded becomes essentially asymptotic. As the number of new species being recorded for survey effort expended approaches this asymptotic value, the survey effort can be considered to be adequate.

3.2.2 Fauna habitat

Vegetation communities and landforms were used to identify the broad fauna habitats in the Survey Area. Habitat assessments were undertaken across the Survey Area at the same location as quadrats. Three habitat assessments were completed within the Survey Area. These fauna habitats were then assessed for their potential to support species of conservation significance and the quality of habitat they provide to a wider suite of fauna.

Each broad habitat type description includes information on:

- location of the broad habitat type within the Survey Area (GPS co-ordinate) and its relative percentage
- habitat condition was assessed, based on the scale given in Keighery (1994)
- landscape position
- dominant vegetation and structure (e.g. number of vegetation strata)
- presence of hollow-bearing trees and dead stags (e.g. average size and abundance of hollows)
- description of any rock and rocky outcrops
- presence of logs (e.g. abundance and size)
- substrate type (e.g. leaf litter)
- presence of wetlands, creeks, rivers, dams and other water bodies
- description of any observed nests and roosts (if present)
- subterranean roosts (e.g. caves, disused mineshafts)
- disturbance (e.g. cattle grazing, fire)
- photo showing a typical example of the broad habitat type
- opportunistic observations of any fauna species observed using the Survey Area.

3.3 Survey limitations and constraints

There are possible limitations and constraints that can impinge on the adequacy of vegetation, flora and fauna surveys. The flora and vegetation assessment has been evaluated against a range of potential limitations (Table 4). Based on this evaluation, the assessment has not been subject to limitations or constraints that have affected the thoroughness of the assessment and the conclusions reached.



Table 4:	Flora and	vegetation	survev i	ootential	limitations and	d constraints

Potential limitation	Impact on assessment	Comment
Sources of information and availability of contextual information (i.e. pre-existing background versus new material).	Not a constraint.	The survey has been undertaken in the Dampierland Botanical District which has been well studied and documented (Beard 1990).
Scope (i.e. what life forms, etc., were sampled).	Not a constraint.	Number of species recorded, number of quadrats sampled and timing of the survey (i.e. wet season) were adequate for this level of survey.
Proportion of flora/fauna collected and identified (based on sampling, timing and _intensity).	Not a constraint.	The proportion of flora surveyed was adequate. The entire Survey Area was traversed and flora species were recorded systematically.
Completeness and further work which might be needed (i.e. was the relevant project area fully surveyed).	Not a constraint.	The information collected during the survey was sufficient to assess the vegetation that was present during the time of the survey.
Mapping reliability.	Not a constraint.	Aerial photography of a suitable scale was used to map the Survey Area. Sites were chosen from these aerials to reflect changes in community structure. Opportunistic sites were also used if differences were observed during on ground reconnaissance. Vegetation types were assigned to each site based on topography, soil type and presence/absence and percent foliage cover of vegetation.
Timing, weather, season, cycle.	Not a constraint.	Primary flora and vegetation surveys are ideally conducted during January to March in the Northern Province (EPA 2016). The field assessment was conducted in March at the end of the wet season, in fine weather conditions, therefore these factors are not deemed to be constraints for the survey.
Disturbances (fire flood, accidental human intervention, etc.).	Not a constraint.	The Survey Area and regional surrounds have been subject to disturbance over a significant period of time. Given the wide range of this disturbance, this is not considered to be a limitation within the Survey Area.
Intensity (in retrospect, was the intensity adequate).	Not a constraint.	The Survey Area was traversed on foot and all differences in vegetation structure and fauna habitat were recorded appropriately.
Resources (i.e. were there adequate resources to complete the survey to the required standard).	Not a constraint.	The available resources were adequate to complete the survey.
Access problems (i.e. ability to access project area).	Not a constraint.	The Survey Area was easily traversed on foot enabling adequate access to survey the vegetation and fauna habitat therein.
Experience levels (e.g. degree of expertise in species identification to taxon level).	Not a constraint.	All survey personnel have the appropriate training in sampling and identifying the flora and vegetation of the region.



4. Results

4.1 Desktop assessment

4.1.1 Threatened and Priority flora

A total of seven flora taxa of conservation significance were identified by database searches (Table 5; Appendix 2).

All seven taxa are listed as Priority flora species by DBCA (Table 5). None are listed as Threatened under the *Biodiversity Conservation Act 2016* (BC Act), or the *Environment Protection and Conservation Act 1999* (EPBC Act).

The potential for these plants to occur within the Survey Area was assessed based on general habitat requirements and distribution (Table 5). One Priority flora species, *Triodia acutispicula*, was considered to have the potential to occur within the Survey Area as it is known to occur on pindan plains, which are present within and surrounding the Survey Area. Database searches conducted by DBCA indicated that this species has been recorded within 1 km to the north of the Survey Area, in proximity to the airstrip.

DBCA database searches indicated one other Priority flora species has been recorded within 5 km of the Survey Area; namely, *Lophostemon grandiflorus* subsp. *grandiflorus*; however, as this occurs in damp habitats (swamps, seepages), it was considered unlikely to be present.



Onesias	Conservation status		Description	Detential to accur	
Species	EPBC Act BC Act		Description		
Cullen candidum	NA	P1	Shrub to 3 m high, flowering white between September and October. Occurs on clayey sand (Western Australian Herbarium 1998-).	Unlikely due to absence of preferred soil type within Survey Area.	
Haemodorum capitatum	NA	P1	Geophyte to 90cm tall, with maroon to dark red flowers observed in August and November. Endemic to the south-west Kimberley of Western Australia, where it is known only from low depressions on pindan sand plains on grey and white sands. Associated species include <i>Corymbia polycarpa</i> , <i>Crotalaria crispata</i> , <i>Eucalyptus tectifica</i> , <i>Melaleuca acacioides</i> , <i>Terminalia canescens</i> and <i>Verticordia verticillata</i> (Barrett et al. 2015a).	Unlikely due to absence of preferred habitat, soil type and associated species within Survey Area.	
Lophostemon grandiflorus subsp. grandiflorus	NA	P3	Tree to 8 m high. Flowers cream – white in January and December. Occurs in damp habitats including swamps and seepages (Western Australian Herbarium 1998-).	Unlikely due to absence of preferred habitat within Survey Area.	
Parsonsia kimberleyensis	NA	P1	Climber to 3 m high. Flowers yellow / green in May and June. Occurs in vine thicket vegetation (Western Australian Herbarium 1998-).	Unlikely due to absence of preferred habitat within Survey Area.	
Stylidium pindanicum	NA	P3	Herbaceous annual to 32 cm high. Flowers pink between May and August. Restricted to seasonally damp areas over pindan sands on the Dampier Peninsula, east to near Fitzroy Crossing, growing with <i>Chrysopogon fallax</i> , <i>Cleome tetrandra</i> s.l., <i>Eucalyptus tectifica</i> , <i>Mitrasacme</i> spp. and <i>Sorghum</i> <i>plumosum</i> (Barrett et al. 2015b).	Unlikely due to absence of preferred habitat within Survey Area.	
Triodia acutispicula	NA	P3	Tussock-forming resinous perennial grass to 1.5 m high. Flowers cream- brown between January and April. Occurs on sandy soils on river levees, pindan plains, rocky hillslopes & outcrops (Western Australian Herbarium 1998-).	Possible due to presence of preferred habitat (pindan plains) within Survey Area.	
Utricularia bidentata	NA	P3	Small to medium-sized probably annual, terrestrial herb. Flowers purple between March and June. Occurs across the Kimberley region from Broome to Mitchell Plateau, WA, along edges of rocky or sandy creeks, among grasses and sedges (Jobson et al. 2018).	Unlikely due to absence of preferred habitat within Survey Area.	

Table 5: Threatened and Priority flora species potentially occurring within the Survey Area

4.1.2 Threatened and Priority Ecological Communities

The DBCA Threatened and Priority Ecological Community Database search identified one TEC and one PEC within a 50 km radius of the Survey Area (Table 6, Figure 6).

Table 0. TEOS and TEOS identified within and field the ourvey field						
Community	Conservation	Status	Description			
Community	EPBC Act BC Act		Description			
Monsoon vine thickets	Endangered	Threatened	Monsoon vine thickets on the coastal sand dunes of Dampier Peninsula. See text below Table 6 for further detail.			
Vegetation Association 37 as defined by John Beard's vegetation mapping for the Kimberley (Beard 1979)	NA	Priority 3	Shrublands; teatree thickets.			

Table 6: TECs and PECs identified within and near the Survey Area

4.1.3 Threatened fauna

A total of 34 fauna taxa of conservation significance were identified by database searches (Table 7; Appendix 2). Of these, nine were listed as Threatened under the *Biodiversity Conservation Act 2016* (BC Act), and 14 were listed as Threatened under the *Environment Protection and Conservation Act 1999* (EPBC Act). The remaining taxa are listed under an international migratory bird agreement, as Priority fauna species, or as Other Specially Protected Fauna (Table 5).

The potential for these species to occur within the Survey Area was assessed based on general habitat requirements and distribution (Table 7).

The following conservation significant fauna species were considered to have the potential to occur within the Survey Area, based on habitat present therein:

- Erythrotriorchis radiatus Red Goshawk (Vulnerable [EPBC Act; Threatened [BC Act])
- Erythrura gouldiae Gouldian Finch (Endangered [EPBC Act; Threatened [BC Act])
- *Numenius minutus* Little Curlew, Little Whimbrel (Migratory [Bonn, CAMBA, JAMBA, ROKAMBA], marine)
- Simoselaps minimus Dampierland Burrowing Snake (Priority 2).

Waterbirds

Due to proximity of the Survey Area to the coast, a number of marine bird species were identified in database searches as potentially occurring therein; however, the majority of these species specifically require coastal habitats to forage and breed; as such, were considered unlikely to occur within the Survey Area.

Marine species

Strictly marine species such as fish, turtles and marine mammals were identified in desktop searches due to proximity of the Survey Area to the coast. These have been excluded from the discussion as the Survey Area does not contain a coastal or marine component.

Species not occurring in WA

The EPBC Protected Matters Search Tool (PMST; DEE 2019b)) is not entirely based on point records, but also on broader information, for example bioclimatic distribution models. Searches using the PMST may identify species occurring outside of the state. These species have been addressed briefly below and considered unlikely to occur within the Survey Area.



Species	Conservation status		Description	Detential to coolur	
Species	EPBC Act	BC Act	Description		
Actitis hypoleucos Common Sandpiper	Migratory - Bonn, CAMBA, JAMBA, ROKAMBA	IA	Species occupies a wide range of coastal and inland wetlands, mostly found around margins, shores and mudflats (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Anous stolidus</i> Common Noddy	Migratory, marine - Bonn, CAMBA, JAMBA	IA	Occurs on or near islands or coral / sand cays and shoals (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Apus pacificus</i> Fork-tailed Swift, Pacific Swift	Migratory - Bonn, CAMBA, JAMBA, ROKAMBA	IA	Almost exclusively aerial, flying over inland plains, coastal areas and settled areas, breeding in Siberia (DEE 2019b).	Unlikely to occur within or utilise the Survey Area, but may fly over.	
Arenaria interpres Ruddy Turnstone	Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	IA	Found in coastal regions with exposed rocky coast lines, and on coral reefs (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Calidris canutus</i> Red Knot, Knot	Endangered Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	IA	Occurs in coastal habitats and occasionally near-coastal wetlands (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Calidris ferruginea</i> Curlew Sandpiper	Critically Endangered Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	Т	Occurs in coastal habitats and occasionally terrestrial water bodies (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Calidris ruficollis</i> Red-necked Stint	Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	IA	Found mostly in coastal areas, occasionally further inland in flooded paddocks or damp grasslands. Species forages in shallow water or mudflats (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Calidris tenuirostris</i> Great Knot	Critically Endangered Migratory, marine - Bonn, CAMBA, JAMBA, BOKAMBA	Т	Found mostly in sheltered coastal areas, rarely further inland (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Charadrius leschenaultii</i> Greater Sand Plover	Vulnerable Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	Т	Entirely coastal in distribution on beaches and lagoons as well as reefs, islands or sand cays (DEE 2019b).	Unlikely due to absence of preferred habitat.	
Charadrius mongolus Lesser Sand Plover	Endangered Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	Т	Occurs in coastal littoral and estuarine environments and near coastal swamps and saltpans (DEE 2019b).	Unlikely due to absence of preferred habitat.	

Table 7: Threatened and Priority fauna species potentially occurring within the Survey Area



Spacias	Conservation status		Description	Detential to accur	
Species	EPBC Act	BC Act	Description		
<i>Erythrotriorchis radiatus</i> Red Goshawk	Vulnerable	т	Occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia. In the Kimberley, tall open forest and woodland, or tall fringing woodlands along rivers in grasslands, shrublands, and low open woodlands are preferred (DEE 2019b).	Possible due to presence of preferred habitat.	
<i>Erythrura gouldiae</i> Gouldian Finch	Endangered	Т	Species occurs in open woodlands that are dominated by <i>Eucalyptus</i> trees and support a ground cover of <i>Sorghum</i> and other grasses. The critical components of suitable core habitat for the Gouldian finch appear to be the presence of favoured annual and perennial grasses (especially <i>Sorghum</i>), a nearby source of surface water and, in the breeding season, unburnt hollow-bearing <i>Eucalyptus</i> trees (DEE 2019b).	Possible due to presence of preferred habitat.	
<i>Fregata ariel</i> Lesser Frigatebird	Migratory, marine - CAMBA, JAMBA, ROKAMBA	P4	Species occupies marine, island and subtidal habitats (Birdlife International 2019).	Unlikely due to absence of preferred habitat.	
<i>Gelochelidon nilotica</i> Gull- billed Tern	Migratory, marine - CAMBA	IA	Species breeds and forages in coastal locations or inland wetlands including man-made water bodies (Birdlife International 2019).	Unlikely due to absence of preferred habitat.	
<i>Limosa lapponica</i> Bar-tailed Godwit	Migratory, marine - CAMBA, JAMBA, ROKAMBA	IA	Species occurs in coastal habitats and near-coastal water bodies (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Macrotis lagotis</i> Bilby, Dalgyte, Ninu	Vulnerable	IA	Occurs in three main habitats: open tussock grassland on uplands and hills; <i>Acacia aneura</i> (mulga) woodland/shrubland growing on ridges and rises; and hummock grassland in plains and alluvial areas (TSSC 2016).	Unlikely due to absence of preferred habitat.	
<i>Numenius madagascariensis</i> Eastern Curlew	Critically Endangered Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	Т	Breeds in lakes and bogs and during the non-breeding season has a largely coastal distribution (Birdlife International 2019).	Unlikely due to absence of preferred habitat.	
<i>Numenius minutus</i> Little Curlew, Little Whimbrel	Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	IA	Forages in short grasslands and sedgelands e.g. floodplains, that have scattered shallow pools or seasonal inundations, open woodlands with grassy or burnt understorey, and coastal habitats (DEE 2019b).	Possible due to presence of preferred foraging habitat.	
<i>Numenius phaeopus</i> Whimbrel	Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	IA	Occurs in coastal habitats, including beaches, reefs and islands (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Papasula abbotti</i> Abbott's Booby	Endangered Marine	NA	Occurs mainly at sea, breeding on shore at Christmas Island (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Pandion cristatus</i> Osprey, Eastern Osprey	Migratory, marine - Bonn	IA	Occurs in littoral and coastal habitats, terrestrial wetlands of tropical and temperate Australia and offshore islands. May travel inland along major rivers (DEE 2019b).	Unlikely due to absence of preferred habitat.	



Creation	Conservation status		Description	Detential to accur	
Species	EPBC Act	BC Act	Description		
<i>Pezoporus occidentalis</i> Night Parrot	Endangered	Т	Largely occur in the arid zone, with some records from the West Kimberley. Require areas of dense spinifex, samphire or other structurally similar vegetation, and sources of water, at least where succulent vegetation is absent. Records from hummock grasslands are almost always near a water source (Blyth 1996).	Unlikely due to absence of preferred habitat.	
<i>Pluvialis fulva</i> Pacific Golden Plover	Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	IA	Occurs in coastal habitats and inland wetlands (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Pluvialis squatarola</i> Grey Plover	Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	IA	Occurs almost entirely in coastal habitats and inland wetlands (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Rostratula australis</i> Australian Painted Snipe	Endangered	Т	Occurs in freshwater wetlands and natural and artificial areas of inundated grasslands. Breeding occurs near these wetlands (DEE 2019b).	Unlikely due to absence of preferred habitat.	
Saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat	Vulnerable	NA	Limited ecological information is available. Species has been recorded foraging over woodland / forest canopy and roosting in tree hollows. all confirmed roosting records are from deep tree hollows in the poplar gum <i>Eucalyptus platyphylla</i> , Darwin woollybutt <i>E. miniata</i> and Darwin stringybark <i>E. tetrodonta</i> . Species has not been recorded in the Kimberley region (Schulz & Thomson 2007).	Unlikely due to known distribution (Northern Territory and Queensland).	
Simoselaps minimus Dampierland Burrowing Snake	NA	P2	Little is known about this species' habitat. Records are known from open areas with few trees. As it is a fossorial (burrowing) species, it is considered likely that the substrate is more important than vegetation type (Ellis et al. 2017).	Possible . As little is known about habitat for this species, it should be considered as potentially occurring.	
Sternula albifrons Little Tern	Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	P2	Occurs in coastal habitats and islands (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Sula leucogaster</i> Brown Booby	Migratory, marine - CAMBA, JAMBA, ROKAMBA	IA	Mainly utilises marine and coastal habitats, usually staying close to breeding islands (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Thalasseus bergii</i> Crested Tern	Migratory, marine - JAMBA	IA	Inhabits tropical and subtropical coastlines, nesting on offshore islands and reefs as well as artificial islets within man-made water bodies (e.g. sewage works) (Birdlife International 2019).	Unlikely due to absence of preferred habitat.	
<i>Tringa brevipes</i> Grey-tailed Tattler	Migratory, marine - CAMBA, JAMBA, ROKAMBA	IA	Occurs in coastal habitats, reefs and islets, roosting mainly in mangroves (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Tringa nebularia</i> Common Greenshank, greenshank	Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	P4	Occurs around inland wetlands and sheltered coastal habitats (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Tringa totanus</i> Common Redshank, redshank	Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	IA	Occurs in sheltered coastal wetlands (DEE 2019b).	Unlikely due to absence of preferred habitat.	

Species	Conservation status		Description	Potential to occur	
	EPBC Act	BC Act	Description		
<i>Tyto novaehollandiae kimberli</i> Masked Owl (northern)	Vulnerable	NA	Known from riparian forest, rainforest, open forest, <i>Melaleuca</i> swamps and the edges of mangroves, as well as along the margins of sugar cane fields. Roosts in large trees or tree hollows (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Xenus cinereus</i> Terek Sandpiper	Migratory, marine - Bonn, CAMBA, JAMBA, ROKAMBA	IA	Occurs in coastal habitats, roosting mainly in mangroves (DEE 2019b).	Unlikely due to absence of preferred habitat.	
<i>Xeromys myoides</i> Water Mouse, False Water Rat, Yirrkoo	Vulnerable	NA	Occurs in freshwater habitats. Most records have been from mangrove forests, saltmarsh, sedgelands, clay pans and freshwater melaleuca wetlands, in Northern Territory and Queensland (DEE 2019b).	Unlikely due to known distribution in Northern Territory and Queensland.	

IA – International agreement

P – Priority

T – Threatened

JAMBA – Japan – Australia Migratory Bird Agreement CAMBA – China – Australia Migratory Bird Agreement ROKAMBA – Republic of Korea – Australia Migratory Bird Agreement



Figure 6: Conservation significant flora and communities



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4.2 Field survey

A total of three quadrats sites were sampled across the Survey Area. Six east-west traverses were also conducted across the Survey Area to determine whether any changes of vegetation were present, and to search for any Threatened or Priority flora. Raw quadrat data is provided in Appendix 4.

4.2.1 Flora and vegetation

Native flora

Thirty-two native vascular plant taxa from 17 plant families were recorded within the Survey Area, of which 30 were recorded within quadrats and two taxa recorded opportunistically. The majority of taxa were recorded within the Fabaceae (four taxa) and Poaceae (five taxa) families (Appendix 3).

Conservation significant flora

None of the following were recorded within the Survey Area:

- Threatened flora species as listed under section 178 of the EPBC Act
- Threatened flora as listed under section 19(1) of the BC Act
- Priority flora species as listed by Western Australian Herbarium (1998-).

Unidentified flora

The lack of identifiable characteristics such as flowers or fruit is problematic as these features are required to complete an accurate ID. One taxon collected from the Survey Area was unable to be identified. This species was a shrub or sapling occurring commonly throughout the Survey Area. Based on morphology of the species, and habitat present within the Survey Area, this species was not considered likely to be any of the flora species of conservation significance identified in desktop searches.

Introduced (exotic) taxa

Ornamental species (e.g. banana palms [*Musa* sp.], frangipanis [*Plumeria* sp.]) were planted around the Survey Area amongst buildings. Introduced species such as *Agave americana* and *Chloris* sp. were present along fence lines and around edges of paving, and a number of ornamental species planted in pots around the accommodation had self-seeded along the western fence line near the existing accommodation. Other grasses were observed throughout VT3, however, these were unable to be identified due to lack of reproductive characteristics such as seed heads.

No introduced (exotic) taxa were recorded within quadrats or during traverses of the intact remnant vegetation at the north of the Survey Area.

Survey adequacy

A total of three quadrats were sampled within intact remnant vegetation in the Survey Area, (approximately one quadrat completed per hectare). This was considered adequate as three quadrats per vegetation type are generally required, and only one vegetation type was present within the Survey Area. A site walkover was conducted to assess vegetation around the remainder of the Survey Area (i.e. amongst infrastructure and accommodation buildings).

A species-area curve (Figure 7), based on a species accumulation analysis, was used to evaluate the adequacy of sampling (Colwell 2013). The asymptotic value was determined using Michaelis-Menten modelling. Using this analysis, the incidence based coverage estimator of species richness (ICE) was calculated to be 41.71 (Chao 2005). Based on this value, and the total of 30 species recorded from quadrats during the survey, approximately 71.93% of the flora species potentially present within the Survey Area recorded within quadrats. With opportunistic records included the total number of vascular flora taxa recorded within the Survey Area was 32. This result is expected due to the uniformity of the vegetation, as well as the relatively small area surveyed.





Figure 7: Averaged randomised Species Accumulation Curve

Vegetation types

Three native vegetation types (VTs) were defined and mapped within the Survey Area (Figure 8) and are summarised in Table 8. The total area mapped within the Survey Area was 5.26 ha which includes fully cleared areas and areas where infrastructure is present. Broadly speaking, vegetation within the Survey Area comprised eucalypt woodland over closed grassland, in various conditions.

Vegetati Type	Description	Area (ha) within project/survey area	% of survey area	Representative photograph
1	Open woodland of <i>Eucalyptus miniata</i> and sometimes <i>Eucalyptus tectifica</i> over sparse shrubland to open shrubland of <i>Acacia colei</i> , <i>Brachychiton diversifolius</i> , and <i>Dodonaea hispidula</i> over closed tussock grassland of <i>Sorghum stipoideum</i> and <i>Sorghum plumosum</i> on pindan soils.	2.69	51.2	
2	Open woodland of <i>Eucalyptus miniata</i> over patches of closed tussock grassland and occasional ornamental plants on pindan soils.	0.60	11.5	р N m h h N N K E E C 20 0 1 1 1 5 519753, 122 915322 9247 1 2 m Оста 2 2 2 0 1 1 1 1 5 519753, 122 915322 9247 1 2 m Оста 2 2 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
3	Cleared areas supporting occasional isolated trees of <i>Eucalyptus miniata</i> over bare soil and introduced species on pindan soils.	1.96	37.3	East Elevation
Total		5.25	100	

Table 8: Vegetation types recorded within the Survey Area











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Vegetation condition

The Survey Area shows signs of having been degraded for a long period of time due to the presence of the fuel station, roadhouse and associated infrastructure. However, vegetation within VT1 appeared to be relatively undisturbed and remained in Excellent condition, notwithstanding some degradation at the southern boundary caused by creation of tracks and dumping of soil and dead vegetation.

As such, vegetation condition within the survey area ranged from Completely Degraded to Excellent (Keighery 1994).

Table 9 gives a numerical breakdown of the area occupied by each vegetation condition rating within the survey area.

Vegetation Condition	Area (ha)	Percentage of the survey area
Excellent	2.69	51.2
Degraded – Poor	0.60	11.5
Completely Degraded – Degraded	1.96	37.3
Total	5.25	100

Table 9: Area (ha) covered by each vegetation condition category within the survey area

Threatened and Priority Ecological Communities

Monsoon vine thickets on the coastal sands of Dampier Peninsula

This TEC comprises occurrences of monsoon vine thickets in the southwest Kimberley region of Western Australia within the Dampierland bioregion. Predominantly restricted to the coastlines of the Dampier Peninsula from Broome in the south to One Arm Point in the north and on the northeastern coast of the Peninsula from One Arm Point to Goodenough Bay, particularly associated with Holocene sand dunes and other coastal geological formations (DSEWPaC 2013).

The community comprises a canopy layer of several tree or tall shrub species which may be deciduous, semi-deciduous or evergreen, depending on landscape position, and may include genera such as *Acacia*, *Corymbia*, *Eucalyptus*, *Hakea* and *Melaleuca*. The mid layer can contain scattered semi-deciduous fruiting shrubs and small trees, including species such as *Breynia cernua*, *Bridelia tomentosa*, *Croton habrophyllus*, *Dodonaea platyptera*, *Exocarpos latifolius*, *Pandanus spiralis* and *Santalum lanceolatum* (DSEWPaC 2013). Vines species may be present in all layers of the community, usually comprising up to 25% of native perennial plant species richness. At the ground level, the community is generally shaded and comprises a layer of leaf litter or organic matter on the soil surface (DSEWPaC 2013).

The TEC is identified by addressing the characteristics listed in Table 10. While the Survey Area is situated in a suitable location for the TEC, vegetation composition did not meet the criteria outlined in Table 10 and, as such, the Survey Area does not contain this TEC.



Parameter	Description	Does the Survey Area meet criteria?
Location	 Distribution occurs within the Dampierland bioregion – mostly in the Pindanland subregion DL2 (IBRA4). The ecological community is mainly restricted to the deep white or grey calcareous sands of the coastal Holocene dunes of the Dampier Ponjacula 	• Yes • No
	 The ecological community mainly occurs within the swales and on the leeward side of the coastal dunes and occasionally on the crests of these dunes and other coastal landforms such as: beach fronts, sand- spit headlands and storm ridges with intertidal flats (Black et al., 2010). 	• No
	 Outliers may occur on different substrates within the DL2 subregion e.g. on pindan soil the ecological community may establish following dispersal of key species by frugivores and where these patches are buffered from moisture loss and fire. 	soil is present within the Survey Area
Overstorey composition	• The overstorey typically ranges from three to nine metres tall and may consist of trees, tall shrubs and/or climbers/vines.	• Yes
	 The tree canopy composition is variable but the most common species are typically one or more of the taxa <i>Bauhinia cunninghammi</i> (jigal, joomoo), <i>Celtis philippensis</i> (goolnji), <i>Diospyros humilis</i> (ebony wood), <i>Exocarpos latifolius</i> (jarnba, mistletoe tree), <i>Grewia breviflora</i> (goolmi, currant/coffee fruit), <i>Mallotus nesophilus</i> (yellow ball flower), <i>Mimusops elengi</i> (joongoon, mamajen), <i>Sersalisia sericea</i> (mangarr), <i>Terminalia ferdinandiana</i> (gabiny, gubinge, kabiny) and <i>Terminalia petiolaris</i> (blackberry tree, marool, narwulu). 	• No
Understorey composition	 Shrub and small tree species when present include: Breynia cernua, Bridelia tomentosa, Caesalpinia major (goolyi), Croton habrophyllus (ankoolmarr), Dodonaea platyptera, snowball bush and Santalum lanceolatum. 	• No
	 The ground layer is generally sparse to absent but may contain a variety of herbaceous species depending on seasonal conditions, site characteristics and canopy density. 	• No
	 Native grass species are uncommon but may occur on the edges of vine thicket patches or in open groves. When present they typically include annual species such as <i>Perotis rara</i> (comet grass) and <i>Setaria</i> <i>apiculata</i> (pigeon grass). 	• No
	• Vines and creepers are often, but not always, present in the overstorey and/or understorey and when present include the following: crab's eye bean, Adenia heterophylla subsp. australis, Capparis lasiantha (ngoorla, bush caper), Jacquemontia paniculata, Jasminum didymum, Tinospora smilacina (oondal, snake vine) and Tylophora cinerascens (oyster-catcher bill).	• No
	• The following genera/species often present in other rainforest/vine thicket types in northern Australia, are typically absent or uncommon in the ecological community: <i>Albizia lebbeck, Bombax ceiba, Cryptocarya cunninghamii, Elaeodendron melanocarpum, Ganophyllum falcatum, Vitex acuminata</i> and <i>Ziziphus quadrilocularis.</i> The understorey of other northern vine thicket patches also contain shrub species that are absent from the ecological community, such as those from the genera <i>Alectryon, Denhamia, Micromelum, Murraya, Strychnos, Trema</i> and <i>Wrightia.</i>	• No

Table 10: Key diagnostic features of Monsoon Vine Thickets TEC

No other TECs or PECs are considered to occur within or adjacent to the Survey Area.

4.2.2 Fauna habitat

Three fauna habitat assessments were undertaken during the survey (see quadrat locations, Figure 8). Based on these habitat assessments and observations recorded throughout a walkover of the overall Survey Area, three broad fauna habitats were identified and mapped (Table 11 and Figure 9). Representative photographs can be seen associated with the corresponding vegetation type in Table 8.

Three broad fauna habitats were identified and delineated from fauna habitat assessments and were considered to range from Completely Degraded to Excellent condition. The three habitats comprised:

- open eucalypt woodland over closed grassland
- open eucalypt woodland over open grassland / patches of closed grassland
- cleared areas with isolated trees.

These habitats likely formed part of the same habitat type, but have been subjected to various levels of level of historical disturbance including clearing and introduction of introduced flora species (Table 11).

No tree hollows suitable for vertebrate fauna were recorded in any of the habitat types. Tracks were not able to be observed due to the level of coverage of foliage and leaf litter in the understorey. No termite mounds were observed in the Survey Area.

The habitat types in the Survey Area were assessed on their extents and levels of significance according to the following criteria:

- Distribution: those habitats widespread and common within the surrounding regions were categorised as 'widespread'; otherwise they were categorised as being of 'limited extent'
- Significance: those habitats considered important to species of conservation significance or distinct fauna assemblages are deemed 'significant'; otherwise they were categorised as being of 'limited significance'.

Vegetation was observed to be fairly uniform in structure within the Survey Area, and in the adjacent sites, as well as alongside the northern section of the Broome-Cape Leveque Road. As such, habitats recorded within the Survey Areas are considered to be widespread, common and of limited significance.

Two reptile species were observed opportunistically and identified during the survey, as follows:

- Lophognathus sp. (tata lizard)
- Pseudechis australis (mulga snake).



Fauna habitat type	Description	Area (ha) within Survey Area	% of Survey Area
1	Open eucalypt woodland over closed grassland.	2.69	51.2
	 This habitat type was associated with undisturbed vegetation to the north of the roadhouse and associated infrastructure. Other than some limited clearing or disturbance at the edges, this habitat type was considered to be in Excellent condition. Habitat elements include: dense understorey minimal mid-storey (i.e. medium height shrubs) habitat refuge under logs and tussock grasses. 		
2	Patches of eucalypt woodland over remnant native shrubs and ornamental species over open grassland. This habitat type was intermittent among buildings and infrastructure; as such, it represents a series of habitat patches subject to frequent human activity. Some patches appeared to contain reasonably intact vegetation structure. Ornamental species (e.g. banana palms) had been planted occasionally throughout. Leaf litter and tussock grasses may provide refuge for smaller vertebrate species including snakes and lizards. This habitat type was in Degraded – Poor condition.	0.60	11.5
3	Isolated eucalypts. This habitat type comprises remnant <i>Eucalyptus miniata</i> trees over cleared ground, infrastructure and weedy grasses. No understorey or habitat refuge areas were present within this habitat type. This habitat type was rated as Completely Degraded – Degraded condition.	1.96	37.3
Total		5.25	100

Table 11: Fauna habitat types recorded within the Survey Area





Figure 9: Fauna habitat



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5. Discussion

5.1 Flora and vegetation

Thirty-two native vascular plant taxa from 17 plant families were recorded within the Survey Area. Of seven Priority flora taxa identified by database searches, one species, *Triodia acutispicula*, was considered to have the potential to occur within the Survey Area and is known from within 1 km of the Survey Area; however, this species was not recorded during the survey. No flora of conservation significance were recorded within the Survey Area, including:

- Threatened flora species as listed under section 178 of the EPBC Act
- Threatened flora as listed under section 19(1) of the BC Act
- Priority flora species as listed by Western Australian Herbarium (1998-).

The lack of identifiable characteristics such as flowers or fruit is problematic as these features are required to complete an accurate ID. One taxon collected from the Survey Area was unable to be identified. This species was a shrub or sapling occurring commonly throughout the Survey Area. Based on morphology of the species and habitat present within the Survey Area, this species was not considered likely to be any of the flora species of conservation significance identified in desktop searches.

Introduced species recorded were restricted to VT2 and VT3, and included deliberately planted species and self-seeded garden plants and weeds. Species recorded included:

- Chloris sp. (purpletop Chloris or Rhodes grass)
- Agave americana (century plant)
- *Plumeria* sp. (frangipani)
- Musa sp. (banana palm)
- Poaceae sp. (unidentified grass species).

No introduced (exotic) taxa were recorded within quadrats.

Three native vegetation types (VTs) were defined and mapped within the survey area, as follows:

- open woodland of *Eucalyptus miniata* and sometimes *Eucalyptus tectifica* over sparse shrubland to open shrubland of *Acacia colei*, *Brachychiton diversifolius*, and *Dodonaea hispidula* over closed tussock grassland of *Sorghum stipoideum* and *Sorghum plumosum* on pindan soils, in Excellent condition
- open woodland of *Eucalyptus miniata* over patches of closed tussock grassland of *Sorghum stipoideum* and *Sorghum plumosum* and occasional ornamental plants on pindan soils, in Degraded Poor condition
- cleared areas supporting occasional isolated trees of *Eucalyptus miniata* over bare soil and introduced species on pindan soils, in Completely Degraded Degraded condition.

While the Survey Area fell within the buffer area of the Monsoon Vine Thickets TEC, an assessment of vegetation against diagnostic criteria for the TEC determined that the TEC was not present within the Survey Area.



5.2 Fauna and fauna habitat

A total of 34 fauna taxa of conservation significance were identified by database searches, of which the following were considered to have the potential to occur within the Survey Area, based on habitat present therein:

- Erythrotriorchis radiatus Red Goshawk (Vulnerable [EPBC Act; Threatened [BC Act])
- Erythrura gouldiae Gouldian Finch (Endangered [EPBC Act; Threatened [BC Act])
- *Numenius minutus* Little Curlew, Little Whimbrel (Migratory [Bonn, CAMBA, JAMBA, ROKAMBA], marine)
- Simoselaps minimus Dampierland Burrowing Snake (Priority 2).

The following two reptile species were observed opportunistically and identified during the survey:

- Lophognathus sp. (tata lizard)
- Pseudechis australis (mulga snake).

Three broad fauna habitats were identified and delineated from fauna habitat assessments, as follows:

- open eucalypt woodland over closed grassland, in Excellent condition
- open eucalypt woodland over open grassland / patches of closed grassland, in Degraded Poor condition
- cleared areas with isolated trees, in Completely Degraded Degraded condition.

Vegetation was observed to be fairly uniform in structure within the Survey Area, and in the adjacent sites, as well as alongside the northern section of the Broome-Cape Leveque Road. As such, habitats recorded within the Survey Areas are considered to be widespread and common and of limited significance.



6. Summary and conclusion

The Detailed flora and vegetation survey and fauna habitat survey conducted in March 2019 during the wet season of the Kimberley bioregion has been successful in collecting data to define and assess the presence, type, extent and significance of vegetation types and fauna habitats within the Survey Area.

Approximately 3 ha of vegetation ranging from Completely Degraded to Excellent condition was recorded within the Survey Area (including vegetation regrowth areas).

No Threatened or Priority flora species as listed by Western Australian Herbarium (1998-) were recorded within the Survey Area.

Less than 0.5% of the pre-European extent of the vegetation association present within the Survey Area has been cleared to date. No TECs or PECs have been recorded within the Survey Area.

The fauna habitats recorded within the survey area are widespread within the local area and are not considered to be significant in the support of conservation significant fauna species.



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Appendix 1 Conservation significant flora and ecological community definitions



CONSERVATION CODES

For Western Australian Flora and Fauna

Threatened, Extinct and Specially Protected fauna or flora¹ are species² which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

The Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the Biodiversity Conservation Act 2016.

Categories of Threatened, Extinct and Specially Protected fauna and flora are:

T <u>Threatened species</u>

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN Endangered species

Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna)* Notice 2018 for endangered fauna or the *Wildlife Conservation (Rare Flora)* Notice 2018 for endangered flora.

VU Vulnerable species

Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora)* Notice 2018 for extinct flora.

EW Extinct in the wild species

Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*

CD Species of special conservation interest (conservation dependent fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

1 Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

2 Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

3 Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

4 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

¹ The definition of flora includes algae, fungi and lichens ²Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Definition of Threatened Ecological Communities -EPBC Act

Critically endangered

An ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).

Endangered

An ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).

Vulnerable

An ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).

Appendix 2 Desktop assessment results (Parks and Wildlife 2007-, DEE 2019b)



NatureMap Species Report

Created By Guest user on 12/03/2019

Kingdom	Plantae
Conservation Status	Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	122° 54' 46" E,16° 31' 13" S
Buffer	20km

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1.	17435	Cullen candidum		P1	
2.	45678	Haemodorum capitatum		P1	
3.	11425	Lophostemon grandiflorus subsp. grandiflorus		P3	
4.	17362	Parsonsia kimberleyensis		P1	
5.	45717	Stylidium pindanicum (Pindan Triggerplant)		P3	
6.	17888	Triodia acutispicula		P3	
7.	48823	Utricularia bidentata		P3	

Conservation Codes T - Rare or likely to become extinct X - Presume dextinct IA - Protected under international agreement 5 - Other specially protected fauna 1 - Priority 1 2 - Priority 2 3 - Priority 2 4 - Priority 4 5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.



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NatureMap Species Report

Created By Guest user on 12/03/2019

Kingdom	Animalia
Conservation Status	Conservation Taxon (T, X, IA, S, P1-P5
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	122° 54' 46" E,16° 31' 13" S
Buffer	20km

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1.	41323	Actitis hypoleucos (Common Sandpiper)		IA	
2.	25634	Anous stolidus (Common Noddy)		IA	
3.	24505	Anous stolidus subsp. pileatus (Common Noddy)		IA	
4.	25554	Apus pacificus (Fork-tailed Swift, Pacific Swift)		IA	
5.	25736	Arenaria interpres (Ruddy Turnstone)		IA	
6.	24779	Calidris acuminata (Sharp-tailed Sandpiper)		IA	
7.	24780	Calidris alba (Sanderling)		IA	
8.	25738	Calidris canutus (Red Knot, knot)		IA	
9.	24784	Calidris ferruginea (Curlew Sandpiper)		Т	
10.	24788	Calidris ruficollis (Red-necked Stint)		IA	
11.	24790	Calidris tenuirostris (Great Knot)		Т	
12.	25575	Charadrius leschenaultii (Greater Sand Plover)		Т	
13.	25576	Charadrius mongolus (Lesser Sand Plover)		Т	
14.	25336	Chelonia mydas (Green Turtle)		Т	
15.	24084	Dugong dugon (Dugong)		S	
16.	24632	Erythrura gouldiae (Gouldian Finch)		P4	
17.	25624	Falco peregrinus (Peregrine Falcon)		S	
18.	24478	Fregata ariel (Lesser Frigatebird)		IA	
19.	47954	Gelochelidon nilotica (Gull-billed Tern)		IA	
20.	48587	Hydroprogne caspia (Caspian Tern)		IA	
21.	25343	Lepidochelys olivacea (Olive Ridley Turtle, Pacific Ridley Turtle)		Т	
22.	25170	Lerista separanda (Dampierland plain slider, skink)		P2	
23.	30932	Limosa lapponica (Bar-tailed Godwit)		IA	
24.	25741	Limosa limosa (Black-tailed Godwit)		IA	
25.	24168	Macrotis lagotis (Bilby, Dalgyte, Ninu)		Т	
26.	24798	Numenius madagascariensis (Eastern Curlew)		Т	
27.	24799	Numenius minutus (Little Curlew, Little Whimbrel)		IA	
28.	25742	Numenius phaeopus (Whimbrel)		IA	
29.	24060	Orcaella heinsohni (Australian Snubfin Dolphin)		P4	
30.	48591	Pandion cristatus (Osprey, Eastern Osprey)		IA	
31.	24382	Pluvialis fulva (Pacific Golden Plover)		IA	
32.	24383	Pluvialis squatarola (Grey Plover)		IA	
33.	25268	Simoselaps minimus (Dampierland Burrowing Snake)		P2	
34.	25640	Sterna dougallii (Roseate Tern)		IA	
35.	25642	Sterna hirundo (Common Tern)		IA	
36.	24527	Sterna hirundo subsp. longipennis (Common Tern)		IA	
37.	48593	Sternula albifrons (Little Tern)		IA	
38.	25754	Sula leucogaster (Brown Booby)		IA	
39.	24828	Sula leucogaster subsp. plotus (Brown Booby)		IA	
40.	48597	Thalasseus bergii (Crested Tern)		IA	
41.	24803	I ringa brevipes (Grey-tailed Tattler)		P4	
42.	24806	I ringa glareola (Wood Sandpiper)		IA	
43.	24808	Tringa nebularia (Common Greenshank, greenshank)		IA	
44.	24810	I ringa totanus (Common Redshank, redshank)		IA	
45.	41351	Xenus cinereus (Terek Sandpiper)		IA	

Conservation Codes T - Rare or likely to become extinct X - Presume dextinct IA - Protected under international agreement S - Other specially protected fauna 1 - Priority 1 2 - Priority 2 3 - Priority 3

NatureMap is a collaborative project of the Department of Parks and Wildlife and the Western Australian Museum.



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NatureMap Mapping Western Australia's biodiversity

Name ID Species Name

Naturalised Conservation Code ¹Endemic To Query Area

4 - Briority 4

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.



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NatureMap Species Report

Created By Guest user on 12/03/2019

Kingdom Plantae Current Names Only Yes Core Datasets Only Yes Method 'By Circle' Centre 122° 54' 46" E,16° 31' 13" S Buffer 5km

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1.	19262	Abildgaardia schoenoides			
2.	3371	Acacia hippuroides			
3.	19641	Acacia tumida var. tumida			
4.	13700	Amyema bifurcata			
5.	12063	Aristida holathera var. holathera			
6.	12757	Bauhinia cunninghamii			
7.	14925	Calotropis gigantea	Y		
8.	275	Chrysopogon pallidus (Ribbongrass)			
9.	5214	Cochlospermum fraseri (Kapok Bush, Malindjarr)			
10.	17089	Corymbia greeniana			
11.	17100	Corymbia polycarpa			
12.	412	Eriachne melicacea			
13.	4635	Euphorbia myrtoides			
14.	43508	Ficus geniculata var. insignis			
15.	2682	Gomphrena flaccida (Gomphrena Weed)			
16.	6158	Gonocarpus leptothecus			
17.	2016	Grevillea heliosperma (Rock Grevillea)			
18.	13748	Gyrocarpus americanus subsp. pachyphyllus			
19.	2178	Hakea macrocarpa (Dyaridany, Jaradinty)			
20.	11346	Hybanthus enneaspermus subsp. enneaspermus			
21.	4656	Jatropha gossypiifolia (Bellyache Bush)	Y		
22.	11425	Lophostemon grandiflorus subsp. grandiflorus		P3	
23.	20638	Megathyrsus maximus	Y		
24.	5901	Melaleuca dealbata (Karnbor)			
25.	31374	Microstachys chamaelea			
26.	6492	Mimusops elengi (Walara)			
27.	5295	Rhizophora stylosa (Spotted-leaved Red Mangrove)			
28.	7360	Richardia scabra (White Eye)	Y		
29.	17890	Ruellia tuberosa	Y		
30.	13153	Scaevola taccada			
31.	10848	Senna occidentalis	Y		
32.	31172	Sersalisia sericea (Nangi)			
33.	4979	Sida hackettiana			
34.	7000	Solanum cunninghamii			
35.	28347	Spermacoce occidentalis			
36.	625	Spinifex longifolius (Beach Spinifex)			
37.	5303	Terminalia ferdinandiana (Mador)			
38.	17888	Triodia acutispicula		P3	
39.	735	Yakirra pauciflora			
40.	4327	Zornia chaetophora			

Conservation Codes T - Rare or likely to become extinct X - Presumed extinct IA - Protected under international agreement S - Other specially protected fauna 1 - Priority 1 2 - Priority 2 3 - Priority 2 4 - Priority 4 5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.







EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about <u>Environment Assessments</u> and the EPBC Act including significance guidelines, forms and application process details.

Report created: 12/03/19 13:35:38

Summary Details Matters of NES Other Matters Protected by the EPBC Act Extra Information Caveat Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

<u>Coordinates</u> Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	25
Listed Migratory Species:	45

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A <u>permit</u> may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	80
Whales and Other Cetaceans:	11
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	8
Nationally Important Wetlands:	None
<u>Key Ecological Features (Marine)</u>	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Natural		
The West Kimberley	WA	Listed place

Listed Threatened Ecological Communities		[Resource Information]
For threatened ecological communities where the distribution plans, State vegetation maps, remote sensing imagery community distributions are less well known, existing very produce indicative distribution maps.	oution is well known, maps and other sources. Where getation maps and point lo	are derived from recovery threatened ecological cation data are used to
Name	Status	Type of Presence
<u>Monsoon vine thickets on the coastal sand dunes of</u> <u>Dampier Peninsula</u>	Endangered	Community likely to occur within area
Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Erythrotriorchis radiatus		
Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Frythrura gouldiae		
Gouldian Finch [413]	Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri		
Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri		
Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Papasula abbotti		
Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Pezoporus occidentalis		
Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Rostratula australis		
Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
Name	Status	area
		alea
Macked Owl (parthern) [26049]	Vulnorable	Species or species habitat
	Vuillerable	may occur within area
		may boot within a ba
Mammals		
Macrotis lagotis		
Greater Bilby [282]	Vulnerable	Species or species habitat
		likely to occur within area
<u>Megaptera novaeangliae</u>		
Humpback Whale [38]	Vulnerable	Breeding known to occur
Casaalaimua aaaalaimua, mudialumiatua		within area
Bara rumped Sheeth tailed Pat. Para rumped	Vulnorable	Species or species habitat
Shoathtail Bat [66880]	Vuillerable	species of species habitat
Xeromvs mvoides		
Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat
		may occur within area
		5
Reptiles		
<u>Caretta caretta</u>		
Loggerhead Turtle [1763]	Endangered	Species or species habitat
		known to occur within area
Obstants much		
Chelonia mydas		Des s die se les sous de la sous
Green Turtie [1765]	vuinerable	Breeding known to occur
Dermochelys coriacea		within area
Leatherback Turtle Leathery Turtle Luth [1768]	Endangorod	Brooding likely to occur
Leaderback furthe, Leaderly furthe, Ludi [1700]	Endangered	within area
Eretmochelvs imbricata		
Hawksbill Turtle [1766]	Vulnerable	Breeding likely to occur
		within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Breeding known to occur
		within area
Sharks		
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat
		may occur within area
Distriction		
Pristis ciavata		
Dwart Sawtish, Queensland Sawtish [68447]	Vulnerable	Species or species habitat
		KIIOWII to occur within area
Pristis pristis		
Freshwater Sawfish Largetooth Sawfish River	Vulnerable	Species or species habitat
Sawfish, Leichhardt's Sawfish, Northern Sawfish	Valitorabio	known to occur within area
[60756]		
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish	Vulnerable	Breeding likely to occur
[68442]		within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat
		may occur within area
Listed Migratory Species		[Resource Information]
* Species is listed upday a different a instifut	the EDBC Act. Threads	
Species is listed under a different scientific name on	Threatened	Type of Dressner
Name Migrotony Morino Dirdo	Inrealened	rype or Presence
Anous stolidus		Chaption of analysis habits
		may occur within area
		may occar within area

Apus pacificus Fork-tailed Swift [678]

Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat known to occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor		
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Sterna dougallii		
Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Sternula albifrons		
Little Tern [82849]		Species or species habitat may occur within area
Sula sula		
Red-footed Booby [1023]		Breeding known to occur within area
Migratory Marine Species		
Anoxypristis cuspidata		
Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<u>Chelonia mydas</u>		
Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon		E construction de la lla construction de
		behaviour likely to occur within area
Hawksbill Turtle [1766]	Vulnerable	Breeding likely to occur within area
Manta alfredi		
Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
<u>Manta birostris</u> Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
<u>Megaptera novaeangliae</u> Humpback Whale [38]	Vulnerable	Breeding known to occur
<u>Natator depressus</u> Flatback Turtle [59257]	Vulnerable	Breeding known to occur
Orcaella heinschni		within area
Australian Snubfin Dolphin [81322]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within
		area
Orcinus orca		
Killer Whale, Orca [46]		Species or species habitat
		may occur within area
Prietie eleviete		
Pristis Clavala	Vulnerable	Charles or encodes hebitat
Dwari Sawiisii, Queensianu Sawiisii [66447]	vuillerable	species of species flabilat
		KINOWIT to occur within area
Pristis pristis		
Freshwater Sawfish Largetooth Sawfish River	Vulnerable	Species or species habitat
Sawfish Leichhardt's Sawfish Northern Sawfish	Vallerable	known to occur within area
[60756]		
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish	Vulnerable	Breeding likely to occur
[68442]		within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat
		may occur within area
		-
Sousa chinensis		
Indo-Pacific Humpback Dolphin [50]		Foraging, feeding or related
		behaviour known to occur
		within area
Tursiops aduncus (Arafura/Timor Sea populations)		
Spotted Bottlenose Dolphin (Arafura/Timor Sea		Species or species habitat
populations) [78900]		likely to occur within area
Minneter Terrestrial Creasies		
Cecropis daurica		On a size on an asian habitat
Red-rumped Swallow [80610]		Species of species habitat
		may occur within area
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat
		may occur within area
Hirundo rustica		
Barn Swallow [662]		Species or species habitat
		may occur within area
		2
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat
		may occur within area
<u>Motacilla flava</u>		
Yellow Wagtail [644]		Species or species habitat
		likely to occur within area
Migratory Watlanda Crasica		
Common Sandpiper [59309]		Species or species habitat
		known to occur within area
Calidris acuminata		
Sharp tailed Sandhiner [974]		Spacios or spacios habitat
		likely to occur within area
		intery to occur within area
Calidris canutus		
Red Knot Knot [855]	Endangered	Species or species habitat
	Endangered	may occur within area
		5
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat
	, 0	known to occur within area
<u>Calidris melanotos</u>		
Pectoral Sandpiper [858]		Species or species habitat
		may occur within area
Oh and the same has		
<u>Unaradrius veredus</u>		.
Oriental Plover, Oriental Dotterel [882]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
<u>Glareola maldivarum</u>		
Oriental Pratincole [840]		Species or species habitat may occur within area
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species * Species is listed under a different scientific name on th	ne EPBC Act - Threatened	[<u>Resource Information</u>] Species list.
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
<u>Apus pacificus</u> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<u>Ardea alba</u> Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
<u>Ardea ibis</u> Cattle Egret [59542]		Species or species habitat may occur within area
<u>Calidris acuminata</u> Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
<u>Calidris canutus</u> Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
<u>Calidris ferruginea</u> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<u>Calidris melanotos</u> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<u>Calonectris leucomelas</u> Streaked Shearwater [1077]		Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat
······································		may occur within area
Chrysococcyx osculans		
Black-eared Cuckoo [705]		Species or species habitat
		likely to occur within area
<u>Fregata ariel</u>		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat
		known to occur within area
Frogata minor		
Creat Frigatabird, Creator Frigatabird [1012]		Species or opening habitat
Great Frigatebild, Greater Frigatebild [1015]		likely to occur within area
		likely to occur within area
Glareola maldivarum		
Oriental Pratincole [840]		Species or species habitat
		may occur within area
		may occar mann aroa
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat
		known to occur within area
Hirundo daurica		
Red-rumped Swallow [59480]		Species or species habitat
		may occur within area
Hirundo rustica		
Barn Swallow [662]		Species or species habitat
		may occur within area
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat
		likely to occur within area
Merces erectus		
Deinhaus Dein seten (CZO)		On a size on an asian habitat
Rainbow Bee-ealer [670]		Species of species nabilat
		may occur within area
Motacilla cinerea		
Grev Wagtail [6/2]		Species or species habitat
		may occur within area
		may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat
		likely to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat
		known to occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat
		known to occur within area
Papasula abbotti		
Abbott's Booby [59297]	Endangered	Species or species habitat
		may occur within area
Rostratula benghalensis (sensu lato)		a
Painted Snipe [889]	Endangered*	Species or species habitat
		may occur within area
Sterna albifrons		
Little Tern [813]		Spacies or spacies babitat
		may occur within area
		may coor within aloa
Sterna dougallii		
Roseate Tern [817]		Foraging, feeding or related
		behaviour likely to occur
		within area

NameThreatenedSula sulaRed-footed Booby [1023]Tringa nebulariaCommon Greenshank, Greenshank [832]

Fish

<u>Campichthys tricarinatus</u> Three-keel Pipefish [66192]

<u>Choeroichthys brachysoma</u> Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]

<u>Choeroichthys suillus</u> Pig-snouted Pipefish [66198]

<u>Corythoichthys flavofasciatus</u> Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]

<u>Cosmocampus banneri</u> Roughridge Pipefish [66206]

Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]

Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]

<u>Filicampus tigris</u> Tiger Pipefish [66217]

<u>Halicampus brocki</u> Brock's Pipefish [66219]

<u>Halicampus grayi</u> Mud Pipefish, Gray's Pipefish [66221]

Halicampus nitidus Glittering Pipefish [66224]

Halicampus spinirostris Spiny-snout Pipefish [66225]

<u>Haliichthys taeniophorus</u> Ribboned Pipehorse, Ribboned Seadragon [66226]

<u>Hippichthys penicillus</u> Beady Pipefish, Steep-nosed Pipefish [66231]

<u>Hippocampus histrix</u> Spiny Seahorse, Thorny Seahorse [66236]

<u>Hippocampus kuda</u> Spotted Seahorse, Yellow Seahorse [66237] Type of Presence

Breeding known to occur within area

Species or species habitat likely to occur within area

Species or species habitat may occur within area

Name

Hippocampus planifrons Flat-face Seahorse [66238]

Hippocampus spinosissimus Hedgehog Seahorse [66239]

Hippocampus trimaculatus

Three-spot Seahorse, Low-crowned Seahorse, Flatfaced Seahorse [66720]

Micrognathus micronotopterus Tidepool Pipefish [66255]

Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]

Solegnathus lettiensis

Gunther's Pipehorse, Indonesian Pipefish [66273]

Solenostomus cyanopterus

Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]

Syngnathoides biaculeatus

Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]

Trachyrhamphus bicoarctatus

Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]

Trachyrhamphus longirostris

Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]

Mammals

Dugong dugon Dugong [28]

Reptiles

Acalyptophis peronii Horned Seasnake [1114]

<u>Aipysurus duboisii</u> Dubois' Seasnake [1116]

<u>Aipysurus eydouxii</u> Spine-tailed Seasnake [1117]

<u>Aipysurus laevis</u> Olive Seasnake [1120]

<u>Aipysurus tenuis</u> Brown-lined Seasnake [1121]

<u>Astrotia stokesii</u> Stokes' Seasnake [1122]

<u>Caretta caretta</u> Loggerhead Turtle [1763]

Threatened

Type of Presence

Species or species habitat may occur within area

Foraging, feeding or related behaviour likely to occur within area

Species or species habitat may occur within area

Species or species habitat known to occur

Endangered

Name	Threatened	Type of Presence
		within area
<u>Chelonia mydas</u>		
Green Turtle [1765]	Vulnerable	Breeding known to occur
Crocodylus johnstoni		within area
Freshwater Crocodile, Johnston's Crocodile,		Species or species habitat
Johnston's River Crocodile [1773]		may occur within area
Crocodylus porosus		
Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat
		likely to occur within area
Dermochelys coriacea		
Leatherback Turtle Leatherv Turtle Luth [1768]	Endangered	Breeding likely to occur
	Endengorod	within area
Disteira kingii		
Spectacled Seasnake [1123]		Species or species habitat
		may occur within area
<u>Disteira major</u>		
Olive-headed Seasnake [1124]		Species or species habitat
		may occur within area
Emydocephalus annulatus		
Turtle-headed Seasnake [1125]		Species or species habitat
		may occur within area
Ephalophis grevi		
North-western Mangrove Seasnake [1127]		Species or species habitat
0		may occur within area
Fretmochelys impricata		
Hawkshill Turtle [1766]	Vulnerable	Breeding likely to occur
	Valliorabio	within area
<u>Hydrelaps darwiniensis</u>		
Black-ringed Seasnake [1100]		Species or species habitat
		may occur within area
<u>Hydrophis elegans</u>		
Elegant Seasnake [1104]		Species or species habitat
		may occur within area
Hydrophis mcdowelli		
null [25926]		Species or species habitat
		may occur within area
Hydrophis ornatus		
Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat
		may occur within area
Lanemis hardwickii		
Spine-bellied Seasnake [1113]		Species or species habitat
		may occur within area
Neteter depreseus		
Natator depressus Elathack Turtle [50257]	Vulnerable	Breeding known to occur
	Vullielable	within area
Pelamis platurus		
Yellow-bellied Seasnake [1091]		Species or species habitat
		may occur within area
Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Relaenontera edeni		
Bryde's Whale [35]		Species or species habitat
2 Let 1		may occur within area
Delphinus delphis		
Deiphillus deiphis		

Common Dophin, Short-beaked Common Dolphin [60]

Species or species habitat may occur within

Name	Status	Type of Presence
Grampus griseus		area
Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
<u>Megaptera novaeangliae</u>		
Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Orcaella brevirostris		
Irrawaddy Dolphin [45]		Species or species habitat likely to occur within area
Orcinus orca		
Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis		
Indo-Pacific Humpback Dolphin [50]		Foraging, feeding or related behaviour known to occur within area
Stenella attenuata		
Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus		
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations)		
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Tursiops truncatus s. str.		
Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Bardi Jawi	WA
Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Canis lupus familiaris		
Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Rattus rattus		
Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Plants		
Cenchrus ciliaris		
Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Jatropha gossypifolia		
Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf		Species or species habitat
Physic Nut, Cotton-leaf Jatropha, Black Physic Nut		likely to occur within area
[7507]		
Lantana camara		
Lantana, Common Lantana, Kamara Lantana, Large-		Species or species habitat
leaf Lantana, Pink Flowered Lantana, Red Flowered		may occur within area
Lantana, Red-Flowered Sage, White Sage, Wild Sage		
[10892]		
Parkinsonia aculeata		
Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse		Species or species habitat
Bean [12301]		likely to occur within area
Reptiles		
Pamphotyphlops braminus		

Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]

Species or species habitat may occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and

- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers
- The following groups have been mapped, but may not cover the complete distribution of the species:
 - non-threatened seabirds which have only been mapped for recorded breeding sites
 - seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-16.51938 122.90411

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales -Department of Environment and Primary Industries, Victoria -Department of Primary Industries, Parks, Water and Environment, Tasmania -Department of Environment, Water and Natural Resources, South Australia -Department of Land and Resource Management, Northern Territory -Department of Environmental and Heritage Protection, Queensland -Department of Parks and Wildlife, Western Australia -Environment and Planning Directorate, ACT -Birdlife Australia -Australian Bird and Bat Banding Scheme -Australian National Wildlife Collection -Natural history museums of Australia -Museum Victoria -Australian Museum -South Australian Museum -Queensland Museum -Online Zoological Collections of Australian Museums -Queensland Herbarium -National Herbarium of NSW -Royal Botanic Gardens and National Herbarium of Victoria -Tasmanian Herbarium -State Herbarium of South Australia -Northern Territory Herbarium -Western Australian Herbarium -Australian National Herbarium, Canberra -University of New England -Ocean Biogeographic Information System -Australian Government, Department of Defence Forestry Corporation, NSW -Geoscience Australia -CSIRO -Australian Tropical Herbarium, Cairns -eBird Australia -Australian Government - Australian Antarctic Data Centre -Museum and Art Gallery of the Northern Territory -Australian Government National Environmental Science Program -Australian Institute of Marine Science -Reef Life Survey Australia -American Museum of Natural History -Queen Victoria Museum and Art Gallery, Inveresk, Tasmania -Tasmanian Museum and Art Gallery, Hobart, Tasmania -Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix 3 Vascular plant taxa recorded from quadrats within the survey area
Family	Species
Asparagaceae	*Agave americana
Apocynaceae	^ <i>Plumeria</i> sp.
Combretaceae	Terminalia ?latipes
Commelinaceae	Commelina ensifolia
Convolvulaceae	Jacquemontia pannosa
	Polymeria ambigua
Cyperaceae	Abildgaardia schoenoides
Fabaceae	Acacia colei
	Acacia hippuroides
	Galactia tenuiflora
	Glycine tomentella
Goodeniaceae	Goodenia sepalosa var. sepalosa
Gyrostemonaceae	Gyrostemon tepperi
Haemodoraceae	Haemodorum sp.
Haloragaceae	Gonocarpus leptothecus
Malvaceae	Brachychiton diversifolius
	Gossypium rotundifolium
	Waltheria indica
	Eucalyptus miniata
	Eucalyptus tectifica
Musaceae	^ <i>Musa</i> sp.
Phyllanthaceae	Phyllanthus exilis
Poaceae	Aristida sp.
	*Chloris sp.
	Eriachne sp.
	*Poaceae sp.
	Setaria apiculata
	Sorghum plumosum
	Sorghum stipoideum
Proteaceae	Grevillea pyramidalis subsp. pyramidalis
	Grevillea refracta subsp. refracta
	Persoonia falcata
Rubiaceae	Spermacoce occidentalis
Sapindaceae	Dodonaea hispidula
Unidentified	Unidentified sp.
Violaceae	Hybanthus enneaspermus subsp. enneaspermus

Table 3-1: Species recorded within Survey Area

* - indicates introduced species

 - indicates deliberately planted species e.g. ornamental or garden plants
- indicates the collected specimen was unable to be identified accurately to species due to lack of flowering or fruiting material present at the time of collection; the most likely identification is given based on plant characteristics available and known distribution of species

sp. - indicates insufficient flowering or fruiting material was present at the time of collection to infer taxon to species level

Species	DR01	DR02	DR03
Abildgaardia schoenoides	х	х	
Acacia colei	x	x	х
Acacia hippuroides	х	х	
Brachychiton diversifolius		x	х
Commelina ensifolia	x		
Dodonaea hispidula	x	x	x
Eriachne sp.	x	x	
Eucalyptus miniata	x	x	x
Eucalyptus tectifica		x	х
Galactia tenuiflora			х
Glycine tomentella	x		х
Gonocarpus leptothecus	х	х	
Goodenia sepalosa var. sepalosa	х	х	
Gossypium rotundifolium	х	х	х
Grevillea pyramidalis subsp. pyramidalis			х
Grevillea refracta subsp. refracta	x		
Gyrostemon tepperi	x		
Haemodorum sp.			х
Hybanthus enneaspermus subsp. enneaspermus	x		
Jacquemontia pannosa	х	x	
Persoonia falcata	х	x	x
Phyllanthus exilis	х		
Polymeria ambigua	x	х	
Setaria apiculata	x		
Sorghum plumosum			х
Sorghum stipoideum	x	х	х
Spermacoce occidentalis	x	x	
Terminalia ?latipes		x	
Unidentified sp.	x	x	x
Waltheria indica		x	

Table 3-2: Species recorded in each quadrat

Appendix 4 Raw Quadrat Data

DR01			
GPS co-ordinate	490983 mE 8173712 mN		
Landform	Plain		
Soils	Orange sand		
Ground cover	0% bare ground		
	15% litter		
Condition	Excellent		
Fire age	10+ years		
Disturbance	Minimal		
Vegetation	Open woodland of <i>Eucalyptus miniata</i> and so sparse shrubland to open shrubland of <i>Acaci</i> <i>Dodonaea hispidula</i> over closed tussock gras <i>plumosum</i> on pindan soils.	ometimes Eucaly ia colei, Brachyc ssland of Sorghu	vptus tectifica over hiton diversifolius, and um stipoideum and S.
Species list	Species	Height	% foliage cover
	Abildgaardia schoenoides	30	0.01
	Acacia colei	250	2
	Acacia hippuroides	80	0.2
	Commelina ensifolia	20	0.2
	Dodonaea hispidula	100	4
	Eriachne sp.	100	0.2
	Eucalyptus miniata	600	30
	Glycine tomentella	cr	1
	Gonocarpus leptothecus	25	0.05
	Goodenia sepalosa var. sepalosa	25	0.2
	Gossypium rotundifolium	cr	1
	Grevillea refracta subsp. refracta	150	3
	Gyrostemon tepperi	50	0.5
	Hybanthus enneaspermus subsp. enneaspermus	30	0.05
	Jacquemontia pannosa	cr	0.5
	Persoonia falcata	200	5
	Phyllanthus exilis	40	2
	Polymeria ambigua	cr	0.01
	Setaria apiculata	25	0.01
	Sorghum stipoideum	200	80
	Spermacoce occidentalis	30	0.2
	Unidentified sp.	80	0.5

DR02			
GPS co-ordinate	490980 mE 8173802 mN		
Landform	Plain		
Soils	Orange sand		
Ground cover	0% bare ground		
	10% litter		
Condition	Excellent		
Fire age	10+ years		
Disturbance	Minimal		
Vegetation	Open woodland of <i>Eucalyptus miniata</i> and so sparse shrubland to open shrubland of <i>Acaci Dodonaea hispidula</i> over closed tussock gras <i>plumosum</i> on pindan soils.	ometimes Eucalyp ia colei, Brachychi ssland of Sorghun	tus tectifica over ton diversifolius, and a stipoideum and S.
Species list	Species	Height	% foliage cover
	Abildgaardia schoenoides	50	0.05
	Acacia colei	300	18
	Acacia hippuroides	25	0.1
	Brachychiton diversifolius	150	1
	Dodonaea hispidula	100	15
	Eriachne sp.	60	2
	Eucalyptus miniata	600	20
	Eucalyptus tectifica	500	5
	Gonocarpus leptothecus	40	0.01
	Goodenia sepalosa var. sepalosa	15	0.01
	Gossypium rotundifolium	cr	0.02
	Jacquemontia pannosa	cr	0.02
	Persoonia falcata	250	2
	Polymeria ambigua	cr	0.01
	Sorghum stipoideum	200	70
	Spermacoce occidentalis	45	0.02
	Terminalia ?latipes	300	5
	Unidentified sp.	180	0.5
	Waltheria indica	15	0.05

DR03			
GPS co-ordinate	490886 mE 8173759 mN		
Landform	Plain		
Soils	Orange sand		
Ground cover	0% bare ground		
	10% litter		
Condition	Excellent		
Fire age	10+ years		
Disturbance	Minimal, with some possible clearing to south		
Vegetation	Open woodland of <i>Eucalyptus miniata</i> and se sparse shrubland to open shrubland of <i>Acac</i> . <i>Dodonaea hispidula</i> over closed tussock gra <i>plumosum</i> on pindan soils.	ometimes Eucalyp ia colei, Brachychi ssland of Sorghun	tus tectifica over ton diversifolius, and n stipoideum and S.
Chaoles list	On a star		
Species list	Species	Height	% foliage cover
Species list	Acacia colei	Height 250	% foliage cover
	Acacia colei Brachychiton diversifolius	Height 250 250	% foliage cover 1 2
	Acacia colei Brachychiton diversifolius Dodonaea hispidula	Height 250 250 150	% foliage cover 1 2 0.5
	Species Acacia colei Brachychiton diversifolius Dodonaea hispidula Eucalyptus miniata	Height 250 250 150 600	% foliage cover 1 2 0.5 20
	Species Acacia colei Brachychiton diversifolius Dodonaea hispidula Eucalyptus miniata Eucalyptus tectifica	Height 250 250 150 600 600	% foliage cover 1 2 0.5 20 10
	Species Acacia colei Brachychiton diversifolius Dodonaea hispidula Eucalyptus miniata Eucalyptus tectifica Galactia tenuiflora	Height 250 250 150 600 600 cr	% foliage cover 1 2 0.5 20 10 5
	Species Acacia colei Brachychiton diversifolius Dodonaea hispidula Eucalyptus miniata Eucalyptus tectifica Galactia tenuiflora Glycine tomentella	Height 250 250 150 600 600 cr cr	% foliage cover 1 2 0.5 20 10 5 0.1
	Species Acacia colei Brachychiton diversifolius Dodonaea hispidula Eucalyptus miniata Eucalyptus tectifica Galactia tenuiflora Glycine tomentella Gossypium rotundifolium	Height 250 250 150 600 600 cr cr cr cr	% foliage cover 1 2 0.5 20 10 5 0.1 1
	Species Acacia colei Brachychiton diversifolius Dodonaea hispidula Eucalyptus miniata Eucalyptus tectifica Galactia tenuiflora Glycine tomentella Gossypium rotundifolium Grevillea pyramidalis subsp. pyramidalis	Height 250 250 150 600 600 cr cr 150	% foliage cover 1 2 0.5 20 10 5 0.1 1 0.2
	Species Acacia colei Brachychiton diversifolius Dodonaea hispidula Eucalyptus miniata Eucalyptus tectifica Galactia tenuiflora Glycine tomentella Gossypium rotundifolium Grevillea pyramidalis subsp. pyramidalis Haemodorum sp.	Height 250 250 150 600 600 cr cr 150 150 120	% foliage cover 1 2 0.5 20 10 5 0.1 1 0.2
	Species Acacia colei Brachychiton diversifolius Dodonaea hispidula Eucalyptus miniata Eucalyptus tectifica Galactia tenuiflora Glycine tomentella Gossypium rotundifolium Grevillea pyramidalis subsp. pyramidalis Haemodorum sp. Persoonia falcata	Height 250 250 150 600 600 cr cr 150 150 250	% foliage cover 1 2 0.5 20 10 5 0.1 1 0.2 3
	Species Acacia colei Brachychiton diversifolius Dodonaea hispidula Eucalyptus miniata Eucalyptus tectifica Galactia tenuiflora Glycine tomentella Gossypium rotundifolium Grevillea pyramidalis subsp. pyramidalis Haemodorum sp. Persoonia falcata Sorghum plumosum	Height 250 250 150 600 600 cr cr 150 150 250 250 250 250 250 250 200	% foliage cover 1 2 0.5 20 10 5 0.1 1 0.2 3 5
	Species Acacia colei Brachychiton diversifolius Dodonaea hispidula Eucalyptus miniata Eucalyptus tectifica Galactia tenuiflora Glycine tomentella Gossypium rotundifolium Grevillea pyramidalis subsp. pyramidalis Haemodorum sp. Persoonia falcata Sorghum plumosum Sorghum stipoideum	Height 250 250 150 600 600 cr cr 150 120 250 200	% foliage cover 1 2 0.5 20 10 5 0.1 1 0.2 3 5 75