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PILBARA MINERALS LIMITED

TARGETED THREATENED FLORA SEARCH, VEGETATION ASSESSMENT AND FAUNA HABITAT ASSESSMENT

GREAT NORTHERN HWY INTERSECTION AND REALIGNMENT

Document Status						
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ecologia Environment
45 Gladstone Street
East Perth WA 6004
Phone: 08 6168 7200
Email: *admin@ecologia.com.au*

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ACRONYMS

BAM Act	*Biosecurity and Agriculture Management Act 2007*
BOM	Bureau of Meteorology
BIF	Banded Ironstone Formation
CALM	Department of Conservation and Land Management (now DCBA and DER)
CAMBA	China – Australia Migratory Bird Agreement
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFWA	Department of Agriculture and Food Western Australia
DBCA	Department of Biodiversity, Conservation and Attractions
DEC	Department of Environment and Conservation (now DBCA)
DER	Department of Environmental Regulation
DoEE	Department of the Environment and Energy (Previously DSEWPaC)
DCBA	Department of Parks and Wildlife (now DCBA)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (now DoEE)
EPA	Environment Protection Authority
EP Act	*Environment Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESCAVI	Executive Steering Committee for Australian Vegetation Information
IA	International Agreement
IBRA	Interim Biogeographic Regionalisation for Australia
ICE	Incidence-based Coverage Estimators
IPA	Indigenous Protected Area
IUCN	International Union for Conservation of Nature
NVIS	National Vegetation Information System
PEC	Priority Ecological Community
SAC	Species accumulation curve
TEC	Threatened Ecological Community
TPFL	Threatened and Priority Flora database
TPFR	Threatened and Priority Flora Report form
TP List	Threatened and Priority Flora List
WA	Western Australia
WAHERB	Western Australian Herbarium Specimen Database
WAOL	Western Australian Organism List
WC Act	*Wildlife Conservation Act 1950*
WONS	Weeds of National Significance

EXECUTIVE SUMMARY

The Study Area occupies a small area of approximately 20 ha in the Pilbara bioregion (Chichester subregion) of Western Australia, within which three vegetation associations occur:

Stony and Sandy Plains

Acacia ancistrocarpa and *Acacia orthocarpa* tall open shrubland over *Triodia epactia* hummock grassland. occurring on stony plains with clay loam soils. This vegetation type occurs over 14.2 ha (70.6%) of the Study Area

Acacia inaequilatera, Acacia acradenia and *Corchorus parviflorus* open shrubland over *Triodia epactia* open hummock grassland on stony and sand plains with clay to sand loam soils. This vegetation type occurs over 1.4 ha (6.9%) of the Study Area.

Minor Drainage Depressions

Corymbia hamersleyana low open woodland over *Acacia ancistrocarpa* and *Acacia inaequilatera* open shrubland over *Triodia epactia* hummock grassland occurring on minor drainage lines with clay loam soils. This vegetation type occurs over 1.3 ha (6.5%) of the Study Area.

No Commonwealth or State listed TECs or PECs have been recorded within the vicinity, nor have any been recorded in surveys reviewed as part of this desktop study. No vegetation was assessed as either regionally or locally significant. Vegetation units described are widespread in the region.

Vegetation condition across much of the Study Area was assessed as 'Very Good' with minimal weed invasion.

A total of 32 vascular plant taxa were recorded. The most diverse families were the Fabaceae, Poaceae, Malvaceae, Amaranthaceae, Euphorbiaceae, and Goodeniaceae. One introduced species *Aerva javanica*) was recorded in low abundance within the Study Area.

No flora species of conservation significance, including Priority species, were recorded over the Study Area although four are considered to have a high likelihood of occurring.

Three broad fauna habitats occur over the Study Area: Stony Plains, Sandy Plains and Minor Drainage Depressions. All fauna habitats recorded from the Study Area are considered widespread and typical of the bioregion.

The only species of conservation significance recorded over the Study Area was the Rainbow Bee-eater. The Rainbow Bee-eater (IA) was removed from the list of migratory species under section 209 of the EPBC Act on 9th June 2016, however, still appears on Schedule 5 of the WC Act as 'Migratory birds protected under an international agreement'. Numerous records of the species have been made and because of its broad habitat requirements is likely to occur. However, sandy Drainage Line habitat utilised as breeding habitat does not occur over the Study Area.

Several additional species were assessed with a Likelihood Rating of 2 (Possible). However no rocky escarpments occur and therefore no Northern Quoll (EN) denning habitat is present. Just two hectares of Sandy Plains habitat occurs but no distinctive evidence in the form of burrows, diggings, tracks or scats of either the Greater Bilby (VU) or Brush-tailed Mulgara (P4) was recorded.

The Western Pebble-mound Mouse (P4) is known to have a preference for hilly and/or rocky landscapes which are not present over the Study Area. No distinctive mounds constructed by this species were recorded.

The Pilbara Leaf-nosed Bat (VU) has been recorded within one kilometre of the Study Area, however, no roosting habitat is present within the Study Area. Creek lines provide foraging habitat for the species, as well as 'flyways' for dispersal. Creeklines are not present over the Study Area and the Turner River, one kilometre to the east, is a likely flyway.

Both the Peregrine (OS) and Grey Falcons (VU) are widespread in Australia. Breeding habitat of cliffs, rocky outcrops, or large trees are not present over the Study Area, however, both have the potential to overfly the Study Area.

Similarly the Fork-tailed Swift (IA) is a migratory, almost exclusively aerial species that has the potential to overfly the Study Area without specifically utilising any particular habitat present.

1 INTRODUCTION

1.1 PROJECT BACKGROUND

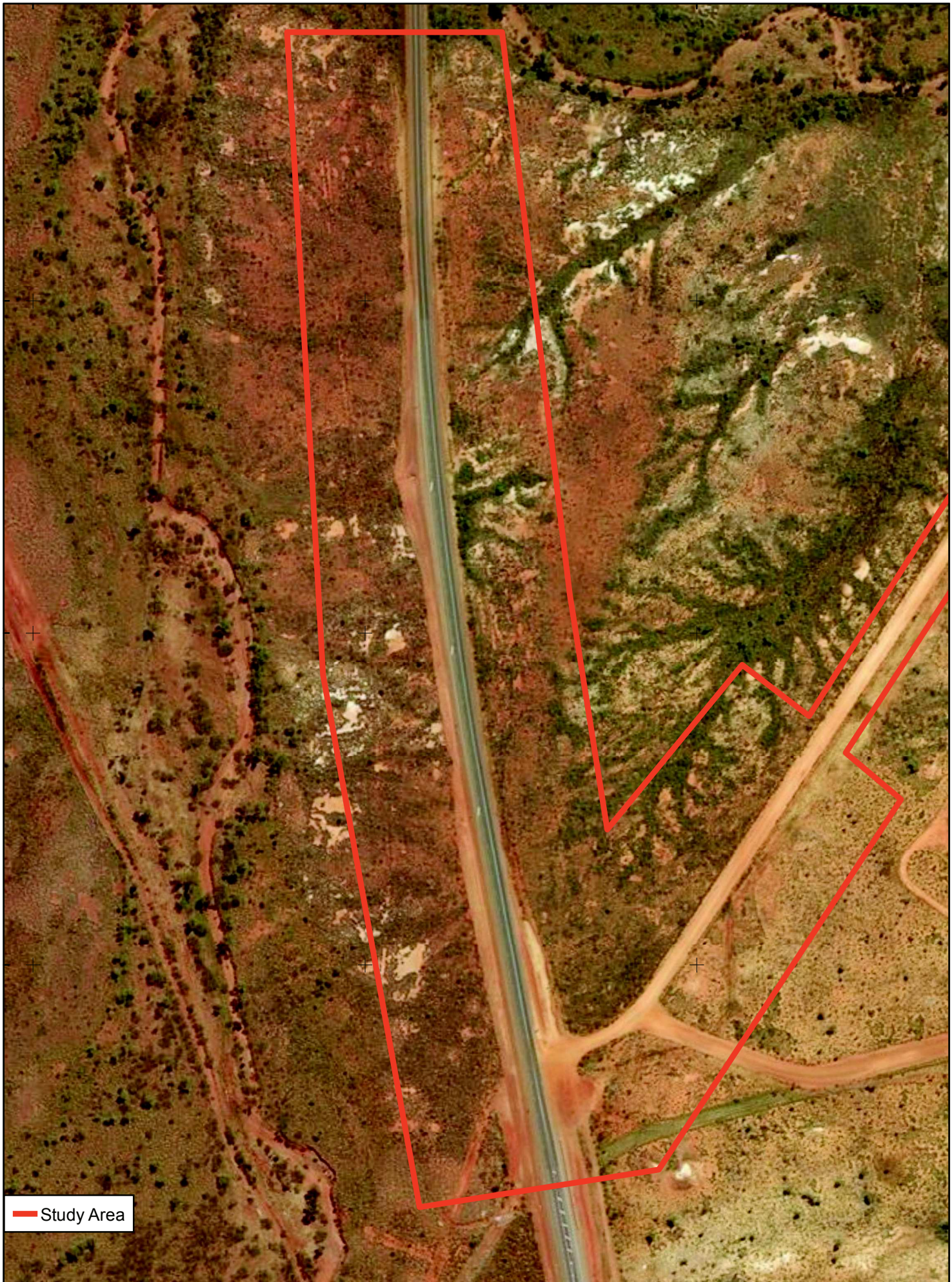
Pilbara Minerals Limited (Pilbara Minerals) required a targeted threatened flora search, vegetation assessment, and fauna habitat assessment over a section of the Great Northern Highway. Pilbara Minerals proposes to modify and re-align the intersection of its Haul Road with Great Northern Highway (the Study Area, Figure 1-1) as a component of the development of its Pilgangoora Lithium-Tantalum Project (Pilgangoora Project).

The targeted threatened flora search, vegetation assessment, and fauna habitat assessment over a ~20 ha area of Miscellaneous Tenement L45/426 was required to support a Native Vegetation Clearing Permit (NVCP) to be submitted to the Native Vegetation Assessment Branch (NVAB) of the DMP in conformance with the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (clearing regulations) under the *Environmental Protection Act 1986* (EP Act).

1.2 SURVEY OBJECTIVES

The objective of this assessment was to provide sufficient information for the DMP to assess the impact of the proposed development on the flora, vegetation and fauna of the Study Area. To this end, the following were provided as part of this assessment:

- A desktop study to evaluate biological values of the Study Area and surrounds, including a review of existing environmental values, threatened and priority flora, vegetation, and fauna databases, and other relevant available literature
- A targeted threatened flora search of the Study Area
- Description and mapping of vegetation types within the Study Area
- An assessment of the local and regional significance of any significant vegetation
- Description and mapping of fauna habitats within the Study Area
- An inventory of the flora and fauna of the Study Area;
- The likelihood of any conservation significant species (vascular flora and vertebrate fauna) occurring within the Study Area



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MGA94 (Zone 50)

Pilgangoora Project
Study Area: GNH Intersection

Figure:
1-1

2 METHODOLOGY

2.1 DESKTOP STUDY

A review of background environmental information relevant to the Study Area was undertaken by *ecologia* including data collected from previous flora, vegetation, and fauna surveys, climate (BoM), biogeography (IBRA 7) (USE 2012), land systems (Van Vreeswyk *et al.* 2004), soils (Northcote *et al.* 1960-1968; Tille 2006), and pre-European vegetation (Shepherd *et al.* 2001).

Definitions used for this assessment are presented in Appendix A. Searches of the following databases were undertaken to determine conservation significant species and communities recorded in the vicinity of the Study Area:

- Department of Environment (DoE) EPBC Act Protected Matters Database
- Department of Parks and Wildlife (DCBA), Threatened and Priority Flora Database (TPFL) (Search reference 16-0317FL)
- DCBA Threatened and Priority Flora List (TP List) (Search reference 16-0317FL)
- DCBA Western Australian Herbarium Specimen Database (WAHERB) (Search reference 16-0317FL)
- DCBA Threatened and Priority Ecological Communities Database (Search reference 12-0317EC)
- DCBA NatureMap database (WA)
- DCBA Threatened and Priority Fauna database (WA)
- BirdLife Australia Custom Atlas Bird List

2.2 FIELD METHODOLOGY

The field survey was undertaken by a Principal Scientist Shaun Grein and Principal Zoologist Andre Schmitz on the 5th September 2017. Database search results were used to provide a list of flora and fauna species of conservation significance known from the region. The field team familiarised themselves with these species prior to the field work. The entire Study Area was searched for flora, vegetation and fauna of conservation significance.

After the field assessment each conservation significant species and ecological community identified during the desktop study was assigned a likelihood of occurrence rating within the Study Area based on the criteria shown in Table 2.1.

Table 2.1 – Criteria used to assess likelihood of occurrence of significant flora and fauna

Rating		Criteria (significant flora and fauna)	Criteria (TEC/PEC)
Recorded		The taxon has been recorded within the Study Area.	The TEC/PEC (not including buffer) has previously been recorded in the Study Area.
1	Likely	Suitable habitat possibly occurs within the Study Area, and there are previous records in the vicinity of the Study Area.	Due to the proximity of previous records and the likely presence of suitable habitat/geology within the Study Area, the TEC/PEC possibly occurs within the Study Area.
2	Possible	Suitable habitat possibly occurs within the Study Area, but there are no records in the vicinity of the Study Area; or there is otherwise insufficient information available to exclude the possibility of occurrence.	The community is broadly defined and could possibly occur at the Study Area and there are records in the vicinity of the Study Area; or there is insufficient information available to exclude the possibility of occurrence at the Study Area.
3	Unlikely	Suitable habitat is considered unlikely to be present within the Study Area.	The community is well defined and suitable habitat/geology is considered unlikely to be present within the Study Area.

2.2.1 Flora and Vegetation

A reconnaissance flora and vegetation and targeted flora and vegetation survey was conducted consistent with the *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a).

The reconnaissance survey including floristic sampling within vegetation unit via releves Threatened and Priority Flora species identified from the database searches were targeted during the field survey, using previously recorded locations as well as known habitat preferences. Searches for conservation significant species involved searches of potential suitable habitat and opportunistic records taken during foot traverses.

Specimen identification was undertaken with reference to current taxonomic literature and herbarium reference specimens. Atypical or difficult specimens were submitted to the Western Australian Herbarium for identification or confirmation.

Local scale vegetation units were described and mapped consistent with NVIS Level V – Association (ESCAVI 2003). Vegetation mapping was undertaken based on aerial imagery and ground-truthed by the field assessment. Correlated environmental variables such as landform and soil types were also considered when describing differences between vegetation units. Species included within vegetation descriptions are those that are most typical of the vegetation unit as a whole. Vegetation units were described, where appropriate, consistent with those units defined by other studies undertaken for the Pilgangoora Project (i.e. *ecologia* 2017 and MMWC Environmental 2016).

Vegetation condition was assessed based on the scale as described in the Technical Guidance (EPA 2016a) (Table 2.2).

Table 2.2 – Vegetation condition scale

Vegetation Condition	Criterion
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.

2.2.2 Fauna

The survey methods adopted by *ecologia* for the survey accorded with the technical guide for sampling terrestrial vertebrate fauna for conducting a Level 1 fauna and fauna habitat assessment published by the EPA (2016b).

Prior to the commencement of the survey as part of the desktop assessment, the preferred habitat of the conservation significant species potentially occurring in the Study Area was determined and

used to assess the likelihood of occurrence (Section 3.3). The field survey was used to ground truth these results and, on the basis of the actual habitats present, searches were undertaken to determine the presence of potential conservation significant species occurring. In particular, efforts were made to detect the tracks or scats of the Northern Quoll, Greater Bilby and Spectacled Hare-wallaby.

A fauna habitat type broadly describes an area of habitat that is distinguishable by its vegetation, soil characteristics and land features from its surroundings, and is likely to host a different fauna assemblage to that found in other fauna habitats. Five habitat assessments were undertaken within the three fauna habitats delineated over the Study Area. Habitat delineation and mapping was based upon interpretation of aerial photography and landforms, habitat site assessments, and the complementary vegetation descriptions for the assessment. Habitat condition was assessed at a rating ranging from 'completely degraded' to 'excellent' (see habitat rating table in Appendix F).

Opportunistic fauna observations were also made during the survey to provide additional data to supplement the targeted searches and habitat mapping results. Observations consisted of direct observation of animals, as well as detection of secondary evidence including tracks, scats, remains and other traces. Sampling of the Study Area was undertaken by hand searching for cryptic species, which included searching beneath the bark of dead trees, breaking open old logs, stumps and dead free-standing trees, investigating burrows and over-turning logs and stones. Tracks, diggings, scats, burrows and nests were recorded wherever possible.

2.2.3 Study Team and Licences

The flora, vegetation, and fauna assessments undertaken by *ecologia* was planned, coordinated, executed and reported by those summarised below in Table 2.3.

Table 2.3 – Study team and licences

Project Staff			
Name	**Qualification**	**Role**	**Project role**
Shaun Grein	B.Sc, Grad.Dip. Nat. Resources, MBA	Managing Director/Principal Scientist	Flora field survey, reporting, QA
Andre Schmitz	B.Sc. Env. Man.	Senior Zoologist	Fauna field assessment
Licences - "Licence to Take Flora for Scientific Purposes"			
The flora, vegetation assessment and fauna assessment described in this report was conducted under the authorisation of the following licences issued by DCBA.			
Name		**Licence Number**	**Valid until**
Shaun Grein		SL012096	30/04/2018

3 RESULTS

3.1 BACKGROUND

3.1.1 Climate

The Study Area is located in the Pilbara region of Western Australia. The Pilbara experiences an arid-tropical climate with two distinct seasons; a hot summer from October to April and a mild winter from May to September. Temperatures are generally high, with summer temperatures frequently exceeding 40°C. Light frosts occasionally occur inland during July and August. The nearest Bureau of Meteorology (BOM) stations for which both rainfall and temperature data are available is Port Hedland Airport (Site No. 4032), 75 km to the north-west the Study Area (BoM 2017) (Figure 3-1).

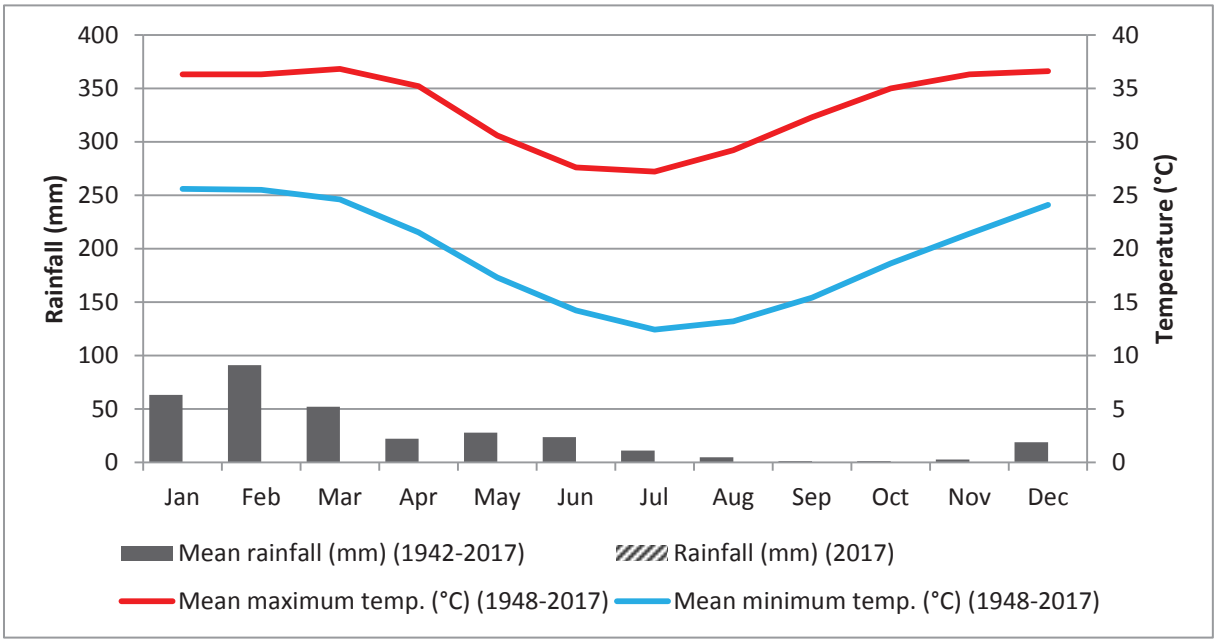


Figure 3-1 – Rainfall and temperature data for Port Headland Airport

3.1.2 IBRA Region and Land Systems

The Study Area is situated within the Pilbara region according to IBRA 7 (DSEWPaC 2012), which is further divided into four sub-regions. The Study Area is situated entirely within the Chichester sub-region. The Chichester sub-region comprises undulating Archaean granite and basalt plains supporting a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* hummock grasslands.

The Study Area occurs over the Macroy Land System of Van Vreeswyk *et al.* (2004), consisting of stony plains and sandy plains of spinifex hummock grasslands *(Triodia)* with scattered *Acacia inaequilatera* and/or other acacia shrubs. Soils consist of red sands, red sandy earths, and red shallow loams.

3.1.3 Previous Surveys

Nine recent flora and fauna assessments have been conducted in the vicinity of the Study Area, including the adjacent Pilgangoora Project, and are summarised in Table 3.1:

- Pilbara Minerals Ltd: Dakota Satellite Project Level 1 Fauna and Detailed Flora and Vegetation Assessment (*ecologia* 2017)
- Pilgangoora Project Area Flora, Vegetation and Fauna Assessment
- Pilgangoora Project Area Flora, Vegetation and Fauna Assessment (MMWC Environmental 2016);
- Pilgangoora Project Baseline Vertebrate Fauna Survey (360 Environmental 2016b);
- Pilgangoora Project: Level 1 Short-Range Endemic (SRE) Fauna Assessment (Bennelongia 2016a);
- Pilgangoora Project: Level 1 Subterranean Fauna Assessment (Bennelongia 2016b);
- Pilgangoora Project: Pilbara Leaf-nosed Bat survey and roost searches (360 Environmental 2015) (360 Environmental 2016a);
- FMG North Star Vegetation and Flora Assessment (*ecologia* 2012a);
- FMG North Star Level 2 Terrestrial Vertebrate Fauna Assessment (*ecologia* 2012b).
- Wodgina DSO Project Flora and Vegetation Assessment (Outback Ecology 2009);
- Abydos DSO Project Flora and Vegetation Studies (Woodman 2012); and
- Abydos DSO Project terrestrial vertebrate fauna baseline surveys for Atlas Iron Limited (Outback Ecology 2011) (Bamford 2009).

Table 3.1 – Flora, vegetation and fauna surveys conducted in the vicinity of the Study Area

Survey	Survey type	Location	Number of taxa	Conservation significant species recorded	Vegetation communities/fauna habitats	TEC/PEC
Pilbara Minerals Ltd: Dakota Satellite Project Level 1 Fauna and Detailed Flora and Vegetation Assessment	Level 2 Flora and Vegetation Level 1 Fauna	ca. 90 km south-southeast of Port Hedland	117 (flora) 45 (fauna)	*Euphorbia clementii* (P2) Rainbow Bee-eater (IA) Pilbara Leaf-nosed Bat (VU) (inactive mounds) Western Pebble-mound Mouse (P4)	4 vegetation associations 5 fauna habitats	None
Pilgangoora Project Area Flora, Vegetation and Fauna Assessment (MMWC Environmental 2016)	Level 2 Flora and Vegetation Level 1 Fauna	ca. 90 km south-southeast of Port Hedland	195 (flora) 46 (fauna)	*Heliotropium muticum* (P1) Rainbow Bee-eater (IA) Pilbara Leaf-nosed Bat (VU) Western Pebble-mound Mouse (P4)	11 vegetation associations 4 fauna habitats	None
Pilgangoora Project Baseline Vertebrate Fauna Survey (360 Environmental 2016)	Level 2 Baseline Fauna	ca. 90 km south-southeast of Port Hedland	60	Rainbow Bee-eater (IA)	4 fauna habitats	NA
Pilgangoora Project: SRE Fauna Assessment (Bennelongia 2016a)	Level 1 SRE	ca. 82 km south-southeast of Port Hedland	23	No confirmed SRE species	4 SRE habitats	NA
Pilgangoora Project: Subterranean Fauna Assessment (Bennelongia 2016b)	Level 1 Subterranean Fauna	ca. 82 km south-southeast of Port Hedland	19 (stygofauna) 5 (Troglofauna)	*Bathynella sp.* B25, Paramelitidae Genus 2 sp. B15 *Nocticola sp.* Coleoptera gen 1 sp. B08	Shallow aquifers	NA
Wodgina DSO Project (Outback Ecology 2009)	Level 2 Flora and Vegetation	ca. 100 km south of Port Hedland	122	*Terminalia supranitifolia* (P3)	12 vegetation associations	None
Abydos Direct Shipping Ore Project (Woodman 2012)	Level 2 Flora and Vegetation	ca. 100 km south-southeast of Port Hedland	263	*Euphorbia clementii* (P2) *Gymnanthera cunninghamii* (P3) *Heliotropium muticum* (P1) *Pityrodia* sp. Marble Bar (T)	10 vegetation associations	None
Abydos DSO Project Fauna Surveys (Bamford 2009, Outback Ecology 2011)	Level 2 Fauna and targeted searches	ca. 100 km south-southeast of Port Hedland	149	Northern Quoll Pilbara Olive Python Pilbara Leaf-nosed Bat Ghost Bat Western Pebble-mound Mouse Spectacled Hare Wallaby Rainbow Bee-eater	5 fauna habitats	NA

Survey	Survey type	Location	Number of taxa	Conservation significant species recorded	Vegetation communities/fauna habitats	TEC/PEC
FMG North Star (ecologia 2012a, ecologia 2012b)	Level 2 Flora and Vegetation Level 2 Fauna	ca. 100 km southeast of Port Hedland	453 (flora) 184 (fauna)	*Abutilon pritzelianum* (P1) *Acacia glaucocaesia* (P3) *Euphorbia clementii* (P2) *Goodenia nuda* (P4) *Gymnanthera cunninghamii* (P3) *Heliotropium muticum* (P1) *Pityrodia* sp. Marble Bar (T) *Ptilotus mollis* (P4) Northern Quoll (EN) Pilbara Leaf-nosed Bat (VU) Rainbow Bee-eater (IA) Fork-tailed Swift (IA) Pilbara Olive Python (VU)	33 vegetation associations 7 fauna habitats	None

3.2 FLORA AND VEGETAION

3.2.1 Desktop Results

The NatureMap database search returned 221 vascular plant taxa from 46 families and 108 genera (Appendix B). The most diverse families were the Fabaceae (41 taxa), Poaceae (27 taxa), Malvaceae (20 taxa), and Amaranthaceae (14 taxa), while the most diverse genera included *Acacia* (15 taxa), *Tephrosia* (10 taxa), *Triodia* (9 taxa) and *Ptilotus* (8 taxa). This floristic composition is typical for the area.

Thirteen conservation significant plant taxa were identified in the NatureMap search, and the TFPL and WAHERB database searches identified 12 species (Table 3.2, Figure 3-2), including the Threatened taxon, *Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4). Nine Priority listed species and one Threatened taxon (*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4) have been recorded in the vicinity of the Study Area in previous surveys (Table 3.1). An additional 15 taxa were identified in a 'place name' search of the TPList, but have no specific records within the search area (Table 3.2). The EPBC Act Protected Matters Report (Appendix C) did not identify any EPBC listed plant species as potentially occurring in the vicinity of the Study Area. Records obtained from TPFL and WAHERB database searches are provided as Appendix D.

Habitat preferences and flowering times were derived, where available, from relevant taxonomic literature, FloraBase (Western Australian Herbarium 1998-2016), Threatened species profiles (SPRATs) (Threatened Species Scientific Committee 2016), or specimen data from Australia's Virtual Herbarium (AVH) (CHAH 2017). Herbarium catalogue numbers are provided if habitat information were derived from specimen data (AVH).

Four flora species of conservation significance are considered to have at least the potential to occur over the Study Area (likelihood rating '1') based on proximity of previous records and the likely presence of suitable habitat (Table 3.2).

The Threatened species *Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4) has been recorded at fourteen locations within 10 kms of the Study Area, with the closest 700 m to the north. A recent regional survey for this taxon conducted by *ecologia* (*ecologia* 2016) recorded it almost entirely within the Capricorn Land System, often on ironstone hill slopes. This land system is not present within the Study Area.

Other database records of interest include *Terminalia supranitifolia* (Priority 3) within 12 km to the east, *Bulbostylis burbidgeae* (Priority 4) 15 kms to the south east, and *Heliotropium muticum* (Priority 1) within 17 km to the north (Figure 3-2).

No Commonwealth or State listed TECs or PECs have been recorded within the vicinity, nor have any been recorded in surveys reviewed as part of this desktop study.

3.2.2 Field results

3.2.2.1 Flora

A total of 32 vascular plant taxa (including species, infraspecific taxa, and phrase names) were recorded from the Study Area during the current survey. A full list of species recorded from the Study Area is provided in Appendix D while data collected from releves is included in Appendix I

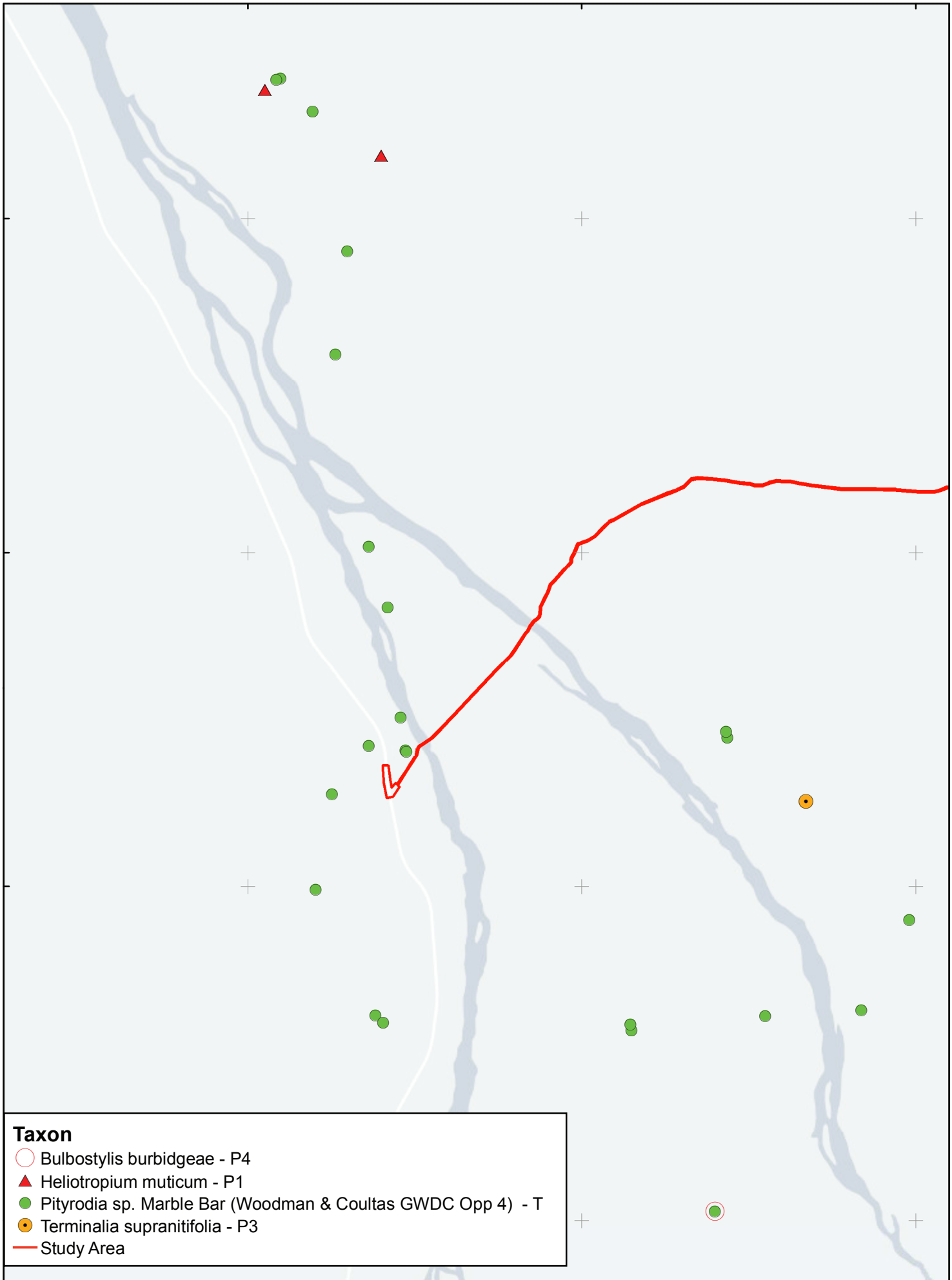
No flora of conservation significance were identified.

The relatively low diversity of annual species is indicative of the timing and low rainfall preceding the survey.

The broad composition of the flora of the Study Area is included in Appendix E. The most diverse families were the Fabaceae, Poaceae, Malvaceae, Amaranthaceae and Goodeniaceae, while the most diverse genera were *Acacia* (Fabaceae), *Ptilotus* (Amaranthaceae), *Triodia* (Poaceae) and *Senna* (Fabaceae).

Table 3.2 – Significant plant species records from database searches

Status	Taxon	TPList Only	Habitat	Flowering period	Notes	Likelihood of occurrence
T	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)		Base of sandstone hill slopes with skeletal brown sandy loam over sandstone.	July to September.	Habitat possibly present; nearby records.	1
1	*Acacia aphanoclada*	X	Skeletal stony soils. Rocky hills, ridges & rises.	August to October.	Habitat possibly present; no nearby records.	2
1	*Acacia cyperophylla* var. *omearana*	X	Stony & gritty alluvium. Along drainage lines.	March to April.	Habitat possibly present; no nearby records.	2
1	*Acacia* sp. Marble Bar (J.G. & M.H. Simmons 3499)	X	Dry watercourse among low rocky hills.	September.	Habitat possibly present; no nearby records.	2
1	*Acacia* sp. Nullagine (B.R. Maslin 4955)	X	Low-lying area between rocky hills on rocky clay.	May to July.	Habitat possibly present; no nearby records.	2
1	*Atriplex spinulosa*	X	Drainage floor with quartz.	Not available.	Habitat possibly present; no nearby records.	2
1	*Corchorus* sp. Yarrie (J. Bull & D. Roberts CAL 01.05)	X	Not available.	Not available.	Habitat information not available; no nearby records.	2
1	*Heliotropium muticum*		Plains. Flat red silt sand on a low lying floodplain	Not available.	Habitat possibly present; nearby records.	1
1	*Ptilotus wilsonii*	X	Stony gravelly soils. Rocky hills.	October.	Habitat possibly present; no nearby records.	2
1	*Rothia indica* subsp. *australis*		Sandy soils. Sandhills and sandy flats.	April to August.	Habitat possibly present; nearby records.	2
1	*Schoenus* sp. Marble Bar (D. Coultas & S. Coultas DCSC-Opp 07)	X	Not available.	Not available.	Habitat information not available; no nearby records.	2
1	*Tribulus minutus*	X	Stony rise. Calcrete/silicrete limestone, red sand.		Habitat possibly present; no nearby records.	2
2	*Euphorbia clementii*		Gravelly hillsides, stony grounds.	April to June.	Habitat possibly present; nearby records.	2
2	*Indigofera ixocarpa*	X	Skeletal red soils over massive ironstone.	May.	Habitat possibly present; no nearby records.	2
2	*Stylidium weeliwolli*		Gritty sand soil, sandy clay. Edge of watercourses.	August to September.	Habitat probably not present.	3
3	*Acacia fecunda*	X	Quartzite gibbers over grey-red skeletal soil. Along shallow creeks and drainage lines, hills.	May to August.	Habitat possibly present; no nearby records.	2
3	*Acacia glaucocaesia*		Red loam, sandy loam, clay. Floodplains.	July to September.	Habitat possibly present; nearby records.	2
3	*Acacia levata*	X	Sand or sandy loam over granite. Hillslopes.	May.	Habitat possibly present; no nearby records.	2
3	*Eragrostis crateriformis*		Clayey loam or clay. Creek banks, depressions.	January to July.	Habitat possibly present; nearby records.	2
3	*Gomphrena leptophylla*	X	Sand, sandy to clayey loam, granite, quartzite. Open flats, sandy creek beds, edges salt pans & marshes, stony hillsides.	March to September.	Habitat possibly present; no nearby records.	2
3	*Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727)	X	Red-brown clay soil, calcrete pebbles. Low undulating plain, swampy plains.	Not available.	Habitat possibly present; no nearby records.	2
3	*Gymnanthera cunninghamii*		Sandy soils.	January to December.	Habitat possibly present; nearby records.	2
3	*Nicotiana umbratica*		Shallow soils. Rocky outcrops.	April to June.	Habitat possibly present; nearby records.	2
3	*Phyllanthus hebecarpus*	X	Sandy areas, granite domes.	April to August.	Habitat possibly present; no nearby records.	2
3	*Terminalia supranitifolia*		Sand. Among basalt rocks. Rocky cliffs.	July or December.	Habitat possibly present; nearby records.	1
4	*Bulbostylis burbidgeae*		Granitic soils. Granite outcrops, cliff bases.	March to August.	Habitat possibly present; nearby records.	1
4	*Goodenia nuda*		Seasonally inundated clay soils and drainage lines	April to August.	Habitat possibly present; nearby records.	2



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Pilgangoora Project
Significant Flora Records

Figure:
3-2

3.2.2.2 Vegetation

Three vegetation communities were identified, described and mapped for the Study Area (Figure 3.3):

Stony and Sandy Plains

S1 *Acacia ancistrocarpa* and *Acacia orthocarpa* tall open shrubland over *Triodia epactia* hummock grassland. occurring on stony plains with clay loam soils. This vegetation type occurs over 14.2 ha (70.6%) of the Study Area.

S2 *Acacia inaequilatera, Acacia acradenia* and *Corchorus parviflorus* open shrubland over *Triodia epactia* open hummock grassland on stony to sandy clay to sand loam. This vegetation type occurs over 1.4 ha (6.9%) of the Study Area.

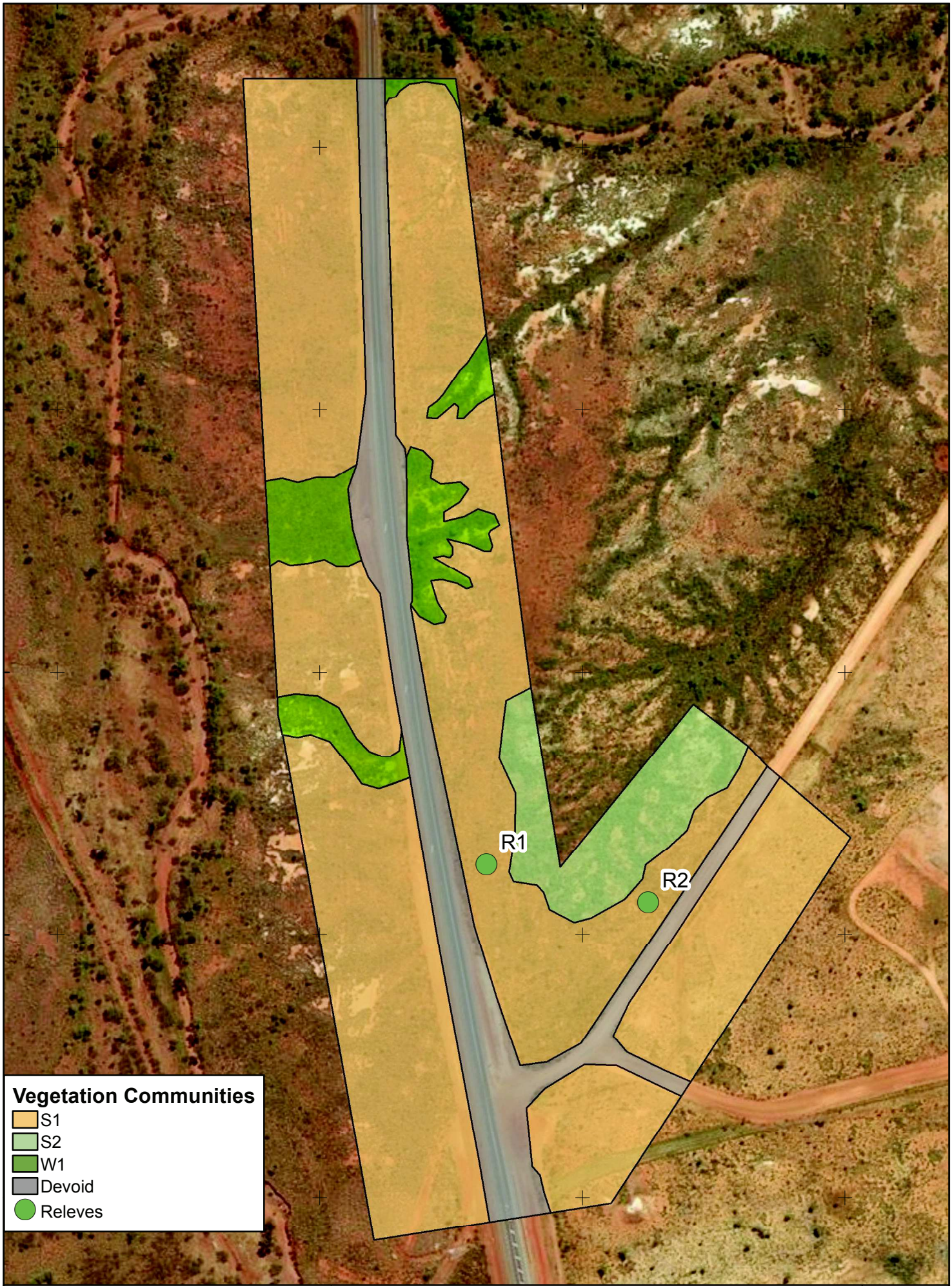
Minor Drainage Depressions

W1 *Corymbia hamersleyana* low open woodland over *Acacia ancistrocarpa and Acacia inaequilatera* open shrubland over *Triodia epactia* hummock grassland occurring on minor drainage lines with clay loam soils. This vegetation type occurs over 1.3 ha (6.5%) of the Study Area.

Table 3.3 – Vegetation types at the Study Area

Vegetation type code	Broad floristic formation (NVIS III)	Vegetation type (NVIS V)	Landforms (Study Area quadrats)	Proportion of total Study Area
S1	*Acacia open Shrubland*	*Acacia ancistrocarpa* and *Acacia orthocarpa* tall open shrubland over *Triodia epactia* hummock grassland	Stony plains	14.2 ha (70.6%)
				
S2	*Acacia* open shrubland	*Acacia inaequilatera, Acacia acradenia* and *Corchorus parviflorus* open shrubland over *Triodia epactia* open hummock grassland.	Stony plain	1.4ha (6.9%)
				

Vegetation type code	Broad floristic formation (NVIS III)	Vegetation type (NVIS V)	Landforms (Study Area quadrats)	Proportion of total Study Area
W1	*Corymbia* open woodland	*Corymbia hamersleyana* low open woodland over *Acacia ancistrocarpa* and *Acacia inaequilatera* open shrubland over *Triodia epactia* hummock grassland.	Stony plains	1.3ha (6.5%)
				



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Pilgangoora Project
Vegetation Communities: GNH Intersection

Figure:
3-3

3.2.2.3 Weeds

Twenty introduced species have been recorded in the vicinity of the Study Area (records from previous surveys and the NatureMap database).

Of these, only one was recorded in low abundance within the Study Area: *Aerva javanica* (kapok bush). This species are listed as 'Permitted' on the Western Australian Organism List (DAFWA 2016), and are not Weeds of National Significance. Kapok bush has a 'High' risk rating according to the Environmental Weed Strategy (CALM 1999).

3.2.2.4 Vegetation Condition

Broadly, there has been little to no disturbance to the vegetation within the Study Area. Vegetation condition across much of the Study Area was assessed as Very Good with minimal weed invasion (*Aerva javanica*) in some areas, and generally no other disturbance.

3.2.2.5 Significance

***Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia)**

- No EPBC Act listed Threatened Flora taxa were recorded within the Study Area.

Wildlife Conservation Act 1950 (Western Australia) Threatened Flora Species

- No WC Act listed Threatened Flora taxa were recorded within the Study Area.

Priority Flora Species

- No Priority-listed Flora taxa were recorded within the Study Area.

Vegetation of Significance

- No Commonwealth or State listed TECs or PECs have been recorded within the vicinity, nor have any been recorded in surveys reviewed as part of this desktop study.
- No vegetation was assessed as either regionally or locally significant. Vegetation units described are widespread in the region.

3.3 VERTEBRATE FAUNA AND HABITATS

3.3.1.1 Fauna Habitats

Habitat assessments were undertaken at 5 representative locations (Figure 3-5). Habitat assessments are provided in Appendix F. Several habitat descriptors have been used in other studies for the Pilgangoora Project and terminology used here has been standardised to maintain consistency with previous mapping and descriptors. The Study Area contains the following fauna habitat types (Table 3.4):

- Stony Plains
- Sandy Plains
- Minor Drainage Depressions

All fauna habitats recorded from the Study Area are considered widespread and typical of the bioregion.

Table 3.4 - Broad fauna habitats in Study Area

This study	Area (ha)	Condition
Stony Plains	13.9	Very Good
Sandy Plains	2.0	Very Good
Minor Drainage Depressions	1.1	Very Good
Devoid of vegetation (Roads)	3.2	NA
Total	**20.1**	

Stony Plains

Stony Plains habitat comprises the majority of the Study Area (13.9 ha). It is considered widespread and well represented in the region, within both the Macroy and Satirist Land Systems. This habitat type is characterised by scattered low *Acacia inaequilatera* over extensive spinifex cover on plains with a stony substrate with loam, and contains limited microhabitats, with the dominant *Acacia* species providing no tree hollows, few logs, limited leaf litter and sparse vegetation. Stony Plains were assessed to be in Very Good condition (Appendix F).

The Western Pebble-mound Mouse occurs on skeletal soils that provide pebbles of a suitable size, and are usually found on gentle slopes and footslopes vegetated by hard spinifex, however, can sometimes occur on stony plains adjacent to low hills. No mounds of the Western Pebble-mound Mouse were recorded.

Sandy Plains

A small The Sandy Plains habitat is identified by its soils and vegetation. It has a top layer of softer, sandier soils over a lower compacted layer. These soils are more suitable for burrowing fauna species. This habitat type consisted of flat sandy plain with an overstorey of scattered vegetation of *Acacia inaequilatera*, *Acacia bivenosa* and *Acacia citrinoviridis* over *Triodia.* Sandy Plains habitat is widespread and well represented in the region, within the Macroy Land System. Sandy Plains habitat was assessed to be in Very Good condition (Appendix F).

Recently burnt habitat may be used for foraging, while long unburnt areas may be used for shelter for a number of species. Greater Bilby and Mulgara both occur in Sandy Plains or other friable substrates that facilitate the construction of burrows. The limited amount (2 ha) of sandy plains habitat was searched for evidence of these species with none recorded.

Minor Drainage Depressions

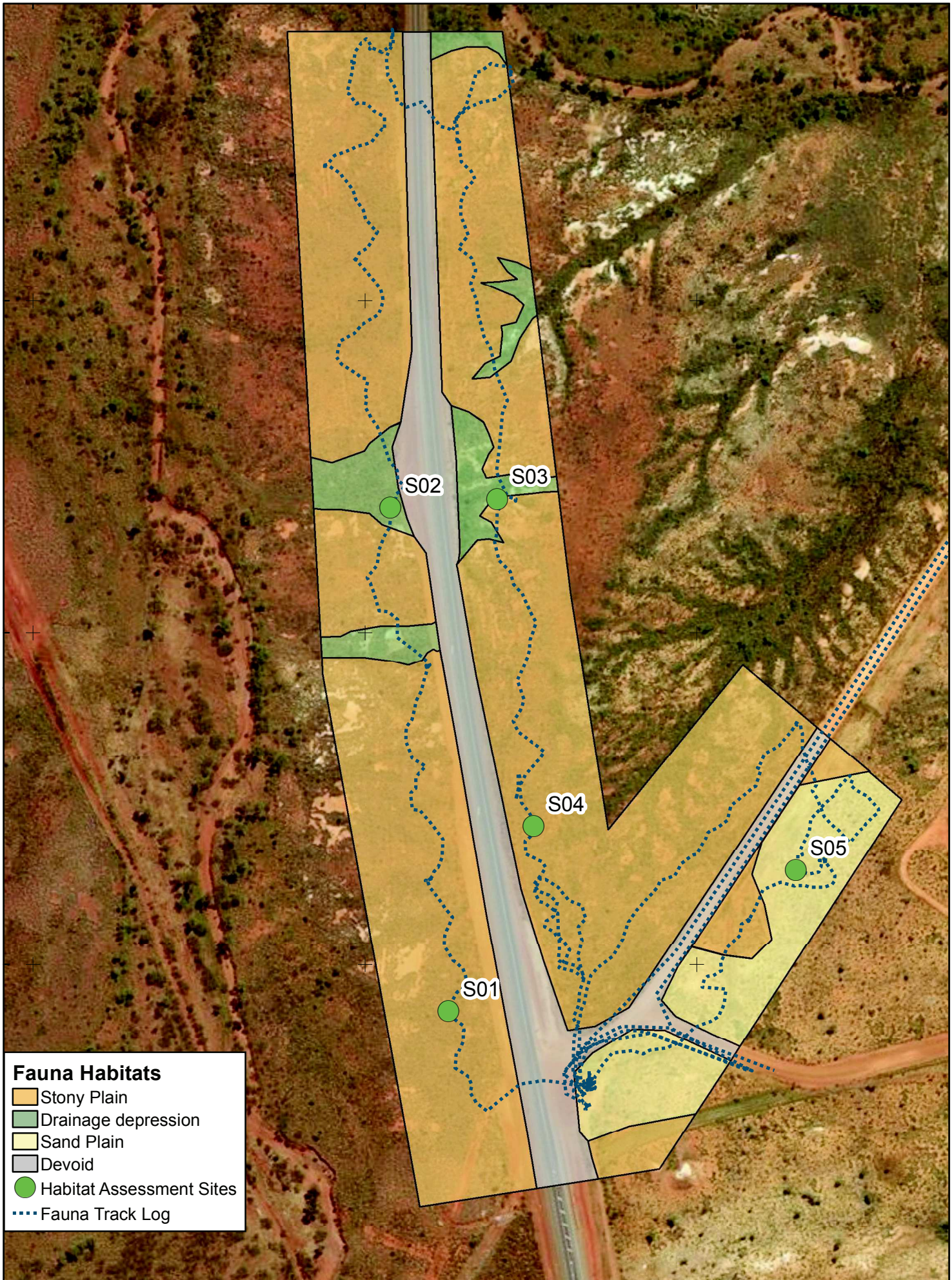
Where culverts pass under Great Northern Highway drainage is consolidated to form wetter areas within the Stony Plains habitat. Substrates and vegetation are analogous with Stony Plains habitat however vegetation is denser due to increased moisture and scattered *Corymbia hamersleyana* occurs in places. Minor Drainage Depressions make up just 1.1 ha of the Study Area. Minor Drainage Depressions habitat was assessed to be in Very Good condition (Appendix F).

Stony Plains (Site S04)

Sandplain (Site S05)

Drainage depression (Site S03)

Figure 3-4 – Photographs of broad fauna habitats of the Study Area



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Pilgangoora Project
Fauna Habitats: GNH Intersection

Figure:
3-5

3.3.2 Desktop Results

A total of 204 terrestrial vertebrate species were recorded from the desktop study, including 25 mammals (3 introduced), 118 birds, 60 reptiles, and one amphibian. NatureMap records of all species are presented in Appendix G.

Records of conservation significant fauna records are presented in Appendix H. Twenty-six of the species identified from the literature review and database searches are considered conservation significant (Table 3.6) (Figure 3-6). However, due to the large search areas used many species would not occur within habitats of the Study Area (e.g. migratory shorebirds). Similarly the DoEE Protected Matters Search (DoEE 2017) (Appendix C) list species that have not actually been recorded within the search area including marine-listed species (e.g. White-bellied Sea-Eagle), wetland and saltmarsh migratory shorebirds from the families Scolopacidae, and Charadriidae (e.g. Curlew Sandpiper and Eastern Curlew) and vagrants (e.g. Grey Wagtail and Yellow Wagtail) would not occur over the Study Area. An assessment of likelihood of occurrence for relevant conservation significant fauna species recorded during the desktop assessment was conducted by examining:

- Fauna habitats present within the Study Area;
- Distance of previously recorded significant species based on publically available records;
- Frequency of occurrence of conservation significant species records; and
- Time passed since conservation significant species were recorded.

Each relevant conservation significant vertebrate fauna species potentially occurring over the Study Area was assigned a likelihood of occurrence rating based on the four categories described in Table 2.1 and the habitats actually present over the Study Area. Results are presented in Table 3.6. The Rainbow Bee-eater was recorded during the survey.

3.3.3 Field Results

3.3.3.1 Vertebrate Fauna

Results of species observed during the survey are included in Table 3.5. A concurrent survey was undertaken along the Haul Road to the Pilgangoora minesite and an associated area of 58 ha adjacent to the Haul Road ('West' Area). For context, sightings within these areas are also included. Forty five vertebrate species were recorded during the combined surveys. Of these over the GNH Study Area 12 birds and four reptiles were recorded. No evidence of native mammals were recorded, however, cattle were present.

Table 3.5- Vertebrate fauna species recorded during the survey

Species		GNH	West	Access
BIRDS				
Crested Pigeon	*Ocyphaps lophotes*	x		
Spinifex Pigeon	*Geophaps plumifera*	x		
Diamond Dove	*Geopelia cuneata*		x	
Whistling Kite	*Haliastur sphenurus*			x
Black Kite	*Milvus migrans*		x	x
Spotted Harrier	*Circus assimilis*			x
Nankeen Kestrel	*Falco cenchroides*		x	
Brown Falcon	*Falco berigora*			x
Little Button-quail	*Turnix velox*	x	x	
Little Corella	*Cacatua sanguinea*	x		x
Cockatiel	*Nymphicus hollandicus*			x

Species		GNH	West	Access
BIRDS				
Rainbow Bee-eater	*Merops ornatus*	x		x
Weebill	*Smicrornis brevirostris*			x
Red-browed Pardalote	*Pardalotus rubricatus*			x
Singing Honeyeater	*Lichenostomus virescens*	x		
Grey-headed Honeyeater	*Lichenostomus keartlandi*		x	
White-plumed Honeyeater	*Lichenostomus penicillatus*		x	
Yellow-throated Miner	*Manorina flavigula*	x		x
Brown Honeyeater	*Lichmera indistincta*			x
White-winged Triller	*Lalage sueurii*	x		
Crested Bellbird	*Oreoica gutturalis*	x		
Little Woodswallow	*Artamus minor*			x
Pied Butcherbird	*Cracticus nigrogularis*		x	
Australian Magpie	*Cracticus tibicen*			x
Willie Wagtail	*Rhipidura leucophrys*	x	x	
Torresian Crow	*Corvus orru*		x	x
Magpie-lark	*Grallina cyanoleuca*			x
Spinifexbird	*Eremiornis carteri*	x		
Zebra Finch	*Taeniopygia guttata*	x	x	x
REPTILES		**GNH**	**West**	**Access**
Long-nosed Dragon	*Amphibolurus longirostris*			x
Shaded-litter Rainbow Skink	*Carlia munda*	x		
Grand Ctenotus	*Ctenotus grandis*	x		
Stony-soil Ctenotus	*Ctenotus saxatilis*		x	x
Common Dwarf Skink	*Menetia greyii*		x	
Ring-tailed Dragon	*Ctenophorus caudicinctus*			x
Military Dragon	*Ctenophorus isolepis*	x		
Sand Monitor	*Varanus gouldii*	x		x
Variegated Dtella	*Gehyra variegata*			x
Bynoe's Gecko	*Heteronotia binoei*			x
MAMMALS		**GNH**	**West**	**Access**
Euro	*Macropus robustus*			x
Western Pebble-mound Mouse	*Pseudomys chapmani*		x	
Cattle	*Bos taurus*	x	x	x
Feral Cat	*Felis catus*			x

The only species of conservation significance recorded over the GNH Study Area was the Rainbow Bee-eater (IA). The Rainbow Bee-eater was removed from the list of migratory species under section 209 of the EPBC Act on 9th June 2016, however, still appears on Schedule 5 of the WC Act as 'Migratory birds protected under an international agreement'. In Western Australia the Rainbow Bee-eater can occur as a resident, breeding visitor, post-nuptial nomad, passage migrant or summer visitor. Numerous records of the species have been made in the vicinity (Figure 3-6) and because of its broad habitat requirements is likely to occur. However, sandy Drainage Line habitat utilised as breeding habitat does not occur over the Study Area.

Of the other species of conservation significance recorded in the region none were assessed with a Likelihood Rating of 1 (Likely) (Table 2.1).

Several species were assessed with a Likelihood Rating of 2 (Possible). Both the Greater Bilby (VU) and Northern Quoll (EN) have been recorded within two kilometres of the Study Area (Figure 3-6).

However no rocky escarpments occur and therefore no quoll denning habitat is present. Just two hectares of Sandy Plains habitat occurs and no distinctive evidence (burrows, diggings, tracks and scats) of either the Bilby or Mulgara (P4) was recorded.

The Western Pebble-mound Mouse (P4) has been recorded within three kilometres of the Study Area (Figure 3-6). This species is known to have a preference for hilly and/or rocky landscapes (Anstee and Armstrong 2001; Ford and Johnson 2007) which are not present over the Study Area. No distinctive mounds constructed by this species was recorded during the survey.

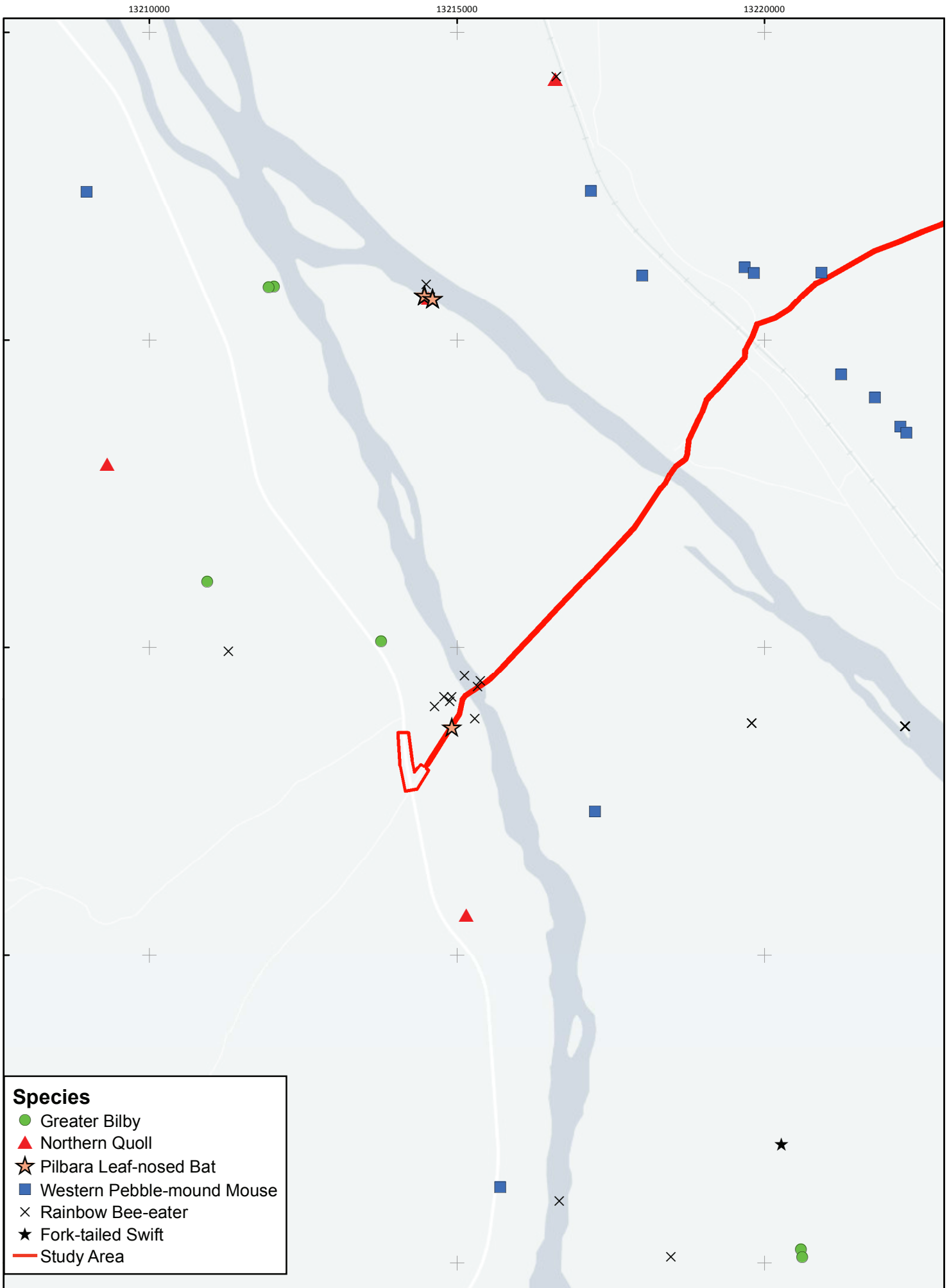
The Pilbara Leaf-nosed Bat (VU) has been recorded within one kilometre of the Study Area (Figure 3-6). No roosting habitat is present. Creek lines provide foraging habitat for the Pilbara Leaf-nosed Bat, as well as 'flyways' for dispersal. Creeklines are not present over the Study Area and the Turner River, one kilometre to the east, is a likely flyway.

Both the Peregrine (OS) and Grey Falcons (VU) are widespread in Australia. Breeding habitat of cliffs, rocky outcrops, or large trees are not present over the Study Area, however, both have the potential to overfly the Study Area.

Similarly the Fork-tailed Swift (IA) is a migratory, almost exclusively aerial species that, in its non-breeding area in Australia, is independent of terrestrial habitats – feeding along the edge of low pressure systems which help lift insect prey and assists in flight. The Fork-tailed Swift therefore has the potential to overfly the Study Area without specifically utilising any particular habitat present.

Table 3.6 – Significant vertebrate fauna species records from the database searches

Common Name	Species	WA Status	EPBC Act Status	Records	Latest Record	Notes	Likelihood of occurrence
Mammals							
Northern Quoll	*Dasyurus hallucatus*	EN	EN	236	2016	Records from vicinity but no suitable rocky denning habitat present.	2
Brush-tailed Mulgara	*Dasycercus blythi*	P4		13	2013	Records from region but no evidence recorded.	3
Long-tailed Dunnart	*Sminthopsis longicaudata*	P4		2	2011	No suitable rocky habitat likely to be present.	3
Greater Bilby	*Macrotis lagotis*	VU	VU	8	2015	Records from vicinity but no evidence recorded	2
Spectacled Hare-wallaby	*Lagorchestes conspicillatus leichardti*	P3		137	1996	Historical record. No suitable mature spinifex habitat present.	3
Western Pebble-mound Mouse	*Pseudomys chapmani*	P4		26	2015	Record from vicinity. No distinctive mounds present and habitat not suitable.	2
Pilbara Leaf-nosed Bat	*Rhinonicteris aurantia (Pilbara)*	VU	VU	114	2016	Recorded nearby. However, no roost habitat present.	2
Ghost Bat	*Macroderma gigas*	VU	VU	13	2016	Records from region. No roost habitat present.	3
Birds							
Night Parrot	*Pezoporus occidentalis*	CR	EN	0		No suitable unburnt habitat likely to be present.	3
Peregrine Falcon	*Falco peregrinus*	OS		1	2002	Widespread species that may overfly the Study Area.	2
Grey Falcon	*Falco hypoleucos*	VU		0		Widespread species that may overfly the Study Area.	2
Barn Swallow	*Hirundo rustica*	IA	IA	0		Few regional records. Habitat unlikely to be present.	3
Grey Wagtail	*Motacilla cinerea*	IA	IA	0		Few regional records. Vagrant.	3
Yellow Wagtail	*Motacilla flava*	IA	IA	0		No records within 30 km. Few regional records. Vagrant.	3
Fork-tailed Swift	*Apus pacificus*	IA	IA	6	2011	May overfly the Study Area without utilising any of the habitats present.	2
Rainbow Bee-eater	*Merops ornatus*	IA	IA	84	2016	Recorded. Suitable woodland habitat likely to be present.	R
Great Egret	*Ardea modesta*	IA	IA	6	2012	Records in vicinity. However, no coastal, wetland or estuarine habitat present.	3
Cattle Egret	*Ardea ibis*	IA	IA	0		No coastal, wetland or estuarine habitat present.	3
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	IA	IA	0		No coastal, wetland or estuarine habitat present.	3
Osprey	*Pandion haliaetus*	IA	IA	0		No coastal, wetland or estuarine habitat present.	3
Australian Painted Snipe	*Rostratula australis*	EN	EN	0		No coastal, wetland or estuarine habitat present.	3
Curlew Sandpiper	*Calidris ferruginea*	VU	CR	0		No coastal, wetland or estuarine habitat present.	3
Eastern Curlew	*Numenius madagascariensis*	VU	CR	0		No coastal, wetland or estuarine habitat present.	3
Oriental Plover	*Charadrius veredus*	IA	IA	1	1999	No coastal, wetland or estuarine habitat present.	3
Oriental Pratincole	*Glareola maldivarum*	IA	IA	0		No suitable habitat present.	3
Reptiles							
Pilbara Olive Python	*Liasis olivaceus barroni*	VU	VU	23	2015	No suitable gorge, gully, riverine, or permanent water habitat present.	3



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Pilgangoora Project
Significant Fauna Records

Figure:
3-6

4 LIMITATIONS

An assessment of survey-specific issues and limitations (EPA 2016a) is detailed in Table 4.1.

Table 4.1 – Flora and vegetation survey limitations

Constraint	Impact	Comment
Availability of contextual information at a regional and local scale	Nil	Broad scale vegetation, soil, and geology mapping data were available for the Study Area, in addition to flora database records, and conservation significant vegetation community records. This information is considered to be adequate to provide appropriate contextual information for the current survey.
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed	Nil	The Botanist undertaking the field work and specimen identification for the survey has conducted numerous botanical surveys in the Pilbara bioregion.
Proportion of flora recorded and/or collected, any identification issues	Nil	Representative specimens of taxa that could not be adequately identified in the field were collected. All of these were confidently identified to species level
Was the appropriate area fully surveyed (effort and extent)	Nil	2 relevés were surveyed across the Study Area. Due to the relatively small size and few vegetation communities within the Study Area, this level of survey effort is considered to be sufficient.
Access restrictions within the survey area	Nil	All parts of the Study Area were accessible by walking from existing vehicle tracks.
Survey timing, rainfall, season of survey	Minor	The survey was conducted during outside of optimal seasonal conditions for flora and vegetation surveys in the Pilbara, however the major of species expected to be present, including annual, were able to be identified at the time of the survey
Disturbance that may have affected the results of survey such as fire, flood or clearing	Nil	There were no natural or human interventions that constrained the survey of the Study Area.

According to EPA Guidance Statement No. 56 (EPA 2004b), terrestrial fauna surveys may be limited by several aspects. An assessment of these aspects with regard to this study is detailed in Table 4.2.

Table 4.2 – Fauna survey limitations

Aspect	Constraint	Comment
Competency/experience of the consultant carrying out the survey.	Nil	The Principal Zoologist undertaking the fauna survey has more than 20 years experienced in conducting terrestrial vertebrate fauna surveys in Western Australia, including in the Pilbara
Scope (what faunal groups were sampled and were some sampling methods not able to be employed because of constraints such as weather conditions).	Nil	A detailed fauna survey was not a vital component for this level of assessment (Level 1 Survey). The scope was well defined. Fauna and their habitats were surveyed using standardised and well-established techniques. Relevant databases and previous studies surrounding the Study Area were reviewed.
Proportion of fauna identified, recorded and/or collected.	Low	A detailed fauna survey was not a vital component for this level of assessment (Level 1 Survey). A comprehensive desktop study adequately gathered background information on the Study Area. A reconnaissance survey verified the desktop results and characterised habitats and terrestrial fauna likely to be present to enable an identification of potential impacts.
Sources of information (previously available information as distinct from new data).	Nil	The Study Area is located in a well-surveyed region with comprehensive survey information available from adjacent areas. Database records, including conservation significant species, were available for the area and considered adequate to provide appropriate contextual information for the study.
The proportion of the task achieved and further work which might be needed.	Nil	Planned survey works were conducted and completed according to an agreed scope.
Timing/weather/season/cycle.	Nil	The survey was conducted following higher than average rainfall.
Disturbances which affected results of the survey (e.g. fire, flood, accidental human intervention).	Nil	There were no natural or human interventions that constrained the survey of the Study Area.
Intensity (in retrospect was the intensity adequate).	Nil	Given the access to available information from areas immediately adjacent and in comparable habitats the survey intensity was considered adequate and is appropriate for a Level 1 fauna assessment.
Completeness (e.g. was relevant area fully surveyed).	Nil	The Level 1 survey was considered complete. Database searches and literature reviews were comprehensive and a large proportion of the Study Area was sampled on foot.
Resources (e.g. degree of expertise available in animal identification to taxon level).	Nil	Resources were adequate to carry out the survey and survey participants were competent in the identification of species and likelihood of occurrence. Database searches and literature reviews were used to prepare for the survey and used for the confirmation of any species.
Remoteness and/or access problems.	Nil	The Study Area was easily accessible by vehicle and on foot.
Availability of contextual (e.g. biogeographic) information on the region.	Nil	The data available was adequate for the level of survey work undertaken during this assessment.
Efficacy of sampling methods (i.e. any groups not sampled by survey methods).	Nil	A detailed fauna survey was not a vital component for this level of assessment (Level 1 Survey). A comprehensive desktop study adequately gathered background information on the Study Area. A reconnaissance survey verified the desktop results and characterised habitats

5 CONCLUSION

The Study Area occupies a small area of approximately 20 ha in the Pilbara bioregion (Chichester subregion) of Western Australia, within which three vegetation associations occur:

Stony and Sandy Plains

Acacia ancistrocarpa and *Acacia orthocarpa* tall open shrubland over *Triodia epactia* hummock grassland. occurring on stony plains with clay loam soils. This vegetation type occurs over 14.2 ha (70.6%) of the Study Area

Acacia inaequilatera, Acacia acradenia and *Corchorus parviflorus* open shrubland over *Triodia epactia* open hummock grassland on stony and sand plains with clay to sand loam soils. This vegetation type occurs over 1.4 ha (6.9%) of the Study Area.

Minor Drainage Depressions

Corymbia hamersleyana low open woodland over *Acacia ancistrocarpa* and *Acacia inaequilatera* open shrubland over *Triodia epactia* hummock grassland occurring on minor drainage lines with clay loam soils. This vegetation type occurs over 1.3 ha (6.5%) of the Study Area.

No Commonwealth or State listed TECs or PECs have been recorded within the vicinity, nor have any been recorded in surveys reviewed as part of this desktop study. No vegetation was assessed as either regionally or locally significant. Vegetation units described are widespread in the region.

Vegetation condition across much of the Study Area was assessed as 'Very Good', with minimal weed invasion.

A total of 32 vascular plant taxa were recorded. The most diverse families were the Fabaceae, Poaceae, Malvaceae and Amaranthaceae. One introduced species (*Aerva javanica*) was recorded in low abundance within the Study Area.

No flora species of conservation significance, including Priority species, were recorded over the Study Area and based on previous records four were classified as highly likely to occur.

Three broad fauna habitats occur over the Study Area: Stony Plains, Sandy Plains and Minor Drainage Depressions. All fauna habitats recorded from the Study Area are considered widespread and typical of the bioregion.

The only species of conservation significance recorded over the Study Area was the Rainbow Bee-eater. The Rainbow Bee-eater (IA) was removed from the list of migratory species under section 209 of the EPBC Act on 9th June 2016, however, still appears on Schedule 5 of the WC Act as 'Migratory birds protected under an international agreement'. Numerous records of the species have been made and because of its broad habitat requirements is likely to occur. However, sandy Drainage Line habitat utilised as breeding habitat does not occur over the Study Area.

Several additional species were assessed with a Likelihood Rating of 2 (Possible). However no rocky escarpments occur and therefore no Northern Quoll (EN) denning habitat is present. Just two hectares of Sandy Plains habitat occurs but no distinctive evidence in the form of burrows, diggings, tracks or scats of either the Greater Bilby (VU) or Brush-tailed Mulgara (P4) was recorded.

The Western Pebble-mound Mouse (P4) is known to have a preference for hilly and/or rocky landscapes which are not present over the Study Area. No distinctive mounds constructed by this species was recorded.

The Pilbara Leaf-nosed Bat (VU) has been recorded within one kilometre of the Study Area, however, no roosting habitat is present. Creek lines provide foraging habitat for the species, as well as 'flyways'

for dispersal. Creeklines are not present over the Study Area and the Turner River, one kilometre to the east, is a likely flyway.

Both the Peregrine (OS) and Grey Falcons (VU) are widespread in Australia. Breeding habitat of cliffs, rocky outcrops, or large trees are not present over the Study Area, however, both have the potential to overfly the Study Area.

Similarly the Fork-tailed Swift (IA) is a migratory, almost exclusively aerial species that has the potential to overfly the Study Area without specifically utilising any particular habitat present.

6 REFERENCES

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7 APPENDICES

APPENDIX A DEFINITIONS

Threatened (WC Act) and Priority flora Categories

Code	Definition
T	**Threatened flora – (Declared Rare Flora – Extant)** Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection and have been gazetted as such (Schedule 1 under the *Wildlife Conservation Act 1950*).
X	**Presumed Extinct Flora (Declared Rare Flora - Extinct)** Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such Schedule 2 under the *Wildlife Conservation Act 1950*).
P1	**Priority One – Poorly Known Species** Species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2	**Priority Two – Poorly Known Species** Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3	**Priority Three – Poorly Known Species** Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities 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 localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
P4	**Priority Four – 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 do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	**Priority Five - Conservation Dependent species** Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Threatened flora (EPBC Act) Categories

Code	Definition
Ex	**Extinct** Taxa which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
ExW	**Extinct in the Wild** Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	**Critically Endangered** Taxa which at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	**Endangered** Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
V	**Vulnerable** Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Taxa which at a particular time if, at that time, the species is the focus of a specific conservation programme, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Definition of codes for Threatened Ecological Communities

Code	Definition
PD: Presumed Totally Destroyed	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant
CR: Critically Endangered	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
EN: Endangered	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future.
VU: Vulnerable	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future.

Definition of codes for Priority Ecological Communities

Code	Definition
P1: Priority One	Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or Pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2: Priority Two	Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3: Priority Three	(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) Communities made up of large, and/or widespread occurrences that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4: Priority Four	Ecological communities that are adequately known, Rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (a) Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. (b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Ecological communities that have been removed from the list of threatened communities during the past five years.
P5: Priority Five	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

BAM Act Definitions (Declared Pests)

Legal status	Definition
Declared Pest, Prohibited - s12	Prohibited organisms are declared pests by virtue of section 22(1), and may only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions.
Declared Pest - s22(2)	Declared pests must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia.
Permitted - s11	Permitted organisms must satisfy any applicable import requirements when imported. They may be subject to an import permit if they are potential carriers of high-risk organisms.
Permitted, Requires Permit - r73	Regulation 73 permitted organisms may only be imported subject to an import permit. These organisms may be subject to restriction under legislation other than the Biosecurity and Agriculture Management Act 2007. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions.
Unlisted - s14	If you are considering importing an unlisted organism/s you will need to submit the name/s for assessment, as unlisted organisms are automatically prohibited entry into WA.
Control categories	Definition
C1 Exclusion	Organisms which should be excluded from part or all of Western Australia.
C2 Eradication	Organisms which should be eradicated from part or all of Western Australia.
C3 Management	Organisms that should have some form of management applied that will alleviate the harmful impact of the organism, reduce the numbers or distribution of the organism or prevent or contain the spread of the organism.
Unassigned	Unassigned: Declared pests that are recognised as having a harmful impact under certain circumstances, where their subsequent control requirements are determined by a Plan or other legislative arrangements under the Act.

Categorisation of Environmental Weeds

Criteria	Description
Invasiveness	Ability to invade bushland in good to excellent condition or ability to invade waterways.
Distribution	Wide current or potential distribution including consideration of known history of widespread distribution elsewhere in the world.
Environmental impacts	Ability to change the structure, composition and function of ecosystems. In particular an ability to form single-species stands.
Category	**Scoring System**
High	A species which scores yes to all three of the above criteria. A rating of high indicates a species that should be prioritised for control and/or research.
Moderate	A species which scores yes for two of the above criteria. A rating of moderate indicates a species which should be monitored. Control or research should be directed to it if funds are available.
Mild	A species which scores yes to one of the criteria. A mild rating indicates monitoring or control if appropriate.
Low	A species which does not score yes for any of the criteria. A low rating indicates a low requirement for monitoring.

Threatened (WC Act) Fauna Categories

Category	Code	Definition	Schedule
Critically Endangered	CR	Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.	**Schedule 1** Fauna that is rare or is likely to become extinct as critically endangered fauna
Endangered	EN	Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.	**Schedule 2** Fauna that is rare or is likely to become extinct as endangered fauna
Vulnerable	VU	Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.	**Schedule 3** Fauna that is rare or is likely to become extinct as vulnerable fauna
Presumed Extinct	EX	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.	**Schedule 4** Fauna presumed to be extinct
Migratory	IA	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 the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice.	**Schedule 5** Migratory birds protected under an international agreement
Conservation Dependent	CD	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice.	**Schedule 6** Fauna that is of special conservation need as conservation dependent fauna
Special Protection	OS	Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.	**Schedule 7** Other specially protected fauna

Fauna (EPBC Act) Categories

Category	Code	Definition
Extinct	Ex	Fauna not definitely located in the wild during the past 50 years
Extinct in the Wild	EW	Fauna which is known only to survive in captivity
Critically Endangered	CR	Fauna that is considered to be facing an extremely high risk of extinction in the wild in the immediate future
Endangered	EN	Fauna that is considered to be facing a very high risk of extinction in the wild in the near future
Vulnerable	VU	Fauna that is considered to be facing a high risk of extinction in the wild in the medium-term future
Conservation Dependent	CD	Fauna whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.
Migratory	IA	Fauna that migrates to, over and within Australia and its external territories.

Definition of codes for Priority Fauna

Code	Definition
P1: Priority One	**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.
P2: Priority Two	**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.
P3: Priority Three	**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.
P4: Priority Four	**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.

APPENDIX B VASCULAR FLORA RECORDS. NATUREMAP

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 12/04/2017

Kingdom	Plantae
Current Names Only	Yes
Core Datasets Only	Yes
Vouchered Status	Vouchered
Method	'By Circle'
Centre	118° 55' 14" E,21° 00' 51" S
Buffer	40km
Group By	Conservation Status

Area (ha)		502569.66
Taxa:	Naturalised	8
	Native	213
Endemics:		1
Families:		46
Genera:		108
Conservation Status:	-	208
	1	2
	3	5
	T	1
	4	3
	2	2
MS Status:	-	213
	PN	8
Rank:	-	189
	subsp.	16
	var.	16

Top Ten Families

		Species	Records
1.	Fabaceae	41	65
2.	Poaceae	27	41
3.	Malvaceae	20	37
4.	Amaranthaceae	14	19
5.	Cyperaceae	13	24
6.	Asteraceae	11	14
7.	Boraginaceae	10	39
8.	Goodeniaceae	10	16
9.	Aizoaceae	6	7
10.	Euphorbiaceae	5	22

Top Ten Genera

		Species	Records
1.	*Acacia*	15	24
2.	*Tephrosia*	10	19
3.	*Triodia*	9	16
4.	*Ptilotus*	8	12
5.	*Heliotropium*	7	36
6.	*Triumfetta*	7	21
7.	*Cyperus*	6	8
8.	*Trianthema*	6	7
9.	*Pluchea*	5	7
10.	*Goodenia*	5	7

[1]Endemic To Query Area

Name ID	Species	Conservation Status
16171	*Pityrodia sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)*	T

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 3
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.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 12/04/2017

Kingdom	Plantae
Current Names Only	Yes
Core Datasets Only	Yes
Vouchered Status	Vouchered
Method	'By Circle'
Centre	118° 55' 14" E,21° 00' 51" S
Buffer	40km
Group By	Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	208	305
Priority 1	2	24
Priority 2	2	19
Priority 3	5	14
Priority 4	3	11
Rare or likely to become extinct	1	10
TOTAL	**221**	**383**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	37720	*Pityrodia sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)*		T	Y
Priority 1					
2.	10891	*Heliotropium muticum*		P1	
3.	17720	*Rothia indica subsp. australis*		P1	
Priority 2					
4.	4622	*Euphorbia clementii*		P2	
5.	18123	*Stylidium weeliwolli*		P2	
Priority 3					
6.	12673	*Acacia glaucocaesia*		P3	
7.	16730	*Eragrostis crateriformis*		P3	
8.	12832	*Gymnanthera cunninghamii*		P3	
9.	6980	*Nicotiana umbratica*		P3	
10.	5313	*Terminalia supranitifolia*		P3	
Priority 4					
11.	751	*Bulbostylis burbidgeae*		P4	
12.	7530	*Goodenia nuda*		P4	
13.	2744	*Ptilotus mollis*		P4	
Non-conservation taxon					
14.	4895	*Abutilon lepidum*			
15.	42920	*Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)*			
16.	3198	*Acacia acradenia*			
17.	3209	*Acacia ampliceps*			
18.	3223	*Acacia arida*			
19.	13502	*Acacia coriacea subsp. pendens*			
20.	16174	*Acacia elachantha*			
21.	3370	*Acacia hilliana*			
22.	3377	*Acacia inaequilatera (Baderi)*			
23.	3471	*Acacia orthocarpa (Needleleaf Wattle)*			
24.	29015	*Acacia pyrifolia var. pyrifolia*			
25.	13078	*Acacia sclerosperma subsp. sclerosperma*			
26.	3553	*Acacia spondylophylla*			
27.	19456	*Acacia stellaticeps*			
28.	13070	*Acacia synchronicia*			
29.	20319	*Acacia tumida var. pilbarensis*			
30.	17422	*Adriana tomentosa var. tomentosa*			
31.	2646	*Aerva javanica (Kapok Bush)*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
32.	2652	*Alternanthera nodiflora (Common Joyweed)*			
33.	2663	*Amaranthus interruptus (Native Amaranth)*			
34.	20018	*Amaranthus undulatus*			
35.	204	*Aristida burbidgeae*			
36.	12063	*Aristida holathera var. holathera*			
37.	5183	*Bergia ammannioides*			
38.	2770	*Boerhavia coccinea (Tar Vine, Wituka)*			
39.	11167	*Bonamia erecta*			
40.	44782	*Bonamia pilbarensis*			
41.	18073	*Byblis filifolia*			
42.	11055	*Cajanus cinereus*			
43.	40825	*Calandrinia pentavalvis*			
44.	2866	*Calandrinia quadrivalvis*			
45.	2870	*Calandrinia stagnensis*			
46.	14090	*Calocephalus beardii*			
47.	6582	*Calotropis procera (Calotrope)*	Y		
48.	258	*Cenchrus ciliaris (Buffel Grass)*	Y		
49.	7919	*Centipeda minima (Spreading Sneezewood, Kanjirralaa, Inteng-inteng, Karengkal, Kata-palkalpa, Munyu-parnti-parnti)*			
50.	32	*Cheilanthes brownii*			
51.	29101	*Cleome uncifera subsp. uncifera*			
52.	2988	*Cleome viscosa (Tickweed, Tjinduwadhu)*			
53.	2778	*Codonocarpus cotinifolius (Native Poplar, Kundurangu)*			
54.	13659	*Corchorus laniflorus*			
55.	4862	*Corchorus parviflorus*			
56.	17093	*Corymbia hamersleyana*			
57.	17084	*Corymbia zygophylla*			
58.	1286	*Corynotheca pungens*			
59.	3774	*Crotalaria cunninghamii (Green Birdflower, Bilbun)*			
60.	20179	*Crotalaria medicaginea var. neglecta*			
61.	3785	*Crotalaria novae-hollandiae (New Holland Rattlepod)*			
62.	7371	*Cucumis melo (Ulcardo Melon)*			
63.	17118	*Cullen leucanthum*			
64.	17119	*Cullen leucochaites*			
65.	15714	*Cullen stipulaceum*			
66.	33077	*Cylindropuntia imbricata*	Y		
67.	6583	*Cynanchum carnosum*			
68.	12801	*Cyperus blakeanus*			
69.	13657	*Cyperus castaneus var. brevimucronatus*			
70.	784	*Cyperus conicus*			
71.	12811	*Cyperus cunninghamii subsp. cunninghamii*			
72.	12808	*Cyperus hesperius*			
73.	809	*Cyperus rigidellus*			
74.	7424	*Dampiera candicans*			
75.	7317	*Dentella asperata*			
76.	13741	*Dichanthium sericeum subsp. humilius*			
77.	3093	*Drosera burmanni (Tropical Sundew)*			
78.	823	*Eleocharis atropurpurea*			
79.	360	*Enneapogon lindleyanus (Wiry Nineawn, Purple-head Nineawn)*			
80.	15733	*Eragrostis fallax*			
81.	389	*Eragrostis minor (Smaller Stinkgrass)*	Y		
82.	395	*Eragrostis speciosa (Handsome Lovegrass)*			
83.	15052	*Eremophila forrestii subsp. forrestii*			
84.	407	*Eriachne festucacea (Plains Wandarrie Grass)*			
85.	412	*Eriachne melicacea*			
86.	414	*Eriachne obtusa (Northern Wandarrie Grass)*			
87.	14377	*Erymophyllum ramosum subsp. ramosum*			
88.	5698	*Eucalyptus leucophloia (Snappy Gum, Migum)*			
89.	35303	*Euphorbia australis var. subtomentosa*			
90.	9048	*Euphorbia careyi*			
91.	12097	*Euphorbia tannensis subsp. eremophila (Desert Spurge)*			
92.	853	*Fimbristylis elegans*			
93.	862	*Fimbristylis microcarya*			
94.	12159	*Fimbristylis simulans*			
95.	896	*Fuirena ciliaris*			
96.	2680	*Gomphrena cunninghamii*			
97.	18257	*Gomphrena leptoclada subsp. leptoclada*			
98.	6151	*Gonocarpus ephemerus*			
99.	7521	*Goodenia lamprosperma*			
100.	7526	*Goodenia microptera*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
101.	12552	*Goodenia muelleriana*			
102.	10982	*Goodenia stobbsiana*			
103.	4910	*Gossypium australe (Native Cotton)*			
104.	19570	*Grevillea pyramidalis subsp. leucadendron*			
105.	2789	*Gyrostemon tepperi*			
106.	30258	*Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)*			
107.	17301	*Heliotropium chrysocarpum*			
108.	6705	*Heliotropium crispatum*			
109.	6706	*Heliotropium cunninghamii*			
110.	17309	*Heliotropium pachyphyllum*			
111.	17313	*Heliotropium skeleton*			
112.	11057	*Heliotropium vestitum*			
113.	443	*Heteropogon contortus (Bunch Speargrass)*			
114.	4924	*Hibiscus burtonii*			
115.	4930	*Hibiscus goldsworthii*			
116.	11651	*Hibiscus sturtii var. campylochlamys*			
117.	5215	*Hybanthus aurantiacus*			
118.	3985	*Indigofera rugosa*			
119.	31035	*Indigofera trita subsp. trita*			
120.	6623	*Ipomoea coptica*			
121.	3989	*Isotropis atropurpurea (Poison Sage)*			
122.	12059	*Jasminum didymum subsp. lineare (Desert Jasmine)*			
123.	3035	*Lepidium pedicellosum*			
124.	3038	*Lepidium pholidogynum*			
125.	37480	*Lobelia arnhemiaca*			
126.	5933	*Melaleuca linophylla*			
127.	6519	*Mitrasacme connata*			
128.	38422	*Notoleptopus decaisnei var. decaisnei*			
129.	31799	*Opuntia elata*	Y		
130.	5227	*Opuntia stricta (Common Prickly Pear)*	Y		
131.	4518	*Owenia reticulata (Native Walnut, Bandal)*			
132.	503	*Panicum decompositum (Native Millet, Kaltu-kaltu)*			
133.	515	*Paraneurachne muelleri (Northern Mulga Grass)*			
134.	3675	*Petalostylis labicheoides (Slender Petalostylis)*			
135.	4680	*Phyllanthus maderaspatensis*			
136.	8167	*Pluchea dentex*			
137.	17816	*Pluchea ferdinandi-muelleri*			
138.	43944	*Pluchea longiseta*			
139.	8168	*Pluchea rubelliflora*			
140.	8170	*Pluchea tetranthera*			
141.	2898	*Polycarpaea corymbosa*			
142.	2902	*Polycarpaea involucrata*			
143.	41365	*Polygala glaucifolia*			
144.	41357	*Polygala saccopetala*			
145.	6653	*Polymeria ambigua (Morning Glory)*			
146.	2695	*Ptilotus arthrolasius*			
147.	2698	*Ptilotus auriculifolius*			
148.	2699	*Ptilotus axillaris (Mat Mulla Mulla)*			
149.	2704	*Ptilotus calostachyus (Weeping Mulla Mulla)*			
150.	2711	*Ptilotus clementii (Tassel Top)*			
151.	2725	*Ptilotus fusiformis*			
152.	2734	*Ptilotus incanus*			
153.	13310	*Rhodanthe margarethae*			
154.	30434	*Salsola australis*			
155.	13006	*Sarcostemma viminale subsp. australe*			
156.	13178	*Scaevola amblyanthera var. centralis*			
157.	12579	*Scaevola browniana*			
158.	13150	*Scaevola browniana subsp. browniana*			
159.	41660	*Schenkia australis*			
160.	599	*Schizachyrium fragile (Senale Redgrass)*			
161.	963	*Schoenoplectus laevis*			
162.	18443	*Senna ferraria*			
163.	46821	*Seringia nephrosperma (Free carpel fire-bush)*			
164.	4966	*Sida arenicola*			
165.	4970	*Sida calyxhymenia (Tall Sida)*			
166.	4972	*Sida clementii*			
167.	6998	*Solanum cleistogamum*			
168.	7014	*Solanum horridum*			
169.	7018	*Solanum lasiophyllum (Flannel Bush, Mindjulu)*			
170.	7029	*Solanum phlomoides*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
171.	7098	*Stemodia grossa (Marsh Stemodia, Mindjaara)*			
172.	7102	*Stemodia viscosa (Pagurda)*			
173.	8235	*Streptoglossa bubakii*			
174.	8240	*Streptoglossa odora*			
175.	7711	*Stylidium desertorum*			
176.	4223	*Swainsona decurrens*			
177.	12356	*Swainsona formosa*			
178.	7363	*Synaptantha tillaeacea*			
179.	13339	*Synaptantha tillaeacea var. tillaeacea*			
180.	4263	*Tephrosia clementii*			
181.	19531	*Tephrosia rosea var. clementii*			
182.	19529	*Tephrosia rosea var. rosea*			
183.	15947	*Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)*			
184.	17768	*Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)*			
185.	41811	*Tephrosia sp. Fortescue (A.A. Mitchell 606)*			
186.	20380	*Tephrosia sp. Meentheena (S. van Leeuwen 4479)*			
187.	42442	*Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)*			
188.	4285	*Tephrosia supina*			
189.	4287	*Tephrosia virens*			
190.	45698	*Terminalia circumalata*			
191.	19043	*Trachymene oleracea subsp. oleracea*			
192.	44240	*Trianthema cusackianum*			
193.	44241	*Trianthema glossostigmum*			
194.	44261	*Trianthema oxycalyptrum var. oxycalyptrum*			
195.	2830	*Trianthema portulacastrum (Giant Pigweed)*	Y		
196.	44362	*Trianthema triquetrum*			
197.	44360	*Trianthema turgidifolium*			
198.	4377	*Tribulus hirsutus*			
199.	6727	*Trichodesma zeylanicum (Camel Bush, Kumbalin)*			
200.	13559	*Trichodesma zeylanicum var. grandiflorum*			
201.	679	*Triodia angusta*			
202.	680	*Triodia basedowii (Lobed Spinifex)*			
203.	17889	*Triodia bitextura*			
204.	13131	*Triodia epactia*			
205.	689	*Triodia lanigera*			
206.	690	*Triodia longiceps (Giant Grey Spinifex)*			
207.	694	*Triodia plurinervata*			
208.	17873	*Triodia schinzii*			
209.	700	*Triodia secunda*			
210.	4873	*Triumfetta appendiculata*			
211.	14694	*Triumfetta clementii*			
212.	16306	*Triumfetta deserticola*			
213.	4878	*Triumfetta johnstonii*			
214.	14942	*Triumfetta maconochieana*			
215.	17317	*Triumfetta propinqua*			
216.	13481	*Triumfetta ramosa*			
217.	7654	*Velleia connata (Cup Velleia)*			
218.		*Vigna sp.*			
219.	5107	*Waltheria virgata*			
220.	729	*Xerochloa barbata (Rice Grass)*			
221.	732	*Yakirra australiensis*			

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 3
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.

APPENDIX C EPBC PROTECTED MATTERS SEARCH TOOL

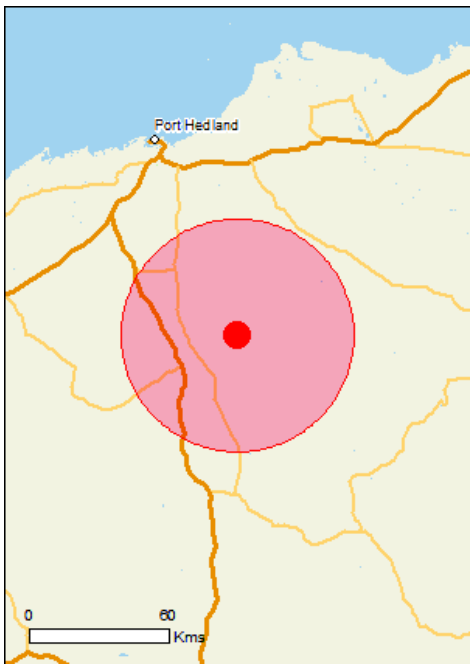
EPBC Act Protected Matters Report

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.

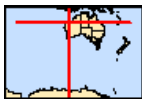
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

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

Report created: 11/04/17 13:40:32



Coordinates
Buffer: 50.0Km



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:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	9
Listed Migratory Species:	9

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 permit 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:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	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:	None
Regional Forest Agreements:	None
Invasive Species:	11
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically 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 [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus hallucatus Northern Quoll, Digul [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Breeding likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Roosting known to occur within area
Reptiles		
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat 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 may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

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
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to 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

-21.01404 118.92097

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.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

APPENDIX D SIGNIFICANT FLORA RECORDS. TPFL AND WAHERB DATABASES

Source	Taxon	ConsStatus	WARank	Gda94Lat	Gda94Long	Record Date
WAHERB	*Acacia glaucocaesia*	3		-21.030658	119.150284	15/10/2011
TPFL	*Bulbostylis burbidgeae*	4		-20.876056	119.007111	27/08/1997
TPFL	*Bulbostylis burbidgeae*	4		-20.909222	118.673	15/05/2006
WAHERB	*Bulbostylis burbidgeae*	4		-20.883897	118.696667	8/06/2011
WAHERB	*Bulbostylis burbidgeae*	4		-20.968404	118.703399	10/06/2011
WAHERB	*Bulbostylis burbidgeae*	4		-20.951861	118.672083	2/06/2010
WAHERB	*Bulbostylis burbidgeae*	4		-20.876056	119.007111	27/08/1997
WAHERB	*Bulbostylis burbidgeae*	4		-20.910646	118.671686	15/05/2006
WAHERB	*Bulbostylis burbidgeae*	4		-20.910518	118.67179	9/04/2011
WAHERB	*Bulbostylis burbidgeae*	4		-20.915681	118.662897	9/04/2011
WAHERB	*Eragrostis crateriformis*	3		-20.957351	118.684888	9/04/2011
WAHERB	*Euphorbia clementii*	2		-21.116542	119.115072	30/05/2013
WAHERB	*Euphorbia clementii*	2		-21.184139	118.701806	29/05/2010
WAHERB	*Euphorbia clementii*	2		-21.182986	118.832465	25/04/2012
WAHERB	*Euphorbia clementii*	2		-21.087934	119.178435	3/07/2011
WAHERB	*Euphorbia clementii*	2		-21.12875	118.69011	31/05/2006
WAHERB	*Euphorbia clementii*	2		-21.152674	118.685711	7/06/2011
WAHERB	*Euphorbia clementii*	2		-21.11453	118.796412	15/05/2008
WAHERB	*Euphorbia clementii*	2		-21.160333	118.845361	10/07/2008
WAHERB	*Euphorbia clementii*	2		-21.092389	119.176797	13/06/2012
WAHERB	*Euphorbia clementii*	2		-21.186083	118.703889	28/05/2010
WAHERB	*Goodenia nuda*	4		-21.066667	118.7	25/02/2008
TPFL	*Gymnanthera cunninghamii*	3		-21.233333	118.793056	7/05/2006
WAHERB	*Gymnanthera cunninghamii*	3		-21.188062	118.770652	4/04/2011
WAHERB	*Gymnanthera cunninghamii*	3		-21.233333	118.793056	7/05/2006
WAHERB	*Gymnanthera cunninghamii*	3		-21.018379	118.690989	10/04/2011
WAHERB	*Heliotropium muticum*	1		-21.186458	118.770344	5/04/2011
WAHERB	*Heliotropium muticum*	1		-21.184357	118.806654	18/08/2011
WAHERB	*Heliotropium muticum*	1		-21.117792	118.709903	13/05/2008
WAHERB	*Heliotropium muticum*	1		-21.118056	118.710111	10/07/2008
WAHERB	*Heliotropium muticum*	1		-21.112972	118.796083	28/05/2010
WAHERB	*Heliotropium muticum*	1		-21.037211	119.147665	15/10/2011
WAHERB	*Heliotropium muticum*	1		-21.037312	119.147542	15/10/2011
WAHERB	*Heliotropium muticum*	1		-21.037113	119.149732	15/10/2011
WAHERB	*Heliotropium muticum*	1		-21.037093	119.147731	15/10/2011
WAHERB	*Heliotropium muticum*	1		-21.037473	119.14841	15/10/2011
WAHERB	*Heliotropium muticum*	1		-21.037644	119.148451	15/10/2011
WAHERB	*Heliotropium muticum*	1		-21.03773	119.14875	15/10/2011
WAHERB	*Heliotropium muticum*	1		-21.037371	119.147879	15/10/2011
WAHERB	*Heliotropium muticum*	1		-21.037123	119.147549	15/10/2011
WAHERB	*Heliotropium muticum*	1		-21.037186	119.147569	15/10/2011
WAHERB	*Heliotropium muticum*	1		-20.992472	118.694222	31/05/2010
WAHERB	*Heliotropium muticum*	1		-20.949083	118.67625	1/06/2010
WAHERB	*Heliotropium muticum*	1		-20.949389	118.675139	2/06/2010
WAHERB	*Heliotropium muticum*	1		-21.036959	119.147633	15/10/2011
WAHERB	*Heliotropium muticum*	1		-21.081836	118.70515	7/04/2011
WAHERB	*Heliotropium muticum*	1		-21.10945	118.708575	7/04/2011
WAHERB	*Nicotiana umbratica*	3		-21.116667	118.7	21/09/1995
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.137833	119.12775	30/08/2010
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.187969	119.062278	19/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.147028	119.095694	29/05/2013
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.145722	119.109889	28/05/2010
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.204162	118.96139	23/04/2012
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.24569	118.979116	17/08/2011
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.221464	119.006918	17/08/2011
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.167391	119.024568	17/08/2011
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.177153	119.02537	17/08/2011
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.185791	119.02504	17/08/2011
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.188818	119.045188	21/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.193387	119.070442	17/08/2011
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.216165	119.045073	17/08/2011
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.223367	119.055893	17/08/2011

Source	Taxon	ConsStatus	WARank	Gda94Lat	Gda94Long	Record Date
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.201002	119.09082	17/08/2011
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.198667	119.099184	17/08/2011
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.19045	119.092617	3/06/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.182078	119.106422	17/08/2011
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.182241	119.125875	17/08/2011
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.148484	119.114274	17/04/2012
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.130519	119.134665	17/04/2012
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.166708	119.101304	25/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.156902	119.090941	3/06/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.172316	119.071333	4/06/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.154257	119.071775	4/06/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.196792	118.953675	26/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.214097	118.961406	26/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.216683	118.990422	24/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.209288	118.98803	24/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.174395	119.018915	17/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.186052	119.016829	22/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.223314	119.03267	16/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.207701	119.028815	23/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.178913	119.033776	17/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.204976	119.053953	27/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.235181	119.08085	22/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.195654	119.079275	26/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.198294	119.084147	26/09/2015
TPFL	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T	EN	-21.198294	119.084147	26/09/2015
WAHERB	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T		-21.137833	119.12775	30/08/2010
WAHERB	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T		-21.189	119.067111	30/08/2010
WAHERB	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T		-21.135965	119.129699	4/07/2011
WAHERB	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T		-21.136318	119.129627	4/07/2011
WAHERB	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T		-21.147028	119.095683	29/05/2013
WAHERB	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T		-21.147028	119.095683	29/05/2013
WAHERB	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T		-21.189013	119.067098	22/09/2011
WAHERB	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T		-21.145722	119.109889	28/05/2010
WAHERB	*Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)	T		-21.137833	119.12775	26/05/2010
WAHERB	*Rothia indica* subsp. *australis*	1		-20.910363	118.657119	9/04/2011
WAHERB	*Stylidium weeliwolli*	2		-20.949793	118.670832	9/04/2011
WAHERB	*Terminalia supranitifolia*	3		-21.130528	118.817472	30/08/2010

APPENDIX E FLORA SPECIES RECORDED OVER THE STUDY AREA

Family	Name
Amaranthaceae	**Aerva javanica*
Amaranthaceae	*Gomphrena cunninghamii*
Amaranthaceae	*Ptilotus astrolasius*
Amaranthaceae	*Ptilotus axillaris*
Amaranthaceae	*Ptilotus calostachyus*
Amaranthaceae	*Ptilotus nobilis* subsp. *nobilis*
Asteraceae	*Streptoglossa* odora
Chenopodiaceae	*Salsola australis*
Cleomaceae	*Cleome viscosa*
Fabaceae	*Acacia ancistrocarpa*
Fabaceae	*Acacia bivenosa*
Fabaceae	*Acacia inaequilatera*
Fabaceae	*Acacia orthocarpa*
Fabaceae	*Acacia monticola*
Fabaceae	*Acacia stellaticeps*
Fabaceae	*Acacia tumida*
Fabaceae	*Cullen cinereum*
Fabaceae	*Cullen martinii*
Fabaceae	*Senna glutinosa* subsp. *glutinosa*
Fabaceae	*Senna notabilis*
Fabaceae	*Tephrosia rosea* var. *clementii*
Goodeniaceae	*Goodenia muelleriana*
Goodeniaceae	*Goodenia stobbsiana*
Lauraceae	*Cassytha capillaris*
Malvaceae	*Corchorus parviflorus*
Myrtaceae	*Corymbia hamersleyana*
Poaceae	*Aristida holathera* var. *holathera*
Poaceae	*Triodia epactia*
Poaceae	*Triodia wiseana*
Proteaceae	*Grevillea wickhamii*
Proteaceae	*Hakea lorea*
Solanaceae	*Solanum lasiophyllum*

APPENDIX F HABITAT ASSESSMENT SHEETS AND PHOTOGRAPHS

Habitat Condition Scale

Habitat Condition	Criteria
Excellent	Pristine or nearly so, no obvious sign of damage caused by modern humans or introduced fauna (cattle, feral cat, dog and rabbit). No signs of recent, extensive fires.
Very Good	Some relatively slight signs of damage caused by the activities of modern humans. eg. damage to tree trunks by repeated fires, no significant signs of introduced fauna or occasional vehicle tracks.
Good	More obvious signs of damage caused by the activities of modern humans, including some obvious impact to vegetation structure such as that caused by low levels of grazing or by selective logging. Some tracks or secondary evidence of introduced fauna. Some signs of recent fires.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of modern humans such as partial clearing or very frequent fires. Presence of introduced fauna.
Very Poor	Severely impacted by grazing, introduced fauna, fire, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management.
Completely Degraded	Areas that are completely or almost completely without vegetation communities and are heavily impacted by extensive fires and/or introduced species e.g. cow paddock

Site	Landform		Condition	Habitat
S01	Plains		Very Good	Stony Plains
Description	Expansive stony plains of scattered Acacia over spinifex			
% Ground Cover	Bare Soil	30%		
	Litter	Minor		
	Canopy Cover	<5%		
	Understorey	70%		
Rocks	No exposed rock	X		
	<20% exposed rock			
	20-50% exposed rock			
	>50% exposed rock			
	Boulders / Rocks %			
Soil	Type	Stony: Clay-Loam		
	Colour	Red		
Habitat Features	Water Impacts	Minor sheet erosion		
	Fire Presence	> 4 yrs		
	Woody Debris	None		
	Grazing	Low		
	Rock Crevices	None		
	Burrowing Suitability	Low		
	Large trees present	No		
	Tree Hollows (>10cm)	No		
Vegetation	**Stratum**	**Form**	**Height**	**Species**
	Upper	None		
	Middle	Shrub	2m	*Acacia ancistrocarpa* and *Acacia orthocarpa*
	Ground	Grasses	0.5m	*Triodia epactia*

Site	Landform		Condition	Habitat
S02	Drainage		Very Good	Minor Drainage Deoression
Description	Minor drainage area emanating from culvert through GNH			
% Ground Cover	Bare Soil	25%		
	Litter	Minor		
	Canopy Cover	15%		
	Understorey	70%		
Rocks	No exposed rock	X		
	<20% exposed rock			
	20-50% exposed rock			
	>50% exposed rock			
	Boulders / Rocks %			
Soil	Type	Loam		
	Colour	Red		
Habitat Features	Water Impacts	Drainage		
	Fire Presence	> 4 yrs		
	Woody Debris	None		
	Grazing	Low		
	Rock Crevices	None		
	Burrowing Suitability	Moderate		
	Large trees present	No		
	Tree Hollows (>10cm)	No		
Vegetation	**Stratum**	**Form**	**Height**	**Species**
	Upper	None		
	Middle	Shrub	1.5m	*Acacia ancistrocarpa* and *Acacia inaequilatera*
	Ground	Grasses	0.75m	*Triodia epactia*

Site	Landform		Condition	Habitat
S03	Watercourses		Very Good	Minor Drainage Deoression
Description	Minor drainage area flowing through culvert under GNH			
% Ground Cover	Bare Soil	30%		
	Litter	Minor		
	Canopy Cover	None		
	Understorey	70%		
Rocks	No exposed rock	X		
	<20% exposed rock			
	20-50% exposed rock			
	>50% exposed rock			
	Boulders / Rocks %			
Soil	Type	Loam		
	Colour	Red		
Habitat Features	Water Impacts	Drainage		
	Fire Presence	> 4 yrs		
	Woody Debris	None		
	Grazing	Low		
	Rock Crevices	None		
	Burrowing Suitability	Moderate		
	Large trees present	No		
	Tree Hollows (>10cm)	No		

Vegetation	Stratum	Form	Height	Species
	Upper	Tree	2.5m	Scattered *Corymbia hamersleyana*
	Middle	Shrub	1.5m	*Acacia ancistrocarpa* and *Acacia inaequilatera*
	Ground	Grasses	0.75m	*Triodia epactia*

Site	Landform		Condition	Habitat
S04	Plains		Very Good	Stony Plains
Description	Expansive stony plains of scattered Acacia over spinifex intersected with minor drainage lines			
% Ground Cover	Bare Soil	30%		
	Litter	Minor		
	Canopy Cover	<10%		
	Understorey	70%		
Rocks	No exposed rock	X		
	<20% exposed rock			
	20-50% exposed rock			
	>50% exposed rock			
	Boulders / Rocks %			
Soil	Type	Stony: Clay-Loam		
	Colour	Red		
Habitat Features	Water Impacts	Minor sheet erosion		
	Fire Presence	> 3 yrs		
	Woody Debris	None		
	Grazing	Low		
	Rock Crevices	None		
	Burrowing Suitability	Low		
	Large trees present	No		
	Tree Hollows (>10cm)	No		
Vegetation	**Stratum**	**Form**	**Height**	**Species**
	Upper	None		
	Middle	Shrub	2m	*Acacia ancistrocarpa* and *Acacia orthocarpa*
	Ground	Grasses	0.5m	*Triodia epactia*

Site	Landform		Condition	Habitat
S05	Plains		Very Good	Sandplain
Description	Expansive stony plains of scattered Acacia over spinifex intersected with minor drainage lines			
% Ground Cover	Bare Soil	30%		
	Litter	Minor		
	Canopy Cover	<10%		
	Understorey	70%		
Rocks	No exposed rock	X		
	<20% exposed rock			
	20-50% exposed rock			
	>50% exposed rock			
	Boulders / Rocks %			
Soil	Type	Sandy-Loam		
	Colour	Red		
Habitat Features	Water Impacts	None		
	Fire Presence	> 4 yrs		
	Woody Debris	None		
	Grazing	Low		
	Rock Crevices	None		
	Burrowing Suitability	High		
	Large trees present	No		
	Tree Hollows (>10cm)	No		
Vegetation	**Stratum**	**Form**	**Height**	**Species**
	Upper	None		
	Middle	Shrub	2m	*Acacia inaequilatera, Acacia acradenia* and *Corchorus parviflorus*
	Ground	Grasses	0.5m	*Triodia epactia*

APPENDIX G VERTEBRATE FAUNA RECORDS.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Andre Schmitz on 30/03/2017

Current Names Only	Yes
Core Datasets Only	Yes
Species Group	Mammals
Method	'By Circle'
Centre	118° 55' 17" E,21° 00' 48" S
Buffer	20km

Area (ha)		125622.02
Taxa:	Naturalised	3
	Native	22
Endemics:		0
Families:		10
Genera:		18
Conservation Status:	-	20
	3	1
	T	2
	4	2
MS Status:	-	25
Rank:	-	21
	subsp.	4

Top Ten Families

		Species	Records
1.	Dasyuridae	7	43
2.	Muridae	5	37
3.	Macropodidae	5	140
4.	Vespertilionidae	2	2
5.	Phalangeridae	1	2
6.	Emballonuridae	1	1
7.	Bovidae	1	4
8.	Canidae	1	1
9.	Felidae	1	1
10.	Megadermatidae	1	1

Top Ten Genera

		Species	Records
1.	*Macropus*	4	4
2.	*Pseudomys*	4	30
3.	*Sminthopsis*	2	5
4.	*Vespadelus*	1	1
5.	*Zyzomys*	1	7
6.	*Dasyurus*	1	7
7.	*Ningaui*	1	17
8.	*Dasykaluta*	1	5
9.	*Taphozous*	1	1
10.	*Trichosurus*	1	2

[1] Endemic To Query Area

Name ID	Species	Conservation Status

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 3
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.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Andre Schmitz on 29/03/2017

Current Names Only Yes
Core Datasets Only Yes
Species Group Mammals
Method 'By Circle'
Centre 118° 55' 17" E,21° 00' 48" S
Buffer 20km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	24251	*Bos taurus (European Cattle)*	Y		
2.	24039	*Canis lupus subsp. dingo (Dingo)*	Y		
3.	30903	*Dasycercus blythi (Brush-tailed Mulgara, Ampurta)*		P4	
4.	24091	*Dasykaluta rosamondae (Little Red Kaluta)*			
5.	24093	*Dasyurus hallucatus (Northern Quoll)*		T	
6.	24041	*Felis catus (Cat)*	Y		
7.	24122	*Lagorchestes conspicillatus subsp. leichardti (Spectacled Hare-wallaby)*		P3	
8.	24180	*Macroderma gigas (Ghost Bat)*		T	
9.	24129	*Macropus agilis (Agile Wallaby)*			
10.	25489	*Macropus robustus (Euro, Biggada)*			
11.	24135	*Macropus robustus subsp. erubescens (Euro, Biggada)*			
12.	24136	*Macropus rufus (Red Kangaroo, Marlu)*			
13.	24095	*Ningaui timealeyi (Pilbara Ningaui)*			
14.	24106	*Pseudantechinus woolleyae (Woolley's Pseudantechinus)*			
15.	24233	*Pseudomys chapmani (Western Pebble-mound Mouse, Ngadji)*		P4	
16.	24234	*Pseudomys delicatulus (Delicate Mouse)*			
17.	24235	*Pseudomys desertor (Desert Mouse)*			
18.	24237	*Pseudomys hermannsburgensis (Sandy Inland Mouse)*			
19.	24200	*Scotorepens greyii (Little Broad-nosed Bat)*			
20.	24116	*Sminthopsis macroura (Stripe-faced Dunnart)*			
21.	24117	*Sminthopsis ooldea (Ooldea Dunnart)*			
22.	24175	*Taphozous georgianus (Common Sheath-tailed Bat)*			
23.	24158	*Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)*			
24.	24205	*Vespadelus finlaysoni (Finlayson's Cave Bat)*			
25.	24248	*Zyzomys argurus (Common Rock-rat)*			

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 3
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.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Andre Schmitz on 30/03/2017

Current Names Only	Yes
Core Datasets Only	Yes
Species Group	Birds
Method	'By Circle'
Centre	118° 55' 17" E,21° 00' 48" S
Buffer	20km

Area (ha)		125622.02
Taxa:	Naturalised	0
	Native	81
Endemics:		0
Families:		38
Genera:		65
Conservation Status:	-	77
	IA	3
	S	1
MS Status:	-	81
Rank:	-	79
	subsp.	2

Top Ten Families

		Species	Records
1.	Accipitridae	8	62
2.	Psittacidae	6	63
3.	Meliphagidae	6	152
4.	Falconidae	6	52
5.	Columbidae	5	209
6.	Dicruridae	3	142
7.	Maluridae	3	35
8.	Pachycephalidae	3	32
9.	Halcyonidae	3	63
10.	Cuculidae	2	6

Top Ten Genera

		Species	Records
1.	*Falco*	6	52
2.	*Artamus*	2	51
3.	*Petrochelidon*	2	19
4.	*Coracina*	2	71
5.	*Accipiter*	2	26
6.	*Cracticus*	2	54
7.	*Geopelia*	2	66
8.	*Todiramphus*	2	40
9.	*Rhipidura*	2	69
10.	*Malurus*	2	32

[1] Endemic To Query Area

Name ID	Species	Conservation Status

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 3
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.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Andre Schmitz on 29/03/2017

Current Names Only Yes
Core Datasets Only Yes
Species Group Birds
Method 'By Circle'
Centre 118° 55' 17" E,21° 00' 48" S
Buffer 20km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	24559	*Acanthagenys rufogularis (Spiny-cheeked Honeyeater)*			
2.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
3.	25536	*Accipiter fasciatus (Brown Goshawk)*			
4.	25647	*Amytornis striatus (Striated Grasswren)*			
5.	24316	*Anas superciliosa (Pacific Black Duck)*			
6.	25670	*Anthus australis (Australian Pipit)*			
7.	25554	*Apus pacificus (Fork-tailed Swift, Pacific Swift)*		IA	
8.	24285	*Aquila audax (Wedge-tailed Eagle)*			
9.	24341	*Ardea pacifica (White-necked Heron)*			
10.	24610	*Ardeotis australis (Australian Bustard)*			
11.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
12.	24355	*Artamus minor (Little Woodswallow)*			
13.		*Barnardius zonarius*			
14.	24359	*Burhinus grallarius (Bush Stone-curlew)*			
15.	25715	*Cacatua roseicapilla (Galah)*			
16.	25716	*Cacatua sanguinea (Little Corella)*			
17.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
18.	25600	*Centropus phasianinus (Pheasant Coucal)*			
19.	24564	*Certhionyx variegatus (Pied Honeyeater)*			
20.	24378	*Charadrius veredus (Oriental Plover)*		IA	
21.	24431	*Chrysococcyx basalis (Horsfield's Bronze Cuckoo)*			
22.	24289	*Circus assimilis (Spotted Harrier)*			
23.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
24.	24361	*Coracina maxima (Ground Cuckoo-shrike)*			
25.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
26.	24416	*Corvus bennetti (Little Crow)*			
27.	25593	*Corvus orru (Torresian Crow)*			
28.	25701	*Coturnix ypsilophora (Brown Quail)*			
29.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
30.	25595	*Cracticus tibicen (Australian Magpie)*			
31.	25547	*Dacelo leachii (Blue-winged Kookaburra)*			
32.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
33.		*Egretta novaehollandiae*			
34.		*Elanus axillaris*			
35.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
36.	24631	*Emblema pictum (Painted Finch)*			
37.		*Eolophus roseicapillus*			
38.	24570	*Epthianura tricolor (Crimson Chat)*			
39.	24837	*Eremiornis carteri (Spinifex-bird)*			
40.	24368	*Eurostopodus argus (Spotted Nightjar)*			
41.	25621	*Falco berigora (Brown Falcon)*			
42.	24471	*Falco berigora subsp. berigora (Brown Falcon)*			
43.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
44.	25623	*Falco longipennis (Australian Hobby)*			
45.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
46.	24476	*Falco subniger (Black Falcon)*			
47.	24401	*Geopelia cuneata (Diamond Dove)*			
48.	25585	*Geopelia striata (Zebra Dove)*			
49.	24404	*Geophaps plumifera (Spinifex Pigeon)*			
50.	24443	*Grallina cyanoleuca (Magpie-lark)*			
51.	24295	*Haliastur sphenurus (Whistling Kite)*			
52.	47965	*Hieraaetus morphnoides (Little Eagle)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
53.	25661	*Lichmera indistincta (Brown Honeyeater)*			
54.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
55.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
56.	24583	*Manorina flavigula (Yellow-throated Miner)*			
57.	47997	*Melanodryas cucullata (Hooded Robin)*			
58.	25665	*Melithreptus gularis (Black-chinned Honeyeater)*			
59.	24736	*Melopsittacus undulatus (Budgerigar)*			
60.	24598	*Merops ornatus (Rainbow Bee-eater)*		IA	
61.	25542	*Milvus migrans (Black Kite)*			
62.	24742	*Nymphicus hollandicus (Cockatiel)*			
63.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
64.	24618	*Oreoica gutturalis (Crested Bellbird)*			
65.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
66.	24627	*Pardalotus rubricatus (Red-browed Pardalote)*			
67.	48060	*Petrochelidon ariel (Fairy Martin)*			
68.	48061	*Petrochelidon nigricans (Tree Martin)*			
69.	24409	*Phaps chalcoptera (Common Bronzewing)*			
70.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
71.	25703	*Podargus strigoides (Tawny Frogmouth)*			
72.	25706	*Pomatostomus temporalis (Grey-crowned Babbler)*			
73.		*Ptilonorhynchus guttatus*			
74.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
75.	24454	*Rhipidura leucophrys subsp. leucophrys (Willie Wagtail)*			
76.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
77.	30870	*Taeniopygia guttata (Zebra Finch)*			
78.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
79.	42351	*Todiramphus pyrrhopygius (Red-backed Kingfisher)*			
80.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
81.	24851	*Turnix velox (Little Button-quail)*			

Conservation Codes
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1 - Priority 1
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3 - Priority 3
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.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Andre Schmitz on 30/03/2017

Current Names Only	Yes
Core Datasets Only	Yes
Species Group	Reptiles
Method	'By Circle'
Centre	118° 55' 17" E,21° 00' 48" S
Buffer	20km

Area (ha)		125622.02
Taxa:	Naturalised	0
	Native	60
Endemics:		0
Families:		9
Genera:		29
Conservation Status:	-	59
	T	1
MS Status:	-	60
Rank:	-	51
	subsp.	9

Top Ten Families

		Species	Records
1.	Scincidae	24	250
2.	Agamidae	7	26
3.	Diplodactylidae	7	46
4.	Pygopodidae	5	12
5.	Varanidae	5	19
6.	Elapidae	5	10
7.	Gekkonidae	3	54
8.	Boidae	3	4
9.	Carphodactylidae	1	1

Top Ten Genera

		Species	Records
1.	*Ctenotus*	10	98
2.	*Ctenophorus*	5	21
3.	*Varanus*	5	19
4.	*Lerista*	5	73
5.	*Delma*	3	5
6.	*Pseudonaja*	2	3
7.	*Antaresia*	2	3
8.	*Gehyra*	2	29
9.	*Carlia*	2	17
10.	*Cyclodomorphus*	2	4

[1]Endemic To Query Area

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Core Datasets Only Yes
Species Group Reptiles
Method 'By Circle'
Centre 118° 55' 17" E,21° 00' 48" S
Buffer 20km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	30833	*Amphibolurus longirostris (Long-nosed Dragon)*			
2.	25318	*Antaresia perthensis (Pygmy Python)*			
3.	25448	*Antaresia stimsoni (Stimson's Python)*			
4.	25331	*Brachyurophis approximans (North-western Shovel-nosed Snake)*			
5.	25015	*Carlia munda (Shaded-litter Rainbow Skink)*			
6.	25017	*Carlia triacantha (Desert Rainbow Skink)*			
7.	25456	*Crenadactylus ocellatus (Clawless Gecko)*			
8.	25458	*Ctenophorus caudicinctus (Ring-tailed Dragon)*			
9.	24865	*Ctenophorus caudicinctus subsp. caudicinctus (Ring-tailed Dragon)*			
10.	25459	*Ctenophorus isolepis (Crested Dragon, Military Dragon)*			
11.	24876	*Ctenophorus isolepis subsp. isolepis (Crested Dragon, Military Dragon)*			
12.	24882	*Ctenophorus nuchalis (Central Netted Dragon)*			
13.	25036	*Ctenotus duricola*			
14.	25039	*Ctenotus fallens*			
15.	25462	*Ctenotus grandis*			
16.	25043	*Ctenotus grandis subsp. titan*			
17.	25045	*Ctenotus helenae*			
18.	25052	*Ctenotus leonhardii*			
19.	25463	*Ctenotus pantherinus (Leopard Ctenotus)*			
20.	25064	*Ctenotus pantherinus subsp. ocellifer (Leopard Ctenotus)*			
21.	25072	*Ctenotus rubicundus*			
22.	25073	*Ctenotus saxatilis (Rock Ctenotus)*			
23.	25466	*Cyclodomorphus melanops (Slender Blue-tongue)*			
24.	25090	*Cyclodomorphus melanops subsp. melanops (Slender Blue-tongue)*			
25.	24998	*Delma elegans*			
26.	25002	*Delma pax*			
27.	25004	*Delma tincta*			
28.	24926	*Diplodactylus conspicillatus (Fat-tailed Gecko)*			
29.	24944	*Diplodactylus savagei (Southern Pilbara Beak-faced Gecko)*			
30.	42402	*Diporiphora vescus (Northern Pilbara Tree Dragon)*			
31.	25301	*Furina ornata (Moon Snake)*			
32.	24958	*Gehyra punctata*			
33.	24959	*Gehyra variegata*			
34.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
35.	25125	*Lerista bipes*			
36.	30928	*Lerista clara*			
37.	30929	*Lerista jacksoni*			
38.	25155	*Lerista muelleri*			
39.	30925	*Lerista verhmens*			
40.	25005	*Lialis burtonis*			
41.	25238	*Liasis olivaceus subsp. barroni (Pilbara Olive Python)*		T	
42.	30933	*Lucasium stenodactylum*			
43.	30934	*Lucasium wombeyi*			
44.	25184	*Menetia greyii*			
45.	25495	*Morethia ruficauda*			
46.	25193	*Morethia ruficauda subsp. exquisita*			
47.	24969	*Nephrurus levis subsp. pilbarensis*			
48.	25199	*Proablepharus reginae*			
49.	25263	*Pseudonaja modesta (Ringed Brown Snake)*			
50.	25264	*Pseudonaja nuchalis (Gwardar, Northern Brown Snake)*			
51.	25009	*Pygopus nigriceps*			
52.	24982	*Rhynchoedura ornata (Western Beaked Gecko)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
53.	24927	*Strophurus elderi*			
54.	25202	*Tiliqua multifasciata (Central Blue-tongue)*			
55.	25209	*Varanus acanthurus (Spiny-tailed Monitor)*			
56.	25210	*Varanus brevicauda (Short-tailed Pygmy Monitor)*			
57.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
58.	25223	*Varanus panoptes subsp. rubidus*			
59.	25224	*Varanus pilbarensis (Pilbara Rock Monitor, Northern Pilbara Rock Goanna)*			
60.	25311	*Vermicella snelli*			

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NatureMap Species Report

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Current Names Only	Yes
Core Datasets Only	Yes
Species Group	Amphibians
Method	'By Circle'
Centre	118° 55' 17" E,21° 00' 48" S
Buffer	20km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	25445	*Uperoleia russelli (Northwest Toadlet)*			

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4 - Priority 4
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[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.

APPENDIX H SIGNIFICANT FAUNA RECORDS. NATUREMAP - DCBA DATABASE

Summary of conservation significant fauna records from DPAW Threatened and Priority Species Database

Common Name	Species	WA Status	EPBC Act Status	Records	Latest Record
Fork-tailed Swift	*Apus pacificus*	IA	IA	6	2011
Great Egret	*Ardea modesta*	IA	IA	6	2012
Oriental Plover	*Charadrius veredus*	IA	IA	1	1999
Peregrine Falcon	*Falco peregrinus*	OS		1	2002
Rainbow Bee-eater	*Merops ornatus*	IA	IA	84	2016
Striated Grasswren	*Amytornis striatus striatus*	P4		9	2015
Brush-tailed Mulgara	*Dasycercus blythi*	P4		13	2013
Ghost Bat	*Macroderma gigas*	VU	VU	13	2016
Greater Bilby	*Macrotis lagotis*	VU	VU	8	2015
Long-tailed Dunnart	*Sminthopsis longicaudata*	P4		2	2011
Northern Quoll	*Dasyurus hallucatus*	EN	EN	236	2016
Pilbara Leaf-nosed Bat	*Rhinonicteris aurantia* (Pilbara)	VU	VU	114	2016
Spectacled Hare-wallaby	*Lagorchestes conspicillatus*	P3		137	1996
Western Pebble-mound Mouse	*Pseudomys chapmani*	P4		26	2015
Pilbara Olive Python	*Liasis olivaceus barroni*	VU	VU	23	2015

APPENDIX I RELEVE SITE DATA

Site R1

Botanist	Shaun Grein (SBG)
Date	05/09/2017
Quadrat Size	Releve
NW Corner Coordinates	51J 677127E; 7662854N
Landform	Stony Plain
Slope & Aspect	Negligible
Soil Group	Loamy
Soil Colour	Brown
Soil Texture	Clay Loam
Rock Size and Abundance	quartz cobbles (64-256 mm) - numerous (>40%)
Vegetation Condition	Very Good
Disturbance Type	road edge effects, weeds, rubbish disturbance
Time since Fire	+5 years
Leaf Litter Distribution and Cover	Low <10%

Structural Description

Acacia ancistrocarpa and *Acacia orthocarpa* tall open shrubland over *Triodia epactia* hummock grassland

Stratum	Taxon	% Cover
Tree (<10 m)	*Corymbia hamersleyana*	<1
Shrub (1-2 m)	*Acacia ancistrocarpa*	1
Shrub (1-2 m)	*Acacia orthocarpa*	1
Shrub (1-2 m)	*Acacia monticola*	<1
Shrub (1-2 m)	*Acacia inaequilatera*	<1
Shrub (1-2 m)	*Acacia bivenosa*	<1
Shrub (1-2 m)	*Acacia stellaticeps*	<1
Shrub (1-2 m)	*Acacia tumida*	<1
Shrub (1-2 m)	*Grevillea wickhamii*	<1
Shrub (1-2 m)	*Hakea lorea*	<1
Shrub (0-1 m)	**Aerva javanica*	<1
Shrub (0-1 m)	*Corchorus parviflorus*	<1
Shrub (0-1 m)	*Gomphrena cunninghamii*	<1
Shrub (0-1 m)	*Goodenia muelleriana*	<1
Shrub (0-1 m)	*Ptilotus astrolasius*	<1

Stratum	Taxon	% Cover
Shrub (0-1 m)	*Ptilotus nobilis*	<1
Shrub (0-1 m)	*Senna notabilis*	<1
Shrub (0-1 m)	*Tephrosia rosea var. clementii*	<1
Grass	*Eriachne pulchella* subsp. *dominii*	<1
Grass	*Triodia epactia*	80
Herb	**Aerva javanica*	<1
Herb	*Cleome viscosa*	<1
Herb	*Gomphrena cunninghamii*	<1
Herb	*Goodenia muelleriana*	<1
Herb	*Maireana georgei*	<1
Herb	*Ptilotus axillaris*	<1
Herb	*Ptilotus astrolasius*	<1
Herb	*Ptilotus calostachyus*	<1
Herb	*Solanum lasiophyllum*	<1

Site R2

Botanist	Shaun Grein (SGB)
Date	5/09/2017
Quadrat Size	Releve
NW Corner Coordinates	51J 677250E; 7662825N
Landform	Stony Plain /Sandy Plain
Slope & Aspect	Negligible
Soil Group	Stony and Sandy
Soil Colour	Red Brown
Soil Texture	Sandy Loam
Rock Size and Abundance	Pebbles (2-64 mm) - few (10-30%)
Vegetation Condition	Very Good
Disturbance Type	No obvious disturbance
Time since Fire	+5 years
Leaf Litter Distribution and Cover	Low <10%

Structural Description

Acacia inaequilatera, Acacia acradenia and Corchorus parviflorus open shrubland over *Triodia epactia* open hummock grassland.

Stratum	Taxon	% Cover
Shrub (1-2 m)	*Acacia ancistrocarpa*	1
Shrub (1-2 m)	*Acacia inaequilatera*	<1
Shrub (1-2 m)	*Hakea lorea*	<1
Shrub (0-1 m)	*Corchorus parviflorus*	<1
Shrub (0-1 m)	*Cullen cinereum*	<1
Shrub (0-1 m)	*Salsola australis*	<1
Shrub (0-1 m)	*Senna glutinosa subsp. glutinosa*	<1
Shrub (0-1 m)	*Senna notabilis*	<1
Shrub (0-1 m)	*Triumfetta ramosa*	<1
Grass	*Triodia epactia*	60
Grass	*Triodia wiseana*	5
Grass	*Aristida holathera* var. *holathera*	1
Herb	*Goodenia muelleriana*	<1
Herb	*Ptilotus astrolasius*	<1
Herb	*Ptilotus axillaris*	<1

Stratum	Taxon	% Cover
Herb	*Ptilotus calostachyus*	<1
Herb	*Ptilotus nobilis* subsp. *nobilis*	<1
Herb	*Streptoglossa odora*	<1
Herb	*Solanum lasiophyllum*	<1