Appendix 2 Flora and fauna assessment

PHOENIX
ENVIRONMENTAL SCIENCES

Flora and vegetation survey and terrestrial fauna survey for Shamrock Station Irrigation Project

Prepared for Argyle Cattle Company Pty Ltd

August 2017

Final Report

Flora and vegetation survey and terrestrial fauna survey fauna survey for the Shamrock Station Irrigation Project

Prepared for Argyle Cattle Company Pty Ltd

Final Report

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EXECUTIVE SUMMARY

Argyle Cattle Company Pty Ltd (ACC) is seeking to develop a pivot irrigation project on Shamrock Station. The area will be used to produce irrigated fodder for station use. The Shamrock Station Irrigation Project (the Project) is located approximately 64 km south of Broome in the Dampierland bioregion of Western Australia.

In March 2017, ACC commissioned Phoenix Environmental Sciences Pty Ltd (Phoenix) to undertake a single-season 'detailed' flora and vegetation survey and a level 1 terrestrial fauna survey to support environmental approvals for the Project. The study area for the survey covered 3,532 ha with the proposed infrastructure constructed in areas of minimal disturbance to significant environmental values.

A desktop study of relevant databases, literature and spatial data was undertaken prior to the field surveys to compile a list of conservation significant flora and fauna species and ecological communities that may occur within the study area based on the proximity of previous records.

The field surveys were undertaken from 27 April – 6 May 2017 and included systematic sampling of flora and vegetation, assessment and mapping of vegetation type and condition, terrestrial fauna habitat assessment and mapping and targeted searches for significant flora and vertebrate fauna. A total of 25 50x50 m quadrats and seven relevés were sampled for flora and vegetation. Twenty-six vertebrate fauna sites were surveyed. The surveys were conducted in accordance with Environmental Protection Authority (EPA) guidelines for the environmental factors 'flora and vegetation' and 'terrestrial fauna'.

The desktop study for flora and vegetation identified three significant flora species as potentially occurring in the study area, all Priority flora listed by Department of Parks and Wildlife (DPaW). No Threatened species listed under the *Environment Protection and Biodiversity Protection Act 1999* (EPBC Act) or the *Wildlife Conservation Act 1950* (WC Act) were identified in the desktop study.

The desktop study determined that no threatened ecological communities (TECs) listed under the EPBC Act or the WC Act, priority ecological communities (PECs) listed by DPaW, or Environmentally Sensitive Areas are present within the study area. Six vegetation-related PECs were identified within 40 km radius of the study area, the closest located 9 km west of the study area associated with lateritic soils and steep coastal gullies; a habitat markedly different to the flat sandplain within the study area. None of the other PECs resemble vegetation of the study area.

A total of 114 flora species and subspecies representing 32 families and 78 genera were recorded during the field survey. This included 88 perennial species and 26 annual or short-lived species. No introduced flora species and no EPBC Act or WC Act listed Threatened flora were recorded in the survey. Three Priority flora species, *Tephrosia andrewii* (P1), *Polymeria* sp. Broome (P1) and *Triodia caelestialis* (P3) were recorded in the study area.

A total of six vegetation types were defined for the study area. The vegetation comprised two woodlands and four shrublands of Excellent to Very Good condition. The cleared access tracks comprised less than 1% of the study area and were rated as Completely Degraded. One of the vegetation types comprised mainly ephemeral shrubs in historically cleared areas. Four vegetation types may be considered locally significant as they contain Priority flora species.

The desktop study for terrestrial fauna identified records for 69 species of conservation significance potentially occurring in the study area. The list included 18 species listed as Threatened, Specially Protected or Conservation Dependent under the EPBC Act and/or the WC Act. Nine species are listed as Priority fauna by DPaW and 54 bird species are listed as 'Migratory' under the EPBC Act and/or WC Act.

One state-listed TEC associated with fauna values was identified in the desktop review 15 km north of the study area – Species-rich faunal community of the intertidal mudflats of Roebuck Bay; however, there are no intertidal mudflats present in the study area

A total of 50 vertebrate fauna species were recorded during the field survey including 40 birds, seven mammals and three reptiles. Two conservation significant fauna species were recorded, Bilby (*Macrotis lagotis*; Vulnerable under the EPBC Act and WC Act) from foraging diggings and Rainbow Bee-eater (*Merops ornatus*; Migratory – WC Act) from direct observations and calls, with potential habitat identified for a further nine species within the study area.

A single terrestrial fauna habitat, a tall shrubland thicket with scattered Eucalypt trees, was defined in the study area. Suitable habitat was identified for Bilby mainly on the eastern edge where understory was typically less dense than the remainder of shrubland in the study area and some open areas were present. Denser areas of shrubland habitat elsewhere in the study area were not considered optimal for Bilby movement and occurrence. While the Rainbow Bee-eater is likely to occur throughout the study area, this is a common and widely distributed bird and the habitat of the study area is not considered critical habitat for the species.

1 INTRODUCTION

Argyle Cattle Company Pty Ltd (ACC) is seeking approval to develop an irrigation project on Shamrock Station, located approximately 64 km south of Broome, Western Australia (Figure 1-1). In March 2017, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by ACC to undertake a flora and vegetation survey and terrestrial fauna survey for the Shamrock Station Irrigation Project (the Project).

The proposal includes the development of twelve 40 ha irrigation pivots, access tracks, water infrastructure for groundwater abstraction. The area will be used to produce irrigated fodder for station use and will be grazed and possibly baled as required. Site design is not finalised but will be guided by:

- access to groundwater – targeting areas of shallow water table
- environmental values identified in the baseline surveys with the aim of avoiding significant environmental values as far as practicable.

1.1 SURVEY OBJECTIVE AND SCOPE

The objective of the survey was to define the flora and vegetation, and terrestrial fauna values of the study area to inform project design and environmental approvals. The scope of works undertaken to achieve this objective was as follows:

- desktop and literature review of all existing flora and vegetation and terrestrial fauna information to define the key biological values likely to occur in the study area
- field survey in the study area comprising:
    - single season detailed flora and vegetation survey
    - level 1 terrestrial vertebrate fauna survey, including targeted plot surveys for Bilby (*Macrotis lagotis*)
- data analyses, sample processing and species identifications for samples collected during the field surveys
- preparation of maps showing significant species records, vegetation units and fauna habitats in the study area
- preparation of a technical report documenting survey methods and results.

Preliminary desktop review of habitat suitability for short range endemic invertebrates (SREs) identified low potential for SREs to be present in the study area. The fauna survey was therefore focussed on vertebrate fauna.

1.2 STUDY AREA

The study area for the survey was 3,532 ha, larger than the proposed project area and thereby allowing sufficient flexibility to avoid or minimise disturbance to significant environmental values (Figure 1-1).

Argyle Cattle Company Pty Ltd
Shamrock Station Irrigation Project

Project No	1147
Date	07-Jun-17
Drawn by	KW
Map author	JC

0 2.5 5 10 15 20
Kilometres

1:500,000 (at A4) GDA 1994 MGA Zone 51

Study area
National Parks & Nature Reserves

Figure 1-1

Project location and study area

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2 LEGISLATIVE CONTEXT

The protection of flora and fauna in Western Australia (WA) is principally governed by three acts:

- *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Western Australian Wildlife Conservation Act 1950* (WC Act)
- *Western Australian Environmental Protection Act 1986* (EP Act).

2.1 COMMONWEALTH

The EPBC Act is administered by the Federal Department of the Environment (DoE). Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of national environmental significance (NES), require approval from the Australian Government Minister for the Environment through a formal referral process. The EPBC Act provides for the listing of threatened native flora, fauna and threatened ecological communities (TECs) as matters of NES.

Conservation categories applicable to Threatened Flora and Threatened Fauna species under the EPBC Act are as follows:

- Extinct (EX)[1] – there is no reasonable doubt that the last individual has died
- Extinct in the Wild (EW) – taxa known to survive only in captivity
- Critically Endangered (CR) – taxa facing an extremely high risk of extinction in the wild in the immediate future
- Endangered (EN) – taxa facing a very high risk of extinction in the wild in the near future
- Vulnerable (VU) – taxa facing a high risk of extinction in the wild in the medium-term
- Conservation Dependent (CD)[1] – taxa whose survival depends upon ongoing conservation measures; without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat' (English & Blyth 1997). There are three categories under which ecological communities can be listed as TECs under the EPBC Act: Critically Endangered, Endangered and Vulnerable.

The EPBC Act is also the enabling legislation for protection of migratory species as matters of NES under a number of international agreements:

- Japan-Australia Migratory Bird Agreement (JAMBA)
- China-Australia Migratory Bird Agreement (CAMBA)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn)
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

[1] Species listed as Extinct and Conservation Dependent are not matters of NES and therefore do not trigger the EPBC Act.

2.2 STATE

2.2.1 Threatened and Priority species

In WA, the WC Act provides for the listing of flora and fauna species which are under identifiable threat of extinction as specially protected (threatened species). Threatened flora listed under the WC Act receive statutory protection and, under current classifications (Western Australian Government 2017a), are assigned to one of four categories (under four schedules in the act; Appendix 1):

- Schedule 1 (S1) – flora that are considered likely to become extinct or rare as critically endangered (CR) flora
- Schedule 2 (S2) – flora that are considered likely to become extinct or rare as endangered (EN) flora
- Schedule 3 (S3) – flora that are considered likely to become extinct or rare as vulnerable (VU) flora
- Schedule 4 (S4) – flora presumed to be extinct (EX).

Under current classifications, protected fauna are assigned to one of seven categories under the WC Act (Western Australian Government 2017b):

- Schedule 1 (S1) – fauna that is rare or is likely to become extinct as critically endangered (CR) fauna
- Schedule 2 (S2) – fauna that is rare or is likely to become extinct as endangered (EN) fauna
- Schedule 3 (S3) – fauna that is rare or is likely to become extinct as vulnerable (VU) fauna
- Schedule 4 (S4) – fauna presumed to be extinct (EX)
- Schedule 5 (S5) – Migratory birds protected under an international agreement (Mig.)
- Schedule 6 (S6) – fauna that is of special conservation need (SC) as conservation dependent fauna
- Schedule 7 (S7) – other specially protected (SP) fauna.

Threatened fauna species are listed under schedules 1-4. Assessments for listing of both flora and fauna are based on the International Union for Conservation of Nature threat categories.

The Department of Parks and Wildlife (DPaW) administers the WC Act and also maintains a non-statutory list of Priority Flora and Priority Fauna species (updated each year). Priority species are still considered to be of conservation significance – that is they may be rare or threatened – but cannot be considered for listing under the WC Act until there is adequate understanding of threat levels imposed on them. Species on the Priority Flora and Fauna lists are assigned to one of five priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

2.2.2 Threatened and Priority Ecological Communities

The Minister for Environment may list ecological communities, which are at risk of becoming destroyed as 'Threatened'. DPaW maintains a list of ministerial-endorsed TECs which fall into three categories:

- Critically endangered (CR)

- Endangered (EN)
- Vulnerable (VU).

There is an additional category, Presumed Totally Destroyed, where all records of the ecological community within the last 50 years have been destroyed or presumed to be destroyed.

DPaW also maintains a non-statutory list of Priority Ecological Communities (PECs), which may become Threatened Ecological Communities in the future, however currently that do not meet survey criteria or that are not adequately defined. PECs are assigned to one of five categories depending on their priority for survey or definition, with Priority 1 of highest concern and Priority 5 of lowest concern.

2.2.3 Significant flora and vegetation

Flora and vegetation may be considered significant for a range of reasons, including, but not limited to the following (EPA 2016d):

- flora
    - being identified as threatened or priority species
    - locally endemic or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
    - new species or anomalous features that indicate a potential new species representative of the range of a species (particularly, at the extremes of range recently discovered range extensions, or isolated outliers of the main range)
    - unusual species, including restricted subspecies, varieties or naturally occurring hybrids
    - relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape
- vegetation
    - being identified as threatened or priority ecological communities
    - restricted distribution
    - degree of historical impact from threatening processes
    - a role as a refuge
    - providing an important function required to maintain ecological integrity of a significant ecosystem.

2.2.4 Clearing of native vegetation

The clearing of native vegetation in WA is not generally permitted where the biodiversity values, land conservation and water protection roles of native vegetation would be significantly affected. Any clearing of native vegetation in WA requires a permit under Part V Division 2 of the EP Act, except where an exemption applies under the Act, or is prescribed by the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (the Regulations), and the vegetation is not in an Environmentally Sensitive Area (ESA). Permit applications to clear native vegetation require assessment against the '10 Clearing Principles', as outlined in the regulations.

2.2.5 Environmentally Sensitive Areas

Under section 51B of the EP Act the Minister for Environment may declare by notice either a specified area of the State or a class of areas of the State to be Environmentally Sensitive Areas (ESAs). ESAs are declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, which was gazetted on 8 April 2005 (DMP 2008).

ESAs are areas where the vegetation has high conservation value. Several types of areas are declared ESAs including:

- the area covered by vegetation within 50 m of Threatened Flora, to the extent to which the vegetation is continuous with the vegetation in which the Threatened Flora is located
- the area covered by a TEC
- a defined wetland (Ramsar wetlands, conservation category wetlands and nationally important wetlands) and the area within 50 m of the wetland
- Bush Forever sites.

2.3 INTRODUCED FLORA

Introduced flora pose threats to biodiversity and natural values by successfully out-competing native species for available nutrients, water, space and sunlight; reducing the natural structural and biological diversity by smothering native plants or preventing them from growing back after clearing, fire or other disturbance; replacing the native plants that animals use for shelter, food and nesting; and altering fire regimes, often making fires hotter and more destructive (AWC 2007).

Management of some weed species is required under Commonwealth or State frameworks. Key classifications for significant introduced flora that are relevant to this report are:

- declared pest – the *Biosecurity and Agriculture Management Act 2007* (BAM Act), Section 22 makes provision for a plant taxon to be listed as a declared pest organism in parts of, or the entire State. Under the *Biosecurity and Agriculture Management Regulations 2013* declared pests are assigned to one of three control categories that dictate level of management required (DAFWA 2016).
- Weed of National Significance (WoNS) – high impact, established introduced flora causing major economic, environmental, social and/or cultural impacts in a number of states/territories, and which have strong potential for further spread (Australian Weeds Committee 2012) Management is required in accordance with Department of Agriculture and Food guidelines for particular WoNS.

Throughout this report, introduced flora species are indicated with an asterisk (*).

3 EXISTING ENVIRONMENT

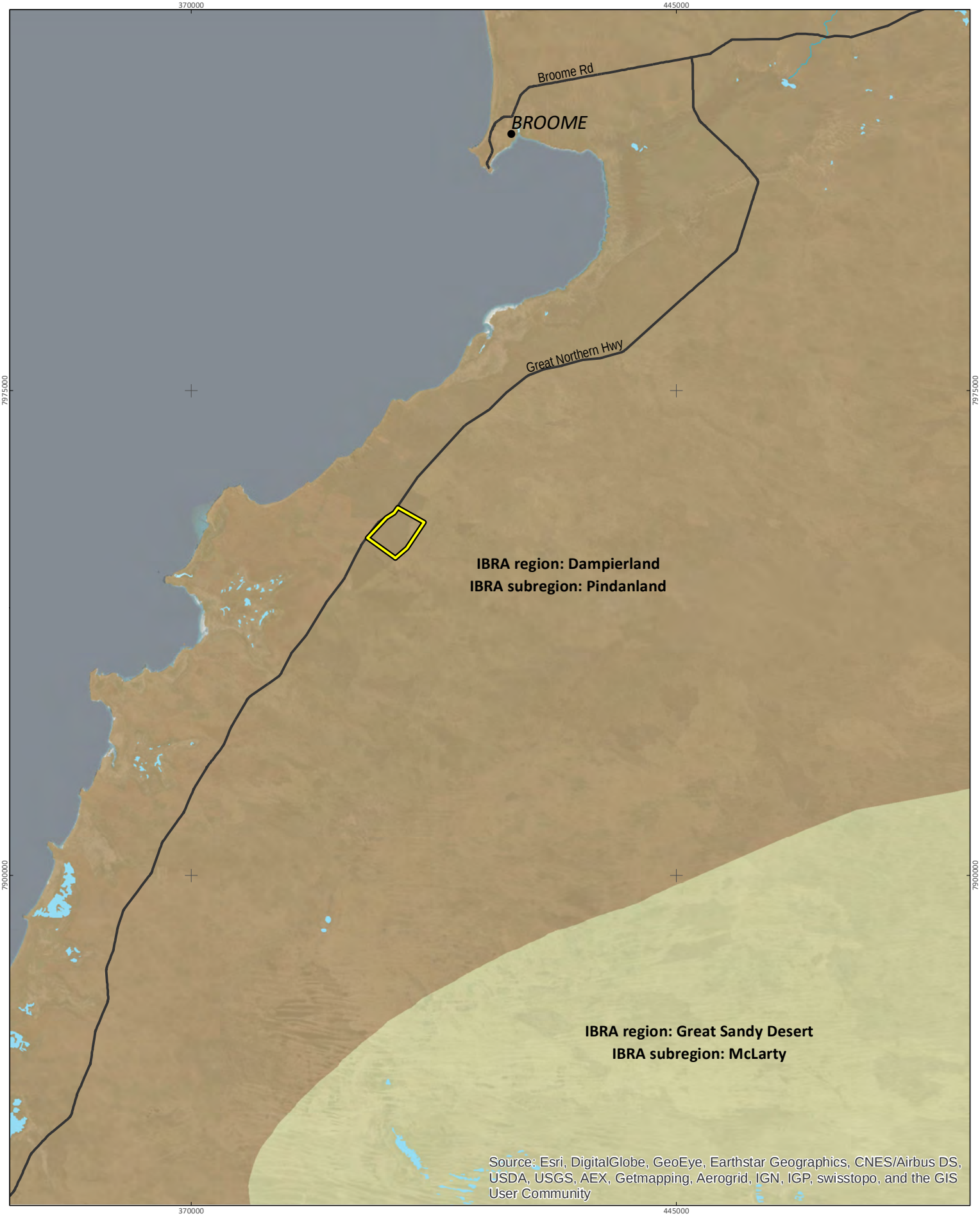
3.1 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA

The Interim Biogeographic Regionalisation of Australia (IBRA) defines 'bioregions' as large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems (Department of the Environment and Energy 2016; Thackway & Cresswell 1995). They categorise the large-scale geophysical patterns that occur across the Australian continent that are linked to fauna and flora assemblages and processes at the ecosystem scale (Thackway & Cresswell 1995).

Western Australia contains 26 IBRA bioregions and 53 subregions. The study area falls within the Dampierland bioregion, which covers an area of 83,460 km^2 (DEWHA 2008; Thackway & Cresswell 1995) and is divided into two subregions (May & McKenzie 2003): Fitzroy Trough (DAL01) and Pindanland (DAL02). The study area is situated within the Pindanland subregion (Figure 3-1) which is characterised by (Graham 2001):

- Quaternary sandplain overlying Jurassic ad Mesozoic sandstones with Pindan. There are hummock grasslands on hills.
- Quaternary marine deposits on coastal plains, with mangal, samphire – *Sporobolus* spp. Grasslands, *Melaleuca alsophila* low forests, and *Spinifex* spp. – *Crotalaria* spp. Strand communities.
- Quaternary alluvial plains associated with the Permian and Mesozoic sediments of Fitzroy Trough support tree savannahs of ribbon grass (*Chrysopogon* spp.) – bluegrass (*Dichanthium* spp.) grasses with scattered coolabah (*Eucalyptus microtheca*) – *Bauhinia cunninghamii*. There are riparian forests of river red gum *(Eucalyptus camaldulensis*) and Cadjeput (*Melaleuca* spp.) fringe drainages.
- Dry hot tropical to semi-arid climate with summer rainfall.

Rare features within the subregion include numerous patches of rainforest found mainly behind coastal primary dune structure unique to Dampier Peninsula, extensive mudflats of Roebuck Bay and Eighty Mile Beach, vast grasslands of the Roebuck Plains and coastal swamps adjacent to Eighty Mile Beach (Graham 2001).



Argyle Cattle Company Pty Ltd
Shamrock Station Irrigation Project

Project No	1147
Date	07-Jun-17
Drawn by	KW
Map author	JC

0 5 10 20 30
Kilometres

1:750,000 (at A4) GDA 1994 MGA Zone 51

Study area
IBRA region
Dampierland
Great Sandy Desert

Figure 3-1

IBRA region of the study area

PHOENIX ENVIRONMENTAL SCIENCES

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3.2 LAND SYSTEMS

The Department of Agriculture and Food (DAFWA) has mapped the land systems in the Kimberley Region (Schoknecht & Payne 2011). The study area falls entirely within the Yeeda land system (Figure 3-2) which is described as sandplains and occasional dunes with shrubby spinifex grasslands or pindan woodlands; sandplains with deep red and yellow sands (Schoknecht & Payne 2011).

Important vertebrate fauna habitats contained within the Yeeda land system of the study area includes:

- sandplain habitat supporting shrubby spinifex grasslands or pindan woodlands for conservation significant burrowing mammal species, including the Greater Bilby and Short-tailed Mouse.
- sandplain habitat providing suitable foraging habitat and possibly nesting habitat where suitable trees or structures are present for conservation significant birds of prey, including the Grey Falcon and Peregrine Falcon.

Argyle Cattle Company Pty Ltd
Shamrock Station Irrigation Project

Project No	1147
Date	21-Jun-17
Drawn by	KW
Map author	JC

0 1 2 4 6
Kilometres

1:150,000 (at A4) GDA 1994 MGA Zone 51

Study area

Land systems

- Yeeda System
- Eighty Mile System
- Gourdon System
- Phire System
- Roebuck System

Figure 3-2

Land system of the study area

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3.3 CLIMATE AND WEATHER

The climate of the Pindanland subregion is described dry hot tropical and semi-arid with summer rainfall (Graham 2001). The nearest Bureau of Meteorology (BoM) weather station with comprehensive data collection and historic climate data is located at Bidyadanga Community (no. 003030, Latitude: -18.6844S Longitude: 121.7803E) approximately 35 km southwest of the study area. Bidyadanga records the highest maximum mean monthly temperature (35.7°C) in April, the lowest maximum mean annual temperature (14.1°C) in July (BoM 2017) (Figure 3-3). Average annual rainfall is 515.9 mm with January, February and March recording the highest monthly averages (127.5, 136.9 and 95.5 mm respectively). Tropical rain-bearing depressions moving southwards from northern Australian waters can cause cyclonic activity and heavy rainfall events during the summer months (BoM 2017) (Figure 3-3).

Daily mean temperatures preceding the survey from April 2016 to March 2017 fluctuated above and below the long-term annual averages (Figure 3-3). Mean minimum temperatures were above annual averages from April 2016 to December 2016 but close to annual averages from January to March 2017. Mean maximum temperatures recorded were above or close to equal with annual averages between April and December 2016, with below average maximum temperatures recorded in January and February 2017 and almost equal to annual averages in March 2017.

Records from Bidyadanga Community weather station show variable amounts of rainfall in the 12 months preceding the survey compared with the long-term annual average (Figure 3-3). Above average rainfall was recorded for the months of May, August, October, December and February with below average recorded for the remainder. Well above average rainfall recorded in December 2016 occurred as a result cyclonic activity in the northwest of WA during which 408 mm of rain was recorded in comparison to the long-term annual average of 57.8 mm for the month (Figure 3-3).

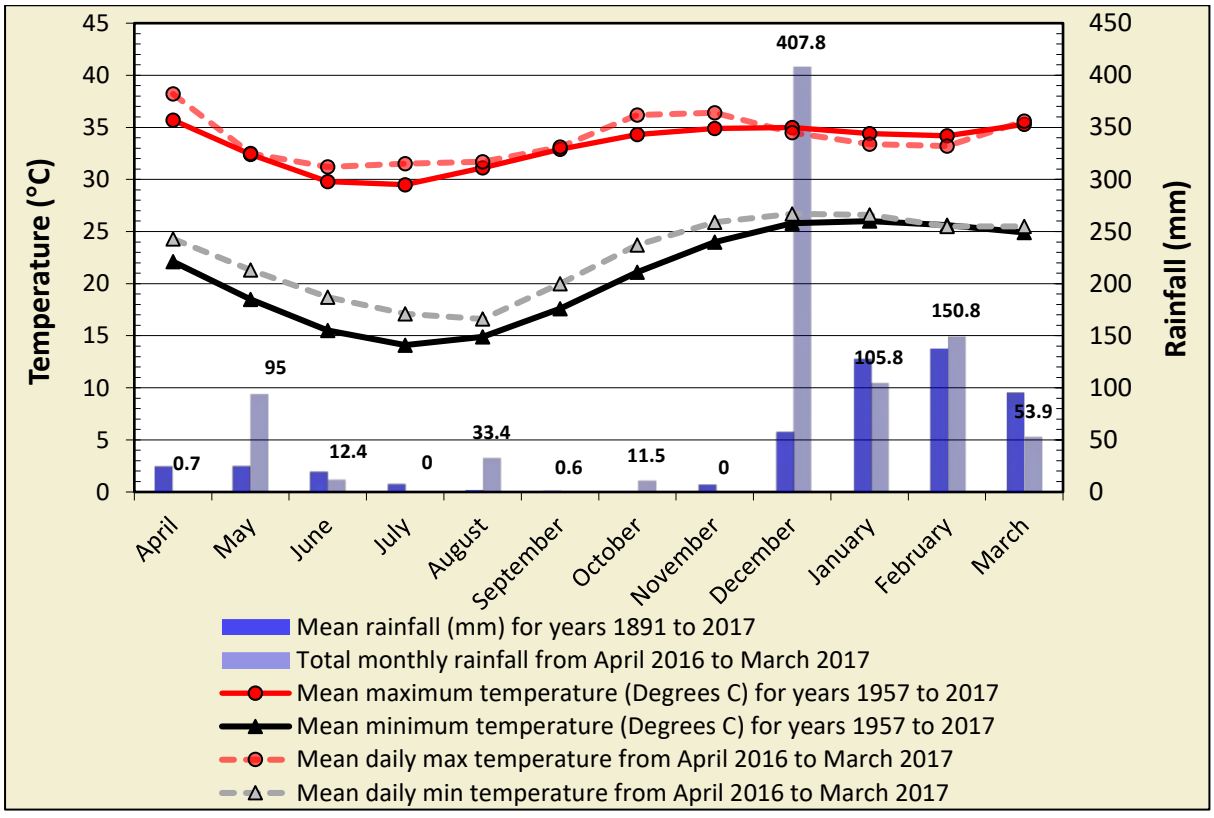


Figure 3-3 Annual climate and weather data for Bidyadanga Community (no. 003030) (BoM 2017) and mean monthly data for the 12 months preceding the field survey

3.4 LAND USE

The dominant land use within the Pindanland subregion is Unallocated Crown Land (UCL) or Crown reserve and grazing-native pasture-leasehold and to a lesser extent conservation reserves (Graham 2001).

3.5 CONSERVATION RESERVES AND ENVIRONMENTALLY SENSITIVE AREAS

The study area does not intersect any ESAs or conservation reserves; however, the Karajarri Indigenous Protected Area is located directly to the west (Figure 1-1).

3.6 THREATENING PROCESSES

Several threatening processes affect biodiversity values of the Pindanland subregion (Graham 2001):

- habitat alteration from grazing pressure
- habitat fragmentation or loss of remnant vegetation from clearing
- introduction and spread of feral fauna
- introduction and spread of non-native flora
- wildfire and modified fire regimes
- modification of hydrology
- disturbance to groundwater for irrigated agriculture
- pollution
- climate change.

4 METHODS

Survey design, methodology and report-writing adhered to relevant principles and guidelines, including:

- EPA *Statement of Environmental Principles, Factors and Objectives* (EPA 2016c)
- EPA *Environmental Factor Guideline: Flora and vegetation* (EPA 2016a)
- EPA *Technical Guidance: Flora and vegetation surveys for Environmental Impact Assessment* (EPA 2016d)
- EPA *Environmental Factor Guideline: Terrestrial fauna* (EPA 2016b)
- EPA *Technical Guidance: Terrestrial fauna surveys* (EPA 2016f)
- EPA *Technical Guidance: Sampling methods for terrestrial vertebrate fauna* (EPA 2016e).

4.1 DESKTOP REVIEW

4.1.1 Database searches and literature review

Database searches and a literature review (Table 4-1) were undertaken to identify the significant flora, vegetation and fauna that may occur within the study area. The following database searches were undertaken within a 40 km buffer around the study area:

- EPBC Act Protected Matters Search Tool (Department of the Environment and Energy 2017b)
- DPaW Threatened Flora, Fauna and Ecological Communities database searches (DPaW 2017e)
- DPaW/WA Museum NatureMap database (DPaW 2017d)
- Birdlife Australia Birdata database (Birdlife Australia 2017).

Table 4-1 Flora and vegetation survey reports incorporated in the desktop review

Report author	Survey type	Project
GHD (2009)	Detailed Flora and Fauna survey	Broome North: Southern Portion (Area A)
GHD (2013)	Vegetation and Flora survey	Cape Leveque Road
Biota (2009)	Vegetation and Flora survey	James Price Point: Wet Season

4.1.2 Habitat assessment

Initial characterisation of terrestrial fauna habitats in the study area was undertaken using various remote geographical tools, including aerial photography (incl. Google Earth™), land system maps and topographic maps. Desktop habitat characterisation was verified and broad fauna habitats were defined and mapped within the study area during the field survey. The potential for the habitats of the study area to support conservation significant flora, ecological communities and terrestrial fauna was then assessed based on species-specific habitat preferences and nearest records.

4.2 FIELD SURVEY

The concurrent flora and vegetation and terrestrial fauna survey was undertaken over ten consecutive days from 27 April to 6 May 2017.

4.2.1 Flora and vegetation

Field methods for the flora and vegetation survey of the study area included:

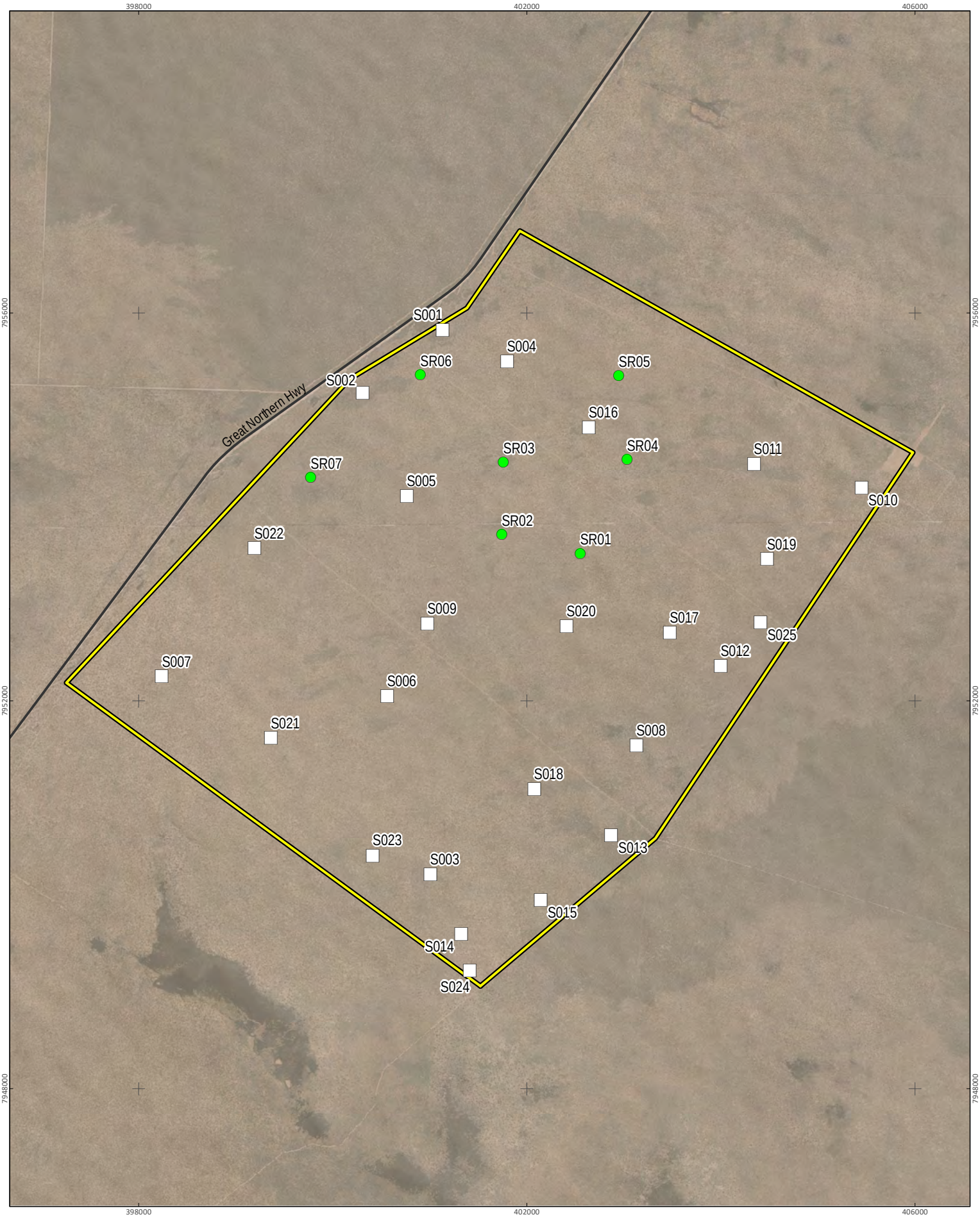
- surveying of quadrats and relevés (see 4.2.1.1)
- targeted flora searches (see 4.2.1.2)
- vegetation association mapping (see 4.2.1.3)
- vegetation condition mapping (see 4.2.1.4).

Prior to the commencement of the field surveys, data including satellite imagery, estimated survey boundary, and pre-selected vegetation quadrats were loaded onto tablets using the application GIS Pro version 3.18 (Garafa 2016). The field survey involved assessing and mapping vegetation boundaries, conducting, where possible, at least three quadrat/relevés sites per vegetation unit and collecting opportunistic flora specimens. GPS locations of vegetation and condition boundaries, and quadrat, relevés and flora specimen data were recorded on an Apple™ digital tablet using Mobile Data Studio (MDS) version 8.0 (CreativityCorp 2016). Photographs were taken at each quadrat (in a south-easterly direction from the north-west corner) and relevé.

4.2.1.1 Quadrats and relevés

Quadrat locations were selected to ensure that an accurate representation of the major vegetation types within the study area were sampled adequately. Two methods were used for the selection of quadrat placement within the study area. Preliminary quadrat locations were pre-selected using high quality aerial photography; with selection based on apparent changes in the vegetation visible in the aerial imagery. The preliminary quadrat locations were re-assessed during the site visit, while ground-truthing the study area on foot. Some preliminary quadrats were moved to locations which better represented vegetation types and some quadrats were changed to relevés, where only dominant vegetation was recorded for the purposes of accurate vegetation mapping. In total, 25 quadrats and seven relevés were surveyed across the study area (Figure 4-1; Appendix 3).

Co-ordinates of all corners of each quadrat were recorded on a hand-held Garmin GPS. A solitary GPS co-ordinate was recorded for each relevé.



Argyle Cattle Company Pty Ltd
Shamrock Station Irrigation Project

Project No	1147
Date	07-Jun-17
Drawn by	KW
Map author	KC

0 0.25 0.5 1 1.5 2
Kilometres

1:50,000 (at A4) GDA 1994 MGA Zone 51

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Study area
Quadrat sites
Relevé sites

Figure 4-1

Flora and vegetation survey sites

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The following information was recorded for each quadrat:

- location – the geographic coordinates of all four corners of the quadrat in WGS84 projection
- description of vegetation – a broad description utilising the structural formation and height classes based on National Vegetation Information System (ESCAVI 2003) and in accordance with EPA (2016d) (Appendix 2)
- habitat – a brief description of landform and habitat
- geology – a broad description of surface soil type and rock type
- disturbance history – a description of any observed disturbance including an estimate of time since last fire, weed invasions, soil disturbance, human activity and fauna activity
- vegetation condition – the condition of the vegetation was recorded utilising the condition scale of Trudgen (1988 in EPA 2016d) (Table 4-2)
- height and percentage foliage cover (PFC) – a visual estimate of the canopy cover of each species present within the 50 m x 50 m quadrat was recorded as a percentage, as was the total vegetation cover, cover of shrubs and trees >2 m tall, cover of shrubs <2 m, total grass cover and total herb cover.
- photograph – a colour photograph of the vegetation within each quadrat in a south-easterly direction from the north-west corner of the quadrat
- flora species list – a list including the name of every flora species present within the quadrat; to ensure accurate taxonomic identification of flora species present within the B2018 study area, collections were made of each specimen at least once and each collection was pressed and documented for identification using the WA Herbarium resources.

4.2.1.2 Targeted flora searches

Targeted flora searches were undertaken simultaneously with the flora and vegetation survey to determine whether any of the conservation significant species identified from the desktop and literature review occurred in the study area. The searches focused on habitats considered likely to support conservation significant flora, in addition to previously recorded locations of conservation significant plants or populations in close proximity to the study area.

If a flora species was considered to potentially be a conservation significant species (i.e. similar floristic characteristics and occurring within suitable habitat) the following information was collected:

- GPS coordinates, including population boundary where applicable
- description of the habitat and floristic community in which the potential conservation significant species was located
- population size estimate (i.e. estimated number of individual plants) where applicable
- specimen collection for taxonomic identification and lodgement at the WA Herbarium
- photograph of live plant in situ and description of important details, such as flower colour, height of individual or average height of population.

4.2.1.3 Vegetation mapping

The vegetation descriptions from quadrats and relevés from the survey were grouped according to similarity of community structure (i.e. canopy levels), species composition and combination of species and the prevalent community structure (i.e. woodland, shrubland, etc.). The vegetation boundaries were mapped utilising high-quality colour aerial photography and from vegetation boundaries recorded on GPS during the field survey.

To support delineation of vegetation types, a cluster analysis was conducted based on species cover in each quadrat. The fusion strategy for the site classification was flexible UPGMA with a beta value of -0.1 and Bray Curtis association measure in the software package PATN (Belbin 2003). A dendrogram was produced to illustrate the similarities between the vegetation units identified. Statistically distinct vegetation units (the floristic group) classified the vegetation at a local scale. Local scale vegetation units were described at NVIS Level V – Association (ESCAVI 2003). The term 'vegetation type' was used for local scale vegetation units in accordance with the technical guidance (EPA 2016d).

4.2.1.4 Condition mapping

The condition of vegetation was mapped across the study area based on the Trudgen (1988 in EPA 2016d) scale, an appropriate condition rating scale for the Northern Botanical Province where the Pindanland subregion is located (EPA 2016d).

The vegetation condition ratings relate to vegetation structure, the level of disturbance and weed cover at each structural layer and the ability of the vegetation unit to regenerate. Vegetation condition ranges from Excellent being the highest rating to Completely Degraded as the lowest (Table 4-2).

Table 4-2 Vegetation condition rating scale (Trudgen 1988, in EPA 2016d)

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

4.2.2 Fauna and fauna habitat

4.2.2.1 Site selection

Initial habitat characterisation was undertaken using various remote geographical tools, including aerial photography (Google Earth®), land system maps and topographic maps. Habitats with the potential to support conservation significant terrestrial fauna species were identified based on known habitats of such species within the Dampierland bioregion. Tentative sites corresponding with flora and vegetation survey quadrats were selected for the terrestrial fauna survey to represent all habitat types. Final survey site selection was conducted after ground-truthing of site characteristics.

At the broadest scale, site selection considered aspect, topography and land systems. At the finer scale, consideration was given to proximity to water bodies (drainage lines and creek), vegetation complexes and condition and soil type. Sites were primarily chosen to represent the best example of distinct habitats within the broader habitat associations of the study area. Consideration was also given to the potential project footprint, as available at the time which predominantly occurred in the northern section for the study area.

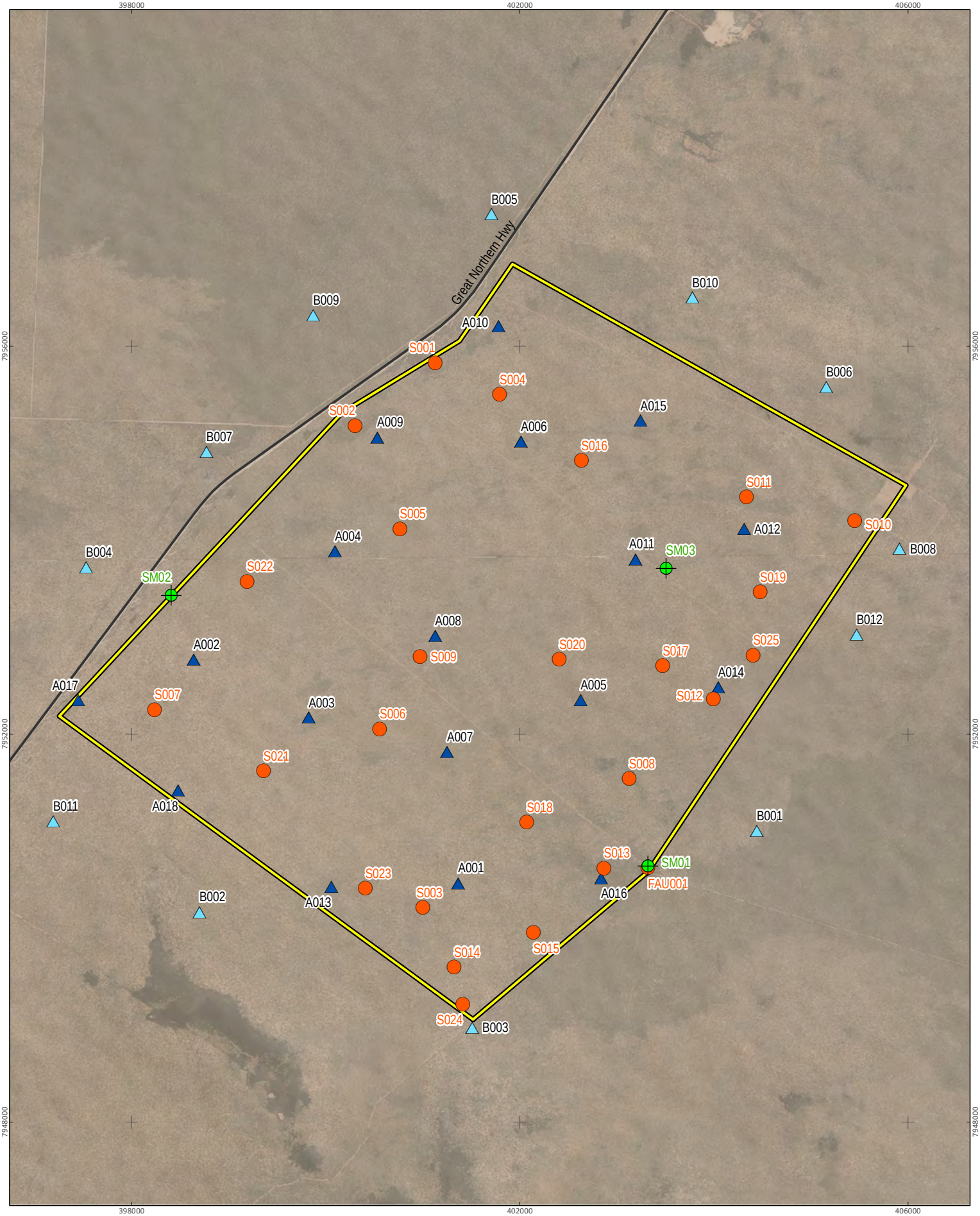
4.2.2.2 Vertebrate fauna

Twenty-six level 1 terrestrial fauna sites were surveyed comprising all botany quadrats and one additional site. These covered all fauna habitats in the study area. In addition, 30 targeted Bilby plot surveys were undertaken in the study area and within a 1 km buffer of the study area (Figure 4-2). Habitat descriptions and characteristics were recorded at all sites (Appendix 7). Survey work was undertaken over 10 consecutive days and comprised:

- active searches (for details see section 4.2.2.2.1)
- avifauna surveys (see 4.2.2.2.1)
- bat echolocation and Night Parrot call recordings (see 4.2.2.2.2)
- opportunistic records (see 4.2.2.2.3)
- targeted Bilby survey plots (see 4.2.2.2.4).

4.2.2.2.1 **Active searches**

Active searches were undertaken at each of the 26 level 1 fauna survey sites and primarily targeted diurnal herpetofauna and mammals from direct sightings and secondary evidence. Searches were undertaken in any observable microhabitats considered likely to support mammals, reptiles and amphibians. Techniques included: raking leaf and bark litter, overturning logs, searching beneath the bark of trees, investigating dead trees and logs, investigating burrows, investigating infrastructure ruins or disused building materials such as tin piles and identifying any secondary evidence including tracks, diggings, scats, fur or sloughs (shed skins), predation or feeding sites, and fauna constructed structures such as nests. A minimum of one person hour was spent active searching at each site for a total of 26 hours over the duration of the field survey.



Western Australia

PERTH

Argyle Cattle Company Pty Ltd
Shamrock Station Irrigation Project

Project No	1147
Date	14-Jun-17
Drawn by	KW
Map author	RE

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Kilometres

1:50,000 (at A4) GDA 1994 MGA Zone 51

- Study area
- Level 1 fauna site
- SongMeter site
- Targeted bilby plot site within study area
- Targeted bilby plot site within buffer

Figure 4-2

Terrestrial fauna survey sites

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4.2.2.2.1 Avifauna surveys

Twenty-minute avifauna surveys were undertaken at each of the 26 level 1 fauna survey sites (Figure 4-2). Avifauna surveys were confined to the habitat type (up to 2 ha) represented by each level 1 survey site to collect assemblage data for each habitat. Avifauna surveys were undertaken throughout the day with a focus on periods of higher activity around sunrise and sunset. Surveys consisted of bird recordings from visual sightings and call recognition.

Additional avifauna observations were also recorded at opportunistically while other field work was being completed, including observations made during travel and active searches or during targeted Bilby plot surveys.

A total of approximately 8.6 person hours of avifauna census was undertaken during the field survey.

4.2.2.2.2 Bat echolocation and Night Parrot call recordings

SongMeter SM2 recording devices were used to record bat echolocation and night parrot calls at three opportunistic sites (Figure 4-2). Recording devices were deployed at each site for one night of recording for between eight and 12 continuous hours per night. Recording devices were aimed at a 45° angle to the ground. Areas of habitat likely to have increased insect activity and to attract bats (i.e. open water sources and likely movement corridors) and potential roosting and nesting sites for Night Parrots (*Pezoporus occidentalis*) (DPaW 2017c) were targeted. The recorded data were analysed by Mr. Bob Bullen, Bat Call WA.

4.2.2.2.3 Opportunistic records

Any opportunistic observations of vertebrate species were recorded during the survey, particularly conservation significant species. Opportunistic sampling involved recording all sightings of vertebrate fauna species while working and travelling within the study area, including species recorded during targeted Bilby plot searches.

4.2.2.2.4 Targeted Bilby survey plots

Consultation was undertaken with DPaW prior to the survey regarding proposed survey methodology for Bilby (Appendix 5).

Targeted Bilby plot surveys were undertaken to search for evidence of occurrence of the species in the study area using standardised 2 ha plots adopted from Southgate *et al.* (2005) and Southgate and Moseby (2008). Due to the size of the study area the distance between placement of plots was reduced for a greater survey effort within the study area. Eighteen random 2 ha plots (~142 m x 142 m), spaced approximately 1–2 km apart (no less than 1 km, no greater than 2 km) within the study area and a further 12 within a 1 km buffer of the study area to identify activity in close proximity (Figure 4-2). Each plot was surveyed for 0.5 person hour (1 observer = 30 min, 2 = 15 min each) during which searches will be undertaken for any evidence of the species including tracks, scats, foraging diggings and/or burrows. Suitability of habitat for Bilby was assessed at all plots based on substrate and vegetation structure or density.

Three fixed transect searches were undertaken along sandy tracks bordering the west, north and east edges of the study area for evidence of Bilby occurrence indicating movement into and out of the study area into areas adjacent to the study area. In addition to 2 ha survey plots and fixed transects, additional transects searches were undertaken while traversing between Bilby survey plots and when moving between level 1 survey sites for evidence of Bilby occurrence.

4.2.1 Taxonomy and nomenclature

Plant species were identified using local and regional flora keys, and comparisons with named species held at the WA Herbarium. Nomenclature for flora and vegetation used in this report follows that used by FloraBase (DPaW 2017b) and the WA Herbarium. The conservation status of all recorded flora was compared against the current lists available on FloraBase (DPaW 2017b) and the EPBC Act Threatened species database provided by the Department of the Environment (Department of the Environment and Energy 2017a).

The taxonomy and nomenclature of terrestrial vertebrate fauna follows several taxon-specific references (Table 4-3).

Table 4-3 Nomenclatural references, morphospecies designations and reference collections

Taxonomic group	Taxonomic reference for described species and higher taxa
Mammals	Menkhorst and Knight (2011)
Birds	Simpson and Day (2010) Christidis and Boles (2008)
Reptiles	Wilson and Swan (2013)
Amphibians	Tyler and Doughty (2009)

4.3 SURVEY PERSONNEL

The personnel involved in the survey are presented (Table 4-4).

Table 4-4 Project team

Name	Qualifications	Role/s
Mr Ryan Ellis	Dip. (Cons. Land Mgmt.)	Project manager, field survey, fauna taxonomy (vertebrates) and reporting
Dr Grant Wells	PhD (Botany)	Field surveys, flora taxonomy, data analyses and report review
Dr Grace Wells	PhD (Plant Conservation)	GIS and vegetation mapping, reporting
Ms Alice Watt	BSc. Hons (Cons Bio. and Botany.)	Reporting
Mrs Karen Crews	BSc. (Env. Biol.) (Hons)	Reporting
Mrs Kathryn Wyatt	BIS. (GIS) Grad. Cert. (GIS)	GIS
Mr Bob Bullen (Bat Call WA)	B. Eng. (Aero. Eng.)	Bat echolocation analysis
Frank Obbens (WA Herbarium)	BSc. Hons. (Env. Biol.)	Flora taxonomy

5 RESULTS

5.1 DESKTOP REVIEW

5.1.1 Flora and vegetation

5.1.1.1 Conservation significant flora

Three conservation significant flora species were identified from the database searches and literature review as previously recorded within 40 km of the study area (Table 5-1).

Table 5-1 Conservation significant flora species identified from the desktop review

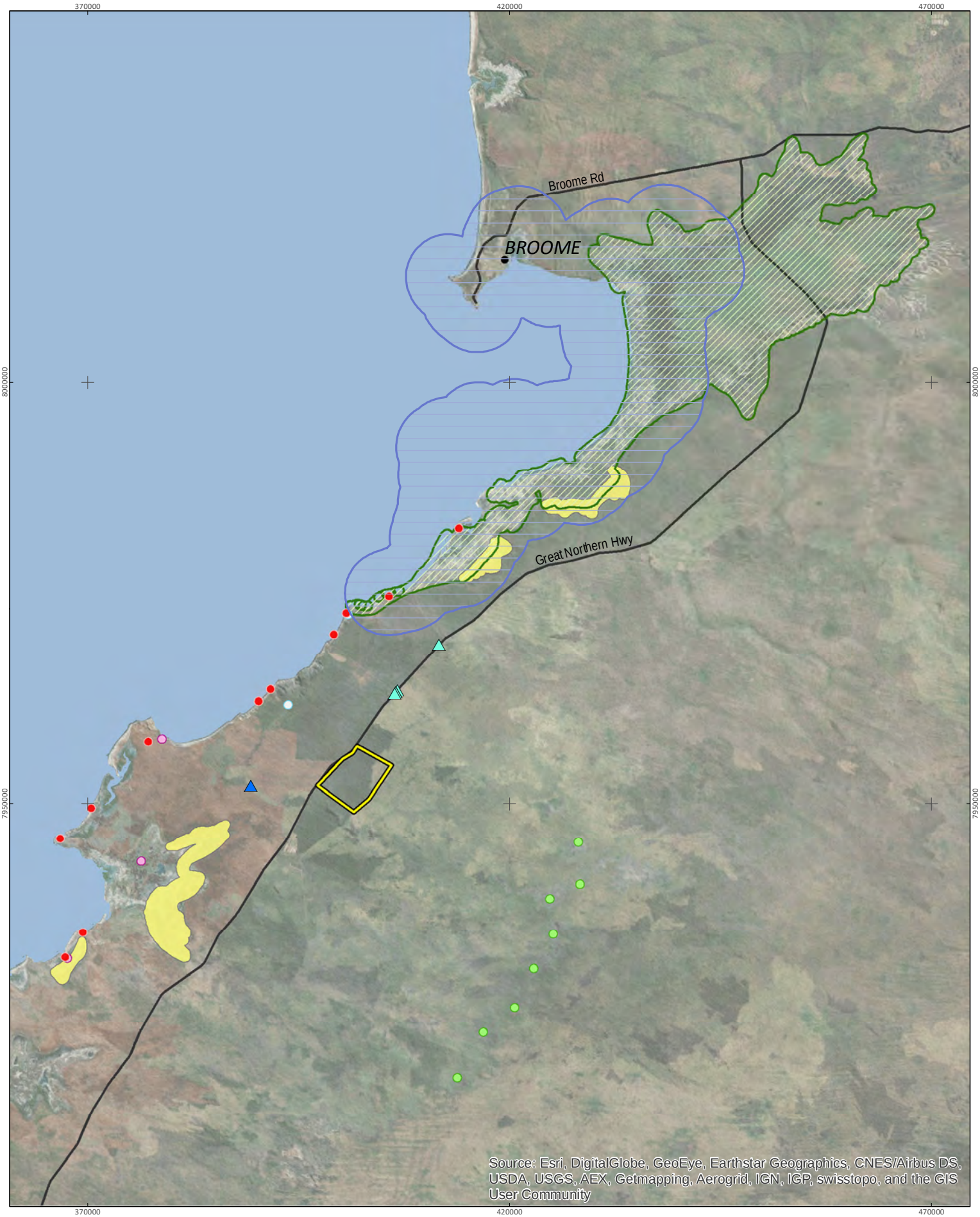
Species	DPaW Priority list	Nearest record to study area	Source
Polymeria distigma	P3	Records ~16 km east of study area	NatureMap
Tephrosia andrewii	P1	Records ~8 km north of study area	NatureMap DPaW T&P flora database
Triodia caelestialis	P3	Records ~8 km west of study area	NatureMap DPaW T&P flora database

5.1.1.2 Introduced flora

The desktop assessment identified records for 11 weed species near the study area (Table 5-2). One of the species, *Parkinsonia aculeata* is a declared pest.

Table 5-2 Weed species recorded by the desktop assessment near the study area

Family	*Name*	WoNS
Amaranthaceae	*Amaranthus viridis*	
Poaceae	*Cenchrus americanus*	
Poaceae	*Cenchrus biflorus*	
Poaceae	*Cenchrus ciliaris*	
Poaceae	*Cenchrus setiger*	
Poaceae	*Eragrostis cilianensis*	
Poaceae	*Megathyrsus maximus*	
Fabaceae	*Parkinsonia aculeata*	yes
Verbenaceae	*Phyla nodiflora var. nodiflora*	
Fabaceae	*Prosopis ssp.*	
Fabaceae	*Stylosanthes hamata*	



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Date	21-Jun-17
Drawn by	KW
Map author	JC

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Kilometres

1:575,000 (at A4) GDA 1994 MGA Zone 51

- Study area
- *Tephrosia andrewii* (P1)
- *Triodia caelestialis* (P3)
- Species-rich faunal community of the intertidal mudflats of Roebuck Bay (Vulnerable)
- Eighty Mile Land System (P3)
- Gourdon Land System (P3)
- Kimberley Vegetation Association 37 (P3)
- Kimberley Vegetation Association 73 (P3)
- Parda Land System (P3)
- Roebuck Land System (P3)

Figure 5-1

Desktop records of conservation significant flora and ecological communities

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5.1.1.3 Vegetation associations

Regional scale vegetation mapping by Shepherd *et al.* (2002, after Beard) defined two vegetation associations in the study area (Figure 5-2):

- Association 699 *Acacia* thicket with scattered low trees over spinifex *Acacia eriopoda*, *Corymbia dichromophloia*, *Triodia pungens*, *T. bitextura* – covering the majority of the study area
- Association 104 Hummock grassland with scattered shrubs or mallee *Triodia* spp. *Acacia* spp., *Grevillea* spp. *Eucalyptus* spp.

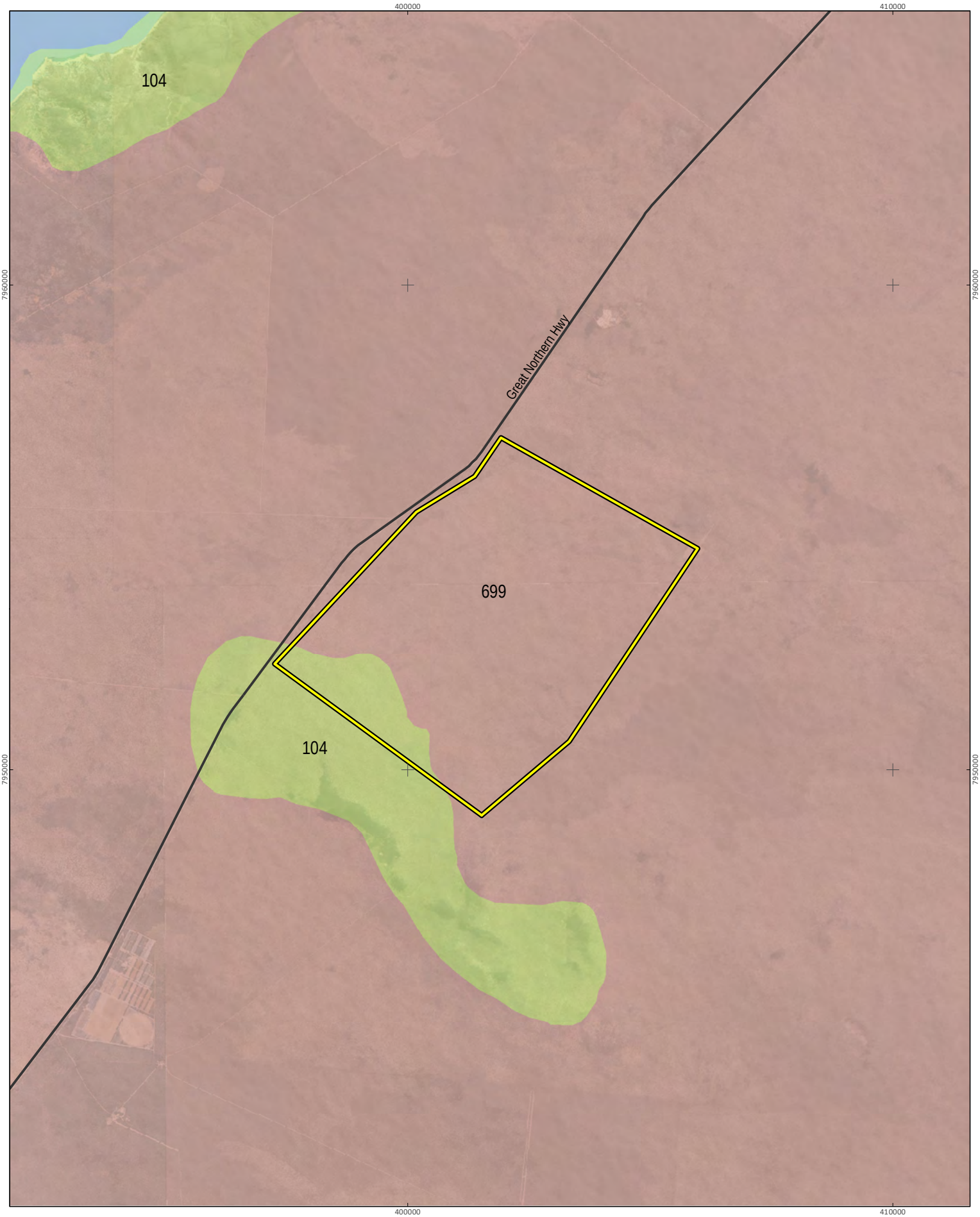
Both vegetation associations are extensively represented in the Pindanland subregion and have over 99% remaining according to Government of Western Australia (2016).

5.1.1.4 Threatened and Priority Ecological Communities

No Commonwealth or State listed TECs or DPaW listed PECs intersect the study area. Six vegetation-related PECs were identified within the area of the desktop review (Figure 5-1; Table 5-2). Based on TEC/PEC descriptions, land system of the study area and regional vegetation associations of study area (section 5.1.1.3), it was considered unlikely that the vegetation of the study area would align with any of the communities.

Table 5-2 Priority ecological communities identified in the desktop review

Community name	Conservation status	Proximity and relevance to study area
Eighty Mile Land System	P3	12 km west. Beach foredunes, longitudinal coastal dunes and sandy plains with tussock grasslands and spinifex grasslands. Not relevant to study area, Eighty Mile land system. Not represented in study area.
Gourdon Land System	P3	9 km west. Sandplain and undulating lateritic country with steep coastal gullies supporting spinifex grasslands with scattered trees. Not relevant to study area, Gourdon land system not represented in study area.
Parda Land System	P3	25 km east. Conical hills, stony ring plains, alluvial plains and shallow valleys supporting spinifex grasslands with sparse shrubs and trees. Not relevant to study area, Parda land system not represented in study area.
Roebuck Land System	P3	20 km west. Paleo-tidal coastal plains and tidal flats with saline soil supporting salt-water couch grasslands, samphire low shrublands, melaleuca. Not relevant to study area, Roebuck land system not represented in study area.
Kimberley Vegetation Association 37	P3	12 km SW. As defined by John Beard's vegetation mapping for the Kimberley. Shrublands; teatree thicket. Unlikely to be relevant to study area
Kimberley Vegetation Association 73	P3	17 km north. As defined by John Beard's vegetation mapping for the Kimberley (Beard 1979). Grasslands, tall bunch grass savanna, Mitchell & blue grass. Unlikely to be relevant to study area



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- Study area
- 104: Hummock grasslands, shrub steppe; *Grevillea refracta* and hakea over soft spinifex
- 699: Shrublands, pindan; *Acacia eripoda* shrubland with scattered low bloodwood (*Eucalyptus dicromophloia*) and *E. setosa* over soft and curly spinifex on sandplain

Figure 5-2

Shepherd *et al.* (2002) vegetation associations of the study area

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5.1.2 Fauna and fauna habitat

A total of 287 terrestrial vertebrate fauna species were identified in the desktop review as potentially occurring in the study area (Appendix 7). This comprised of one freshwater fish, three frogs, 42 reptiles, 216 birds (215 native or migratory and one introduced) and 25 mammals (17 native and eight introduced). All marine species returned in the desktop review, due to the proximity of the study area to the coast and the desktop review search area, were subsequently excluded due to the absence of any marine habitats within the study area.

A total of 69 species or subspecies of conservation significance were identified in the desktop review including 18 listed under the EPBC Act and/or WC Act as Threatened, Conservation Dependent or Specially Protected (Table 5-3; Figure 5-3). Fifty-four species are listed as 'Migratory' under the EPBC Act and WC Act and nine species are listed as Priority species (Table 5-3). Nine species returned for the desktop review are listed as Threatened and Migratory under the EPBC Act and/or WC Act (CR, EN, VU) and two are listed as Threatened under the EPBC Act and as a Priority species by DPaW (Table 5-3).

One state-listed TEC associated with fauna values was identified in the desktop review – Species-rich faunal community of the intertidal mudflats of Roebuck Bay (VU) (Figure 5-1). The buffer boundary for this TEC is 15 km north of study area. The TEC is not relevant to study area as it is confined to the Roebuck Bay mudflats.

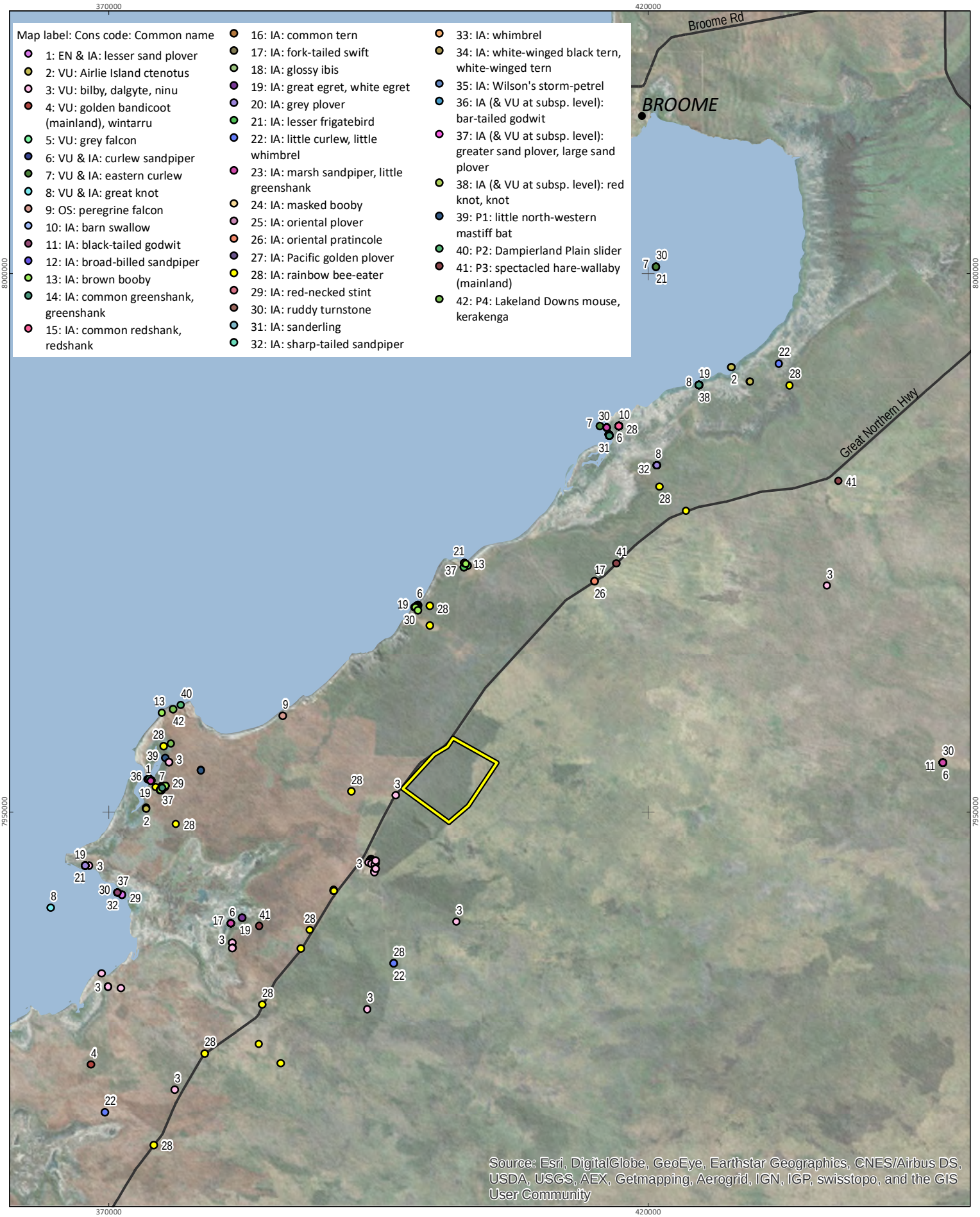
Table 5-3 Conservation significant terrestrial fauna identified through the desktop review

Scientific name	Common name	Conservation status		
		EPBC Act	WC Act	DPaW
Fish				
Pristis pristis	Freshwater Sawfish			P3
Reptiles				
Crocodylus porosus	Salt-water Crocodile		SP	
Ctenotus angusticeps	Airlie Island Ctenotus	VU	VU	
Lerista separanda	Dampierland Plain Slider			P2
Birds				
Pandion haliaetus	Osprey	Mig.	Mig.	
Apus pacificus	Fork-tailed Swift	Mig.	Mig.	
Ardea ibis	Cattle Egret	Mar	Mig.	
Ardea modesta	Eastern Great Egret		Mig.	
Charadrius bicinctus	Double-banded Plover	Mig.	Mig.	
Charadrius leschenaultii	Greater Sand Plover	VU/Mig.	Mig.	
Charadrius mongolus	Lesser Sand Plover	EN/Mig.	EN/Mig.	
Charadrius veredus	Oriental Plover		Mig.	
Pluvialis fulva	Pacific Golden Plover		Mig.	
Pluvialis squatarola	Grey Plover		Mig.	
Cuculus optatus	Oriental Cuckoo	Mig.	Mig.	
Falco hypoleucos	Grey Falcon		VU	
Falco peregrinus	Peregrine Falcon		SP	
Fregata ariel	Lesser Frigatebird		Mig.	
Fregata minor	Greater Frigatebird		Mig.	
Glareola maldivarum	Oriental Pratincole		Mig.	
Hirundo rustica	Barn Swallow		Mig.	
Oceanites oceanicus	Wilson's Storm Petrel	Mig.	Mig.	

Scientific name	Common name	Conservation status		
		EPBC Act	WC Act	DPaW
Anous stolidus	Common Noddy		Mig.	
Chlidonias leucopterus	White-winged Black Tern	Mig.	Mig.	
Onychoprion anaethetus	Bridled Tern		Mig.	
Sterna albifrons	Little Tern	Mig.	Mig.	
Sterna caspia	Caspian Tern	Mig.	Mig.	
Sterna hirundo	Common Tern	Mig.	Mig.	
Merops ornatus	Rainbow Bee-eater		Mig.	
Motacilla cinerea	Grey Wagtail		Mig.	
Motacilla flava	Yellow Wagtail		Mig.	
Calonectris leucomelas	Streaked Shearwater	Mig.	Mig.	
Puffinus pacificus	Wedge-tailed Shearwater	Mig.	Mig.	
Pezoporus occidentalis	Night Parrot	EN	CR	
Polytelis alexandrae	Princess Parrot	VU		P4
Arenaria interpres	Ruddy Turnstone		Mig.	
Calidris acuminata	Sharp-tailed Sandpiper		Mig.	
Calidris alba	Sanderling		Mig.	
Calidris canutus	Red Knot	EN/Mig.	Mig.	
Calidris ferruginea	Curlew Sandpiper	CR/Mig.	VU/Mig.	
Calidris ruficollis	Red-necked Stint		Mig.	
Calidris tenuirostris	Great Knot	CR/Mig.	VU/Mig.	
Gallinago megala	Swinhoe's Snipe	Mig.	Mig.	
Gallinago stenura	Pin-tailed Snipe	Mig.	Mig.	
Heteroscelus brevipes	Grey-tailed Tattler			P4
Limicola falcinellus	Broad-billed Sandpiper		Mig.	
Limnodromus semipalmatus	Asian Dowitcher	Mig.	Mig.	
Limosa lapponica	Bar-tailed Godwit		Mig.	
Limosa lapponica baueri	Bar-tailed Godwit (western Alaskan)	VU	VU/Mig.	
Limosa lapponica menzbieri	Bar-tailed Godwit (northern Siberian)	CR	VU/Mig.	
Limosa limosa	Black-tailed Godwit		Mig.	
Numenius madagascariensis	Eastern Curlew	CR/Mig.	VU/Mig.	
Numenius minutus	Little Curlew		Mig.	
Numenius phaeopus	Whimbrel		Mig.	
Tringa brevipes	Grey-tailed Tattler			P4
Tringa glareola	Wood Sandpiper		Mig.	
Tringa nebularia	Common Greenshank		Mig.	
Tringa stagnatilis	Marsh Sandpiper		Mig.	
Tringa totanus	Common Redshank	Mig.	Mig.	
Xenus cinereus	Terek Sandpiper		Mig.	
Sula abbotti	Abbott's Booby	EN/Mig.		
Sula dactylatra	Masked Booby	Mig.	Mig.	
Sula leucogaster	Brown Booby		Mig.	
Plegadis falcinellus	Glossy Ibis	Mig.	Mig.	
Mammals				
Saccolaimus saccolaimus nudicluniatus	Bare-rumped Sheath-tailed Bat	VU		P3

Scientific name	Common name	Conservation status		
		EPBC Act	WC Act	DPaW
Lagorchestes conspicillatus leichardti	Spectacled Hare-wallaby			P3
Mormopterus loriae cobourgiana	Little North-western Mastiff Bat			P1
Leggadina lakedownensis	Short-tailed Mouse			P4
Isoodon auratus auratus	Golden Bandicoot	VU	VU	
Macrotis lagotis	Bilby	VU	VU	

1 — CR – Critically Endangered; EN – Endangered; VU – Vulnerable; SP – Specially Protected; CD – Conservation Dependant; Mig — Migratory; P1–P4 —Priority 1–4.



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Map author	JC

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Kilometres

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Study area

Figure 5-3

Desktop records of conservation significant fauna

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5.2 FIELD SURVEY

5.2.1 Flora and vegetation

A total of 114 flora species and subspecies representing 32 families and 78 genera were recorded during the field surveys (Appendix 6). Species richness ranged from 18–50 species between sites with more than 30 species recorded in 76% of quadrat surveys (Appendix 3). The assemblage included 88 perennial species and 26 annual or short-lived species. The most prominent families recorded were Fabaceae (25 species), Malvaceae (13), Poaceae (10) and Proteaceae (6). No introduced flora species were recorded.

5.2.1.1 Conservation significant flora

No Commonwealth or State listed Threatened flora were recorded in the study area during the survey. Three Priority flora were recorded during the survey (Figure 5-4):

- *Tephrosia andrewii* (P1)
- *Polymeria* sp. Broome (P1)
- *Triodia caelestialis* (P3).

The specimens of *Polymeria* sp. Broome were confirmed by the WA Herbarium.

5.2.1.1.1 ***Tephrosia andrewii***

Status: Priority 1

Description: Ascending, multistemmed, perennial shrub to 0.8 m (Plate 1). Orange flowers in April and October; fruits April and August.

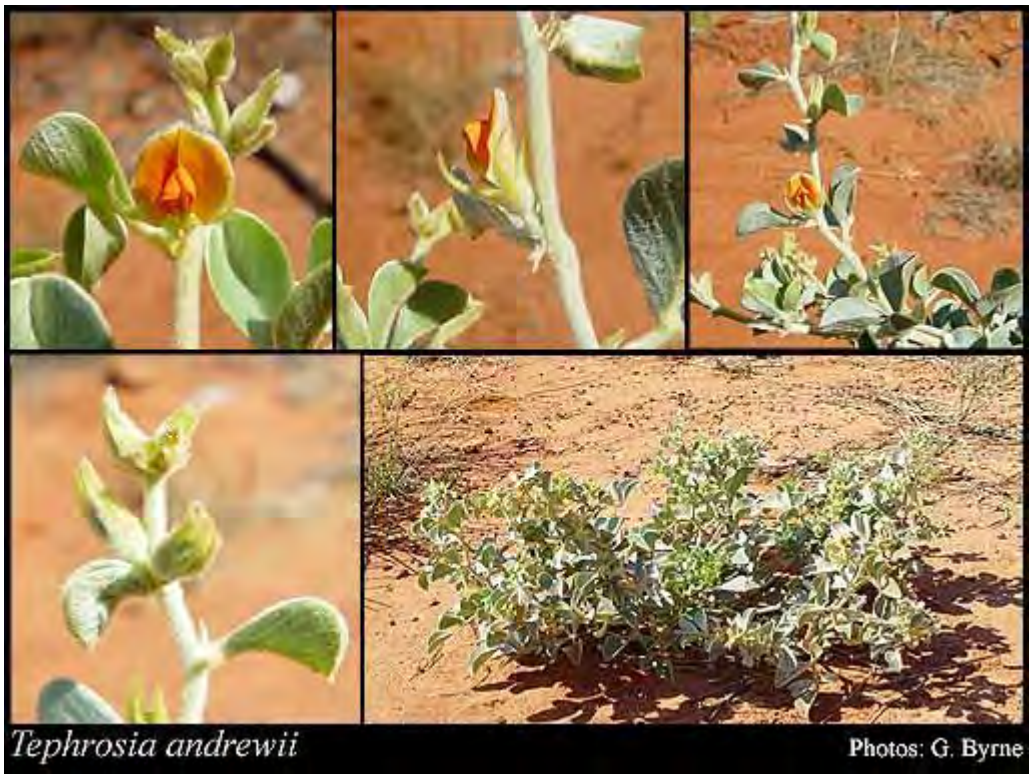


Plate 1 *Tephrosia andrewii* – Florabase (DPaW 2017b)

Distribution and ecology: Endemic to an area between Broome and Port Headland. Grows in pindan country, in shrubland on sandy soils (Cowie 2004). This species is known from only a few collections and is not known to occur on any reserve. The size and extent of populations and existence of any threats to the species is not known and requires further investigation (Cowie 2004).

Florabase (DPaW 2017b) lists three locations for the species, with habitat descriptions including:

- red sand on a low rise in *Acacia? neurocarpa*, *Erythrophleum*, *Grevillea pyramidalis* low woodland with *Chrysopogon* and *Triodia*
- road verge on a hill side in brown sand in a tall shrubland
- road verge on a plain in brown sand in low shrubland.

Records and distribution in study area: Over 370 plants were recorded from 18 locations ranging from 1 to >100 individuals) in the study area (Figure 5-4; Plate 2). Two large populations of 100+ plants were recorded, one in the very southeast corner and the other on the northern boundary (Figure 5-4). Both of these populations extended beyond the study area with >100 plants beyond the survey boundary. Field-time limitations precluded mapping the entire extent of these populations outside of the study area. In addition, two records for the species identified from the desktop review approximately 8 km to the north of the study area were confirmed to be still present during the field survey with multiple plants present, exact numbers were not ascertained.

Tephrosia andrewii was recorded in two habitats, vegetation Type 01 and Type 06. Both types represent woodlands of *Corymbia hamersleyana* and *C. zygophylla* over tall shrubland dominated by *Acacia eriopoda* and mixed species shrublands but vegetation Type 06 has been burnt within the last year and included post-fire ephemeral shrubs.

Plate 2 *Tephrosia andrewii* from study area

5.2.1.1.2 *Polymeria* sp. Broome

Status: Priority 1

Description: Prostrate herb 10 cm high x 30 cm wide, trailing herb with greyish green leaves and mauve flowers.

Distribution and ecology: according to DPaW (2017b), the species is confined to the Pindanland subregion and is know from five records with habitat including:

- poorly defined drainage line on a plain in pale orange pindan sand in *Acacia eriopoda*, *A. monticola*, *Grevillea pyramidalis* and *Hakea macrocarpa* tall shrubland over *Dodonaea hispidula* var. *arida* open shrubland and *Eucalyptus miniata* tall open woodland over *Acacia eriopoda* and A. *monticola* tall open shrubland

- *Acacia eriopoda* shrubland over low *Gyrostemon tepperi* low open shrubland over *Eragrostis* aff. *eriopoda*, *Aristida holathera* var. *holathera* and *A. hygrometrica* open tussock grassland
- on coastal plain in *Terminalia ferdinandiana* scattered shrubs over **Cenchrus ciliaris*, *Heteropogon contortus* tussock grassland.
- red pindan soil on road verge and in drain.

Records and distribution in study area:

Polymeria sp. Broome was collected from seven quadrats (S004, S009, S011, S015, S018, S019, S022) (Figure 5-4; Plate 5) in two habitats, vegetation Type 01, a woodland of *Corymbia hamersleyana* and *C. zygophylla* over tall shrubland dominated by *Acacia eriopoda* and mixed species shrublands, and Type 03, Isolated low *Corymbia zygophylla* trees over tall *Acacia eriopoda* shrubland over low closed *Aristida holathera*, *Chrysopogon pallidus* and *Triodia schinzii* tussock grassland and sparse low *Fimbristylis oxystachya* sedgeland. Population counts were not undertaken as the species was identified post-field.

Plate 3 *Polymeria* sp. Broome from study area

5.2.1.1.3 *Triodia caelestialis*

Status: Priority 3

Description: Caespitose, non-resinous, non-stoloniferous perennial forming compact, non-branching tussocks 40 cm tall x 60 cm wide (Armstrong 2008) (Plate 4). Not hummock forming.

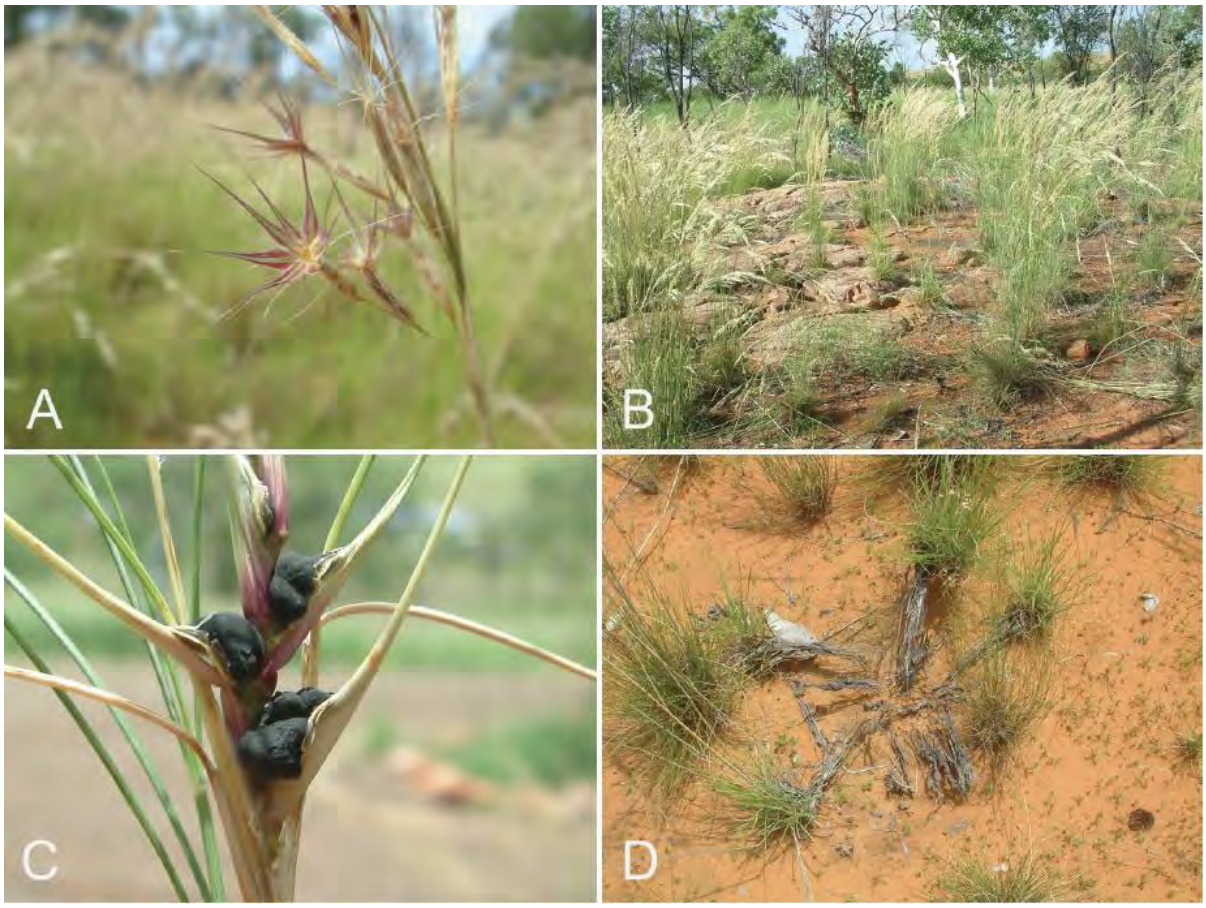


Plate 4 *Triodia caelestialis* – A – florets showing star structure; B – habit and usual habitat; C – fungal infection in leaf axils; D – division of adult plant (Armstrong 2008)

Plate 5 *Triodia caelestialis* – from study area

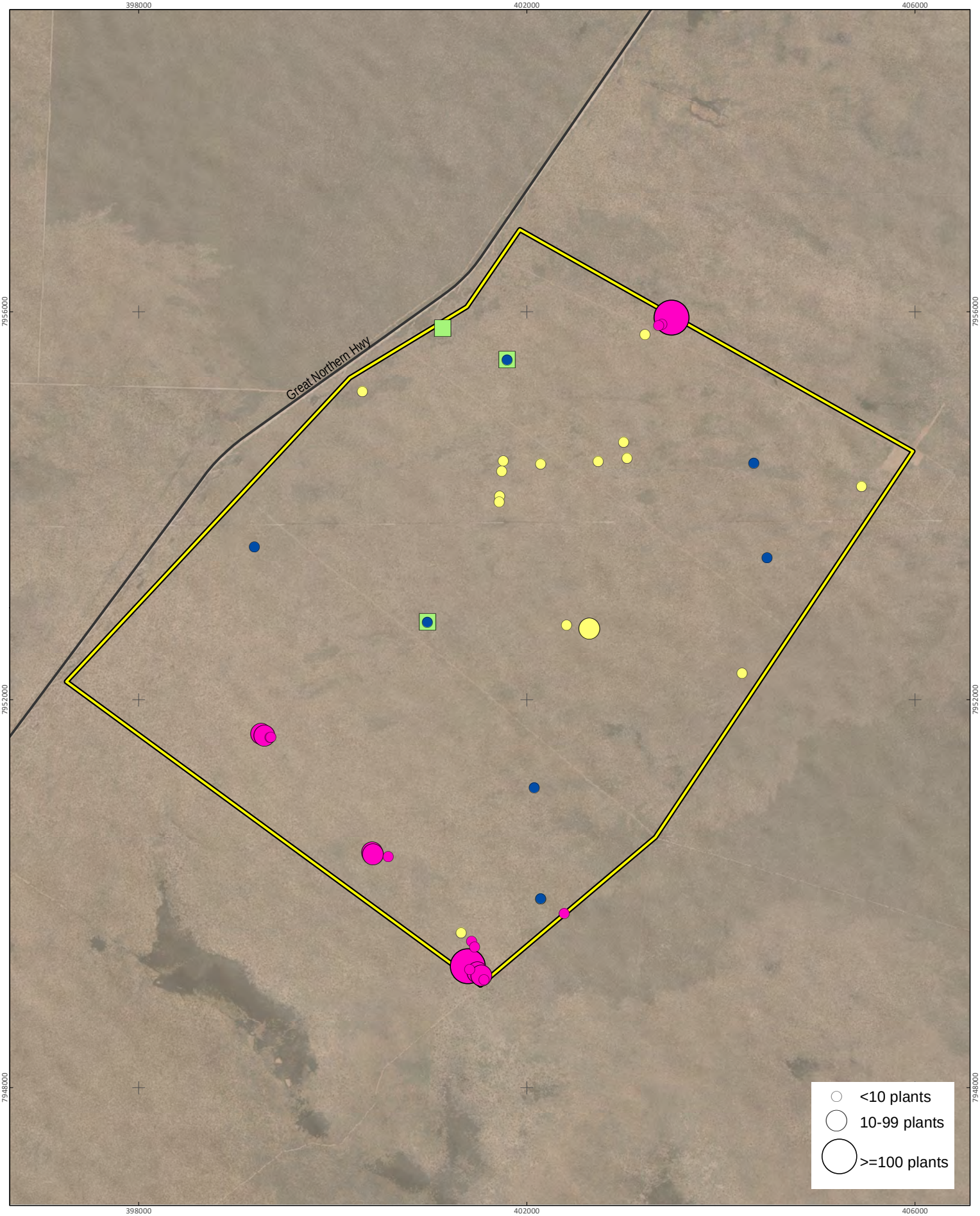
Distribution and ecology: according to Florabase (DPaW 2017b), in addition to records from the Pindanland subregion and Fitzroy Trough subregion of the Dampierland bioregion, it is also known from the Pentecost subregion of the Central Kimberley bioregion and Mitchell subregion of the Northern Kimberley bioregion. The species is known from 24 records (DPaW 2017b) with habitat including:

- red sandplain with pindan shrubland
- brown orange sand n a plain in *Corymbia greeniana* low woodland with *Bauhinia cunninghamii*, *Triodia acutispicula*, *Sorghum plumosum* and *Chrysopogon pallidus*

- brown sand-silt on low plain in woodland with *Chrysopogon fallax*, *Sorghum stipoideum*, *Eriachne obtusa* and *Grevillea striata*
- gentle mid-slope in red sand with *Michrostachys chamaelea*, *Acacia tumida* var. *tumida*, *Chrysopogon pallidus* and *Corymbia greeniana*
- brown sandy loam on flat lower slope with *Acacia tumida* var. *pilbarensis*, *Santalum lanceolatum*, *Acacia colei* var. *colei*, *Corymbia bella* and *Enneapogon polyphyllus*
- open woodland savannah in skeletal soil on mountainous low ridge
- flat pindan plain with ironstone gravel with *Acacia holosericea* and *Sorghum* savannah
- sandstone habitat (Armstrong 2008).

A population of the species identified in the desktop review located approximately 8 km to the west of the study area was confirmed during the field survey. Population size was not ascertained but several plants were observed at the location of the record.

Records and distribution in study area: *Triodia caelestialis* was recorded from 16 locations in the study area in numbers ranging from 1 to 25 plants (Figure 5-4; Plate 5). It was recorded in one habitat, a woodland of *Corymbia hamersleyana* and *C. zygophylla* over tall shrubland dominated by *Acacia eriopoda* and mixed species shrublands (vegetation Type 01).



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Map author	KC

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Kilometres

1:50,000 (at A4) GDA 1994 MGA Zone 51

Study area

Priority flora

- ? *Polymeria* sp. Broome (P1)
- *Tephrosia andrewii* (P1)
- *Triodia caelestialis* (P3)

Significant range extension only

- *Crotalaria aridicola* subsp. *densifolia*

Figure 5-4

Conservation significant flora records from survey

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5.2.1.2 Introduced flora

No introduced flora species were recorded in the survey.

5.2.1.3 Range extensions

Based on available distribution data, survey records for *Polymeria* sp. Broome (P1) represent a possible modest range extension of approximately 60 km south.

5.2.1.4 Unidentified flora

Three taxa collected could not be identified definitively to species level due to a lack of reproductive structures comprised two *Corymbia* sp. and one *Ipomoea* sp. The remaining taxa (97.4% of all collected) were identified to species level.

5.2.1.5 Vegetation types

A total of six vegetation types were defined for the study area (Table 5-4; Figure 5-5) The vegetation types comprised two woodlands (Type 01 and 06) and four shrublands. Both woodlands comprised *Corymbia hamersleyana* and *C. zygophylla* trees over mixed species shrubland but vegetation Type 06 also included post-fire ephemeral shrubs at quadrat S024 (Table 5-4). The shrublands were dominated by *Acacia eriopoda* with mixed species mid to low shrublands over mixed tussock grasslands.

Vegetation Type 04 comprised mainly ephemeral shrubs recolonising previously cleared areas. Large section on the eastern side of the study area and three access tracks have been historically cleared. The areas have been colonised by re-growth of the local species, most likely following a fire. In total, 43 species have been recorded at the assessment site (S025) that included many post-fire ephemerals.

The statistical analysis of vegetation in quadrats resulted in two ‘super groups’, two floristic groups and four unique vegetation types (Figure 5-6). The largest floristic group (assigned vegetation type 01) comprised a sparse to open woodland of *Corymbia hamersleyana* and *C. zygophylla* over tall mixed species shrubland in spinifex grassland and was recorded at 20 quadrats (Table 5-4).

The study area was dominated by vegetation Type 01 (Table 4-1) with all remaining vegetation types representing just 11% of the study area.

Table 5-4 Vegetation types recorded in the study area

Vegetation type	Site/s	Vegetation description	Photograph
Type 01 CzAeTs	S001, S003 S004, S005 S006, S007 S009, S010 S011, S012 S013, S015 S016, S017 S019, S020 S021, S022 S023, S024	Woodland: Isolated low trees to low woodland of *Corymbia hamersleyana* and *C. zygophylla* over tall shrubland dominated by *Acacia eriopoda* with *Bauhinia cunninghamii*, *Grevillea pyramidalis*, *G. refracta* and *G. wickhamii* over low tussock grassland dominated by *Triodia schinzii* with *Aristida holathera*, *Chrysopogon pallidus* and *Sorghum plumosum*.	

Vegetation type	Site/s	Vegetation description	Photograph
Type 02 CzAeTc	S002 S014	Shrubland: Isolated low *Corymbia hamersleyana* and *C. zygophylla* over tall shrubland dominated by *Acacia eriopoda* with *Bauhinia cunninghamii*, *Grevillea refracta* and *G. wickhamii* over low *Triodia caelestialis* and *Sorghum plumosum* tussock grassland.	
Type 03 CzAeAhFo	S018	Shrubland: Isolated low *Corymbia zygophylla* trees over tall *Acacia eriopoda* shrubland over low closed *Aristida holathera*, *Chrysopogon pallidus* and *Triodia schinzii* tussock grassland and sparse low *Fimbristylis oxystachya* sedgeland.	

Vegetation type	Site/s	Vegetation description	Photograph
Type 04 CzAeAh	S025	Shrubland: Isolated low *Corymbia zygophylla* mallee over mid open *Acacia eriopoda*, *A. colei* and *Senna notabilis* shrubland over low open *Aristida holathera* and *Chrysopogon pallidus* tussock grassland.	
Type 05 AeToCp	S008	Shrubland: Tall closed *Acacia eriopoda* and *A. monticola* shrubland over mid open *Trachymene oleracea* subsp. *oleracea* shrubland over low open *Chrysopogon pallidus* tussock grassland.	

Vegetation type	Site/s	Vegetation description	Photograph
Type 06 CzTaTs	S024	Woodland: Low *Corymbia hamersleyana* and *C. zygophylla* woodland over low sparse *Indigofera monophylla*, *Tephrosia andrewii* and *T.* sp. D Kimberley Flora shrubland over low open *Aristida holathera*, *Chrysopogon pallidus* and *Triodia schinzii* tussock grassland.	

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- AeToCp
- CzAeAh
- CzAeAhFo
- CzAeTc
- CzAeTs
- CzTaTs
- Cleared

Figure 5-5

Vegetation types in the study area

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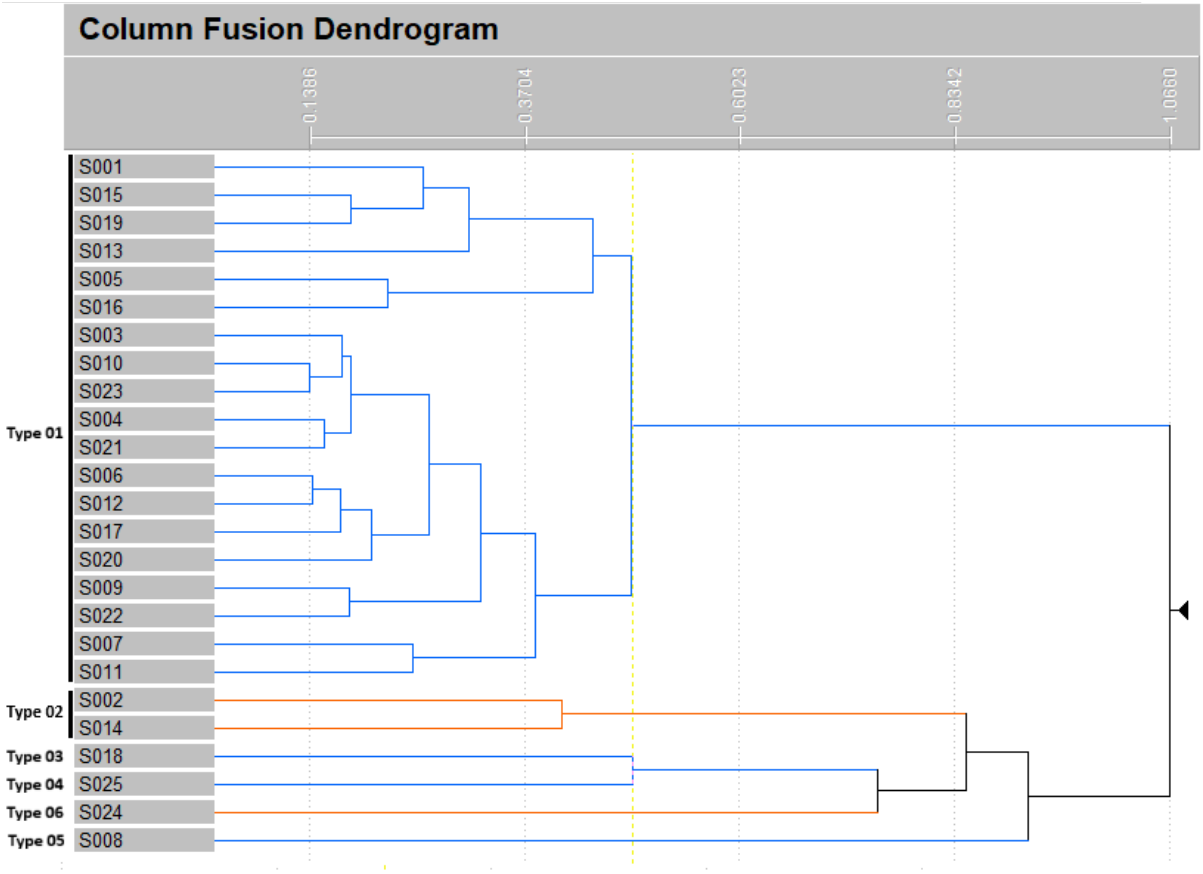

Figure 5-6 Hierarchical clustering (UPGMA) of the flora quadrats of the study area

Table 5-5 Extent of vegetation types in the study area

Vegetation type	Area (ha)	Percentage of vegetated areas
Type 01	3,142.7	89.0%
Type 02	47.4	1.3%
Type 03	236.4	6.7%
Type 04	57.9	1.6%
Type 05	8.2	0.2%
Type 06	13.5	0.4%
Cleared Areas	26.0	0.7%
Total	**3,532.1**	**100.0%**

5.2.1.6 Vegetation condition

The condition of vegetation across the study area ranged from Excellent to Completely Degraded according to the applied condition scale (Figure 5-7). The majority of vegetation was mapped as Excellent with regrowth of vegetation in previously cleared areas (including historic tracks) rated as Very Good. Cleared access tracks were rated as Completely Degraded (Table 5-6).

Table 5-6 Vegetation condition – extent of each condition rating in study area

Condition (Trudgen 1988, in EPA 2016d)	Area (ha)	Percentage (%) of study area
Excellent	3,444.8	97.5%
Very Good	61.3	1.7%
Completely Degraded	26.0	0.7%
Total:	**3532.1**	**100%**

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Degraded
Very good
Excellent

Figure 5-8

Vegetation condition in the study area

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5.2.1.7 Threatened and Priority Ecological Communities

No vegetation types were classified as either a TEC or PEC.

5.2.1.8 Local and regional significance of vegetation

Four vegetation types (Type 01, 02, 03 and 06) may be considered locally significant as they contain Priority flora species. Vegetation with a restricted distribution included Types 05 and 06 (Table 5-5). Vegetation Type 06 was a recently burnt area and following growth of the recovering vegetation and subsequent decrease in the abundance of fire ephemeral shrubs is likely to resemble the dominant vegetation Type 01.

5.2.2 Fauna and fauna habitats

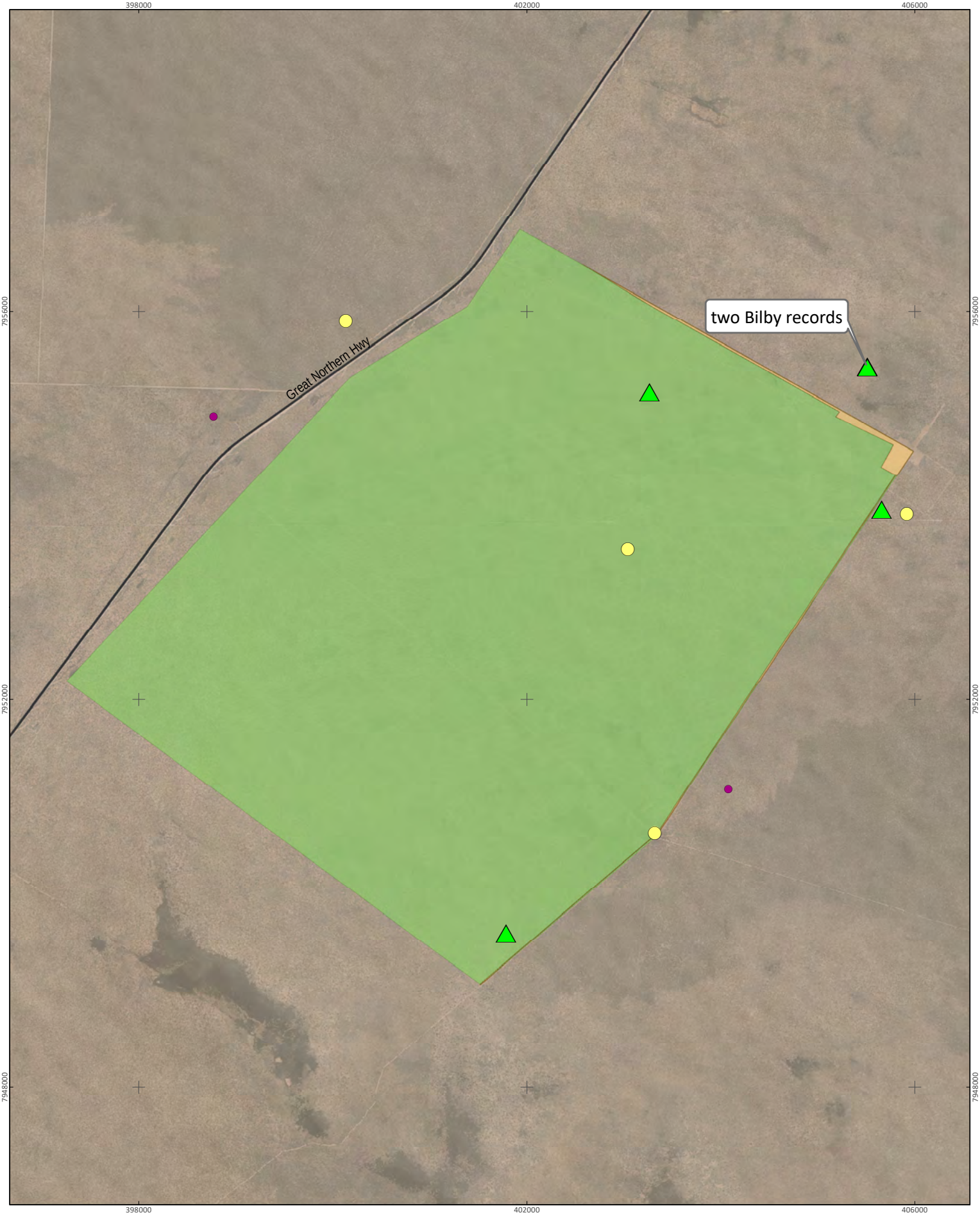
5.2.2.1 Fauna habitats

The study area contains a single terrestrial fauna habitat, tall shrubland thicket (Table 5-7; Figure 5-8). The tall shrubland thickets often consisted of sparsely scattered *Corymbia hamersleyana* and *C. zygophylla* up to 12 m over scattered patches of open to dense tall shrubs dominated by *Grevillea pyramidalis, G. refracta* and *G. wickhamii* to 4 m over scattered patches of dense understory, often dominated by *Bauhinia cunninghamii* and *Triodia schinzii* with *Aristida holathera*, *Chrysopogon pallidus* and *Sorghum plumosum* hummock and tussock grasses and a few open areas on sandy to clay-loam substrates.

The vegetation structure varied in parts of the study area, particularly along the eastern edge where previous clearing and fire have resulted in varying stages of regrowth. In areas where understory was not too dense and some open areas were present to allow for fauna movement through the habitat, shrubland thicket habitat within the study area provides suitable habitat for the Bilby (Figure 5-8). This habitat may also provide suitable foraging habitat for the Grey Falcon and Peregrine Falcon in areas where tall shrubs are not as dense, particularly in area of regrowth, and nesting habitat where suitable tall trees are present within the study area.

Table 5-7 Fauna habitats of the study area

Habitat	Area (ha)	Percentage
Tall shrubland thicket	3,506.1	99.3%
Existing cleared areas	26.0	0.7%
Total:	3,532.1	100%



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Drawn by	KW
Map author	KC

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Kilometres

1:50,000 (at A4) GDA 1994 MGA Zone 51

- Bilby (*Macrotis lagotis*): Foraging evidence - digging (VU)
- Rainbow Bee-eater (*Merops ornatus*): Direct observation - call (Mig.)
- Rainbow Bee-eater (*Merops ornatus*): Direct observation (Mig.)

Fauna habitats
- Tall shubland thicket
- Cleared

Figure 5-9

Fauna habitats and conservation significant fauna records from survey

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5.2.2.2 Vertebrate fauna

A total of 50 vertebrate species were recorded during the field survey representing approximately 17% of the species identified from the desktop review (Table 5-8; Appendix 7). Two conservation significant species were recorded during the field survey, Bilby (*Macrotis lagotis*) (VU – EPBC Act, WC Act) from secondary evidence and Rainbow Bee-eater (*Merops ornatus*) (Mig – WC Act) from direct observation (Table 5-9; Figure 5-8).

Table 5-8 Vertebrate taxa recorded during the survey and the total number of species potentially occurring in the study area

Taxa	No. of species recorded during this survey in the study area	Total no. of species potentially occurring in study area (based on desktop review)
Fish	-	1
Amphibians	-	3
Reptiles	3	42
Birds	40	216
Mammals	7	25
Total	**50**	**287**

Table 5-9 Conservation significant vertebrate fauna recorded during the field survey

Species	Common name	Record type	Qty.	Within study area or 1 km buffer	Latitude	Longitude
Macrotis lagotis	Bilby	Foraging digging	1	Buffer	-18.5028	122.1063
Macrotis lagotis	Bilby	Foraging digging	1	Study area	-18.5421	122.0694
Macrotis lagotis	Bilby	Foraging digging	1	Study area	-18.4917	122.0837
Macrotis lagotis	Bilby	Foraging digging	1	Buffer	-18.4894	122.1050
Macrotis lagotis	Bilby	Foraging digging	1	Buffer	-18.4895	122.1050
Merops ornatus	Rainbow Bee-eater	Call	1	Buffer	-18.5287	122.0912
Merops ornatus	Rainbow Bee-eater	Direct observation	2	Study area	-18.5063	122.0815
Merops ornatus	Rainbow Bee-eater	Direct observation	2	Study area	-18.5328	122.0840
Merops ornatus	Rainbow Bee-eater	Direct observation	1	Buffer	-18.4849	122.0540
Merops ornatus	Rainbow Bee-eater	Call	1	Buffer	-18.4938	122.0411
Merops ornatus	Rainbow Bee-eater	Direct observation	1	Buffer	-18.5031	122.1087

5.2.2.4 Conservation significant species recorded and potentially occurring in the study area

In addition to the two conservation significant vertebrate fauna species recorded during the field survey (Bilby and Rainbow Bee-eater), potential habitat was identified for a further nine species within the study area. Potential habitat was identified for a further nine of the 69 conservation significant species identified in the desktop review (Table 5-3). Potential occurrence of conservation significant species in the study area was assessed based on presence of suitable habitat, proximity of previous records and current known distributions of the species. Due to the proximity of the study area to the coast, the desktop review returned a large number of threatened and migratory shorebirds which are considered unlikely to be present within the study area due to a lack of suitable habitat or specific habitat qualities (Table 5-3).

5.2.2.4.1 **Fork-tailed Swift**

Status: Migratory (EPBC Act and WC Act)

Distribution and ecology: The Fork-tailed Swift is a widespread migratory species that overwinters in Australia. It can be found across most of WA and is uncommon to moderately common in the north-west. They are mostly found over inland plains and along foothills, coastal areas and over settlements. They occur in a wide range of dry or open habitats, including riparian woodlands, tea-tree swamps, low scrub, heathland, saltmarsh, grassland and spinifex sandplains, open farmland and inland and coastal sand-dunes. Fork-tailed Swifts are often found in areas that experience updraughts around cliffs and normally forage several hundred metres above ground level (Department of the Environment and Energy 2017c).

Records and likely distribution in the study area: Fork-tailed Swift was not recorded during the field survey but is likely to occur occasionally within the study area. The nearest records of the species is located approximately 20 km north northeast and 20 km southwest of the study area (DPaW 2017d). The species can occur within a wide range of habitats, including those found in the study area. The species is likely to forage, though it is unlikely it will land or nest within the study area.

5.2.2.4.2 **Cattle Egret**

Status: Migratory (EPBC Act and WC Act)

Distribution and ecology: The Cattle Egret is a worldwide widespread, polytypic, medium-size Ardeidae. In Australia, they are more common in eastern states than on the west coast. The species is uncommon in south-western WA and breed in small numbers near Kununurra. The origin of the species in Australia is not certain. It may have been introduced but a natural colonisation from individuals reaching the northern coast through Indonesian islands is more probable (McKilligan 2005).

In Australia, Cattle Egrets have benefited from human settlements (irrigation, grazing). They can feed on a wide range of prey (vertebrate and invertebrates) that they find in swamps and open grasslands, inland as well as on the coast (McKilligan 2005). The species is partially migratory with overseas movements between New-Zealand and Australia.

Records and likely distribution in the study area: The Cattle Egret was not recorded during the field survey; however, it may occasionally occur within the study area, particularly in close proximity to the small dam located along the eastern border of the study area when water is present. The nearest record of the species is located approximately 60 km north of the study area (DPaW 2017d).

5.2.2.4.3 Eastern Great Egret

Status: Migratory (WC Act)

Distribution and ecology: The Eastern Great Egret can be found near waterbodies or along inland rivers, lakes and shallow freshwater or saltwater wetlands and inundated samphire flats (McKilligan 2005). This species is highly mobile and can be found throughout most of the western fringes of the State in coastal areas and towards the semi-arid interior (Johnstone & Storr 1998).

Records and likely distribution in the study area: No Eastern Great Egret were recorded during the field survey; however, the species may occasionally occur within the study area, particularly in close proximity to the small dam located along the eastern border of the study area when water is present. The nearest record of the species is located approximately 13 km north of the study area (DPaW 2017d).

5.2.2.4.4 Grey Falcon

Status: Vulnerable (WC Act)

Distribution and ecology: The Grey Falcon is a widespread but rare species inhabiting much of the semi-arid interior of Australia. Its distribution is centred along inland drainage systems. It has a large foraging range extending from timbered plains, such as *Acacia* shrublands, into open grasslands. Prey includes mainly birds (Sutton 2010), but also invertebrates and mammals. The species often utilizes old nests of other species, particularly other raptors, in the tallest trees along watercourses and sometimes in telecommunication towers (Sutton 2010).

There are no confirmed threats to the Grey Falcon but it is thought that clearing of the semi-arid zone for marginal farming has reduced habitat availability and overgrazing of arid zone rangelands may affect prey abundance (Garnett *et al.* 2011).

Records and likely distribution in the study area: The Grey Falcon was not recorded during the field survey; however, the species is considered likely to occasionally occur within, and in the vicinity of, the study area due to its large foraging range, particularly within areas where very dense vegetation isn't present allowing the species to forage for ground dwelling species. The species may nest where suitable tall trees are present. The nearest record of the species is located approximately 13 km north of the study area (DPaW 2017d).

5.2.2.4.5 Peregrine Falcon

Status: Specially Protected (WC Act)

Distribution and ecology: The Peregrine Falcon is a widespread bird of prey with a large foraging range found across Australia. In WA, it can be rare or scarce to moderately common. The Peregrine Falcon's preferred habitat includes cliffs and wooded watercourses. Nesting occurs mainly on cliff ledges, granite outcrops, quarries and in trees with old raven or Wedge-tailed Eagle nests (Johnstone & Storr 1998).

Birds constitute a very large proportion of their diet, if not the exclusive part (Johnstone & Storr 1998; Ratcliffe 1980). Historically, the widespread use of DDT caused worldwide global decline of the Peregrine Falcon. The main current threat to the species in Australia is habitat loss, particularly woodland trees for nesting (Department of the Environment and Energy 2017c).

Records and likely distribution in the study area: Peregrine Falcon was not recorded during the field survey; however, the species is considered to possibly occur occasionally within the study area to

forage. It is unlikely to nest due to the lack of suitable nesting habitat within the study area. The species has previously been recorded approximately 13 km west of the study area (DPaW 2017d).

5.2.2.4.6 **Rainbow Bee-eater**

Status: Migratory (WC Act)

Distribution and ecology: The Rainbow Bee-eater is a migratory bird that moves between Australia and Asia and is commonly seen singly or in pairs. It can be found across Australia, with complex seasonal movements depending on location and rainfall, preferring the more watered areas of the country. In Western Australia, the Rainbow Bee-eater can be found in lightly wooded, preferably sandy country, near water (Department of the Environment and Energy 2017c).

Occurring as a resident, breeding visitor, postnuptial nomad, passage migrant or winter visitor, and being highly mobile, they can be scarce to locally common. They are often associated with creek lines supporting sandy banks in which burrows can be created (Johnstone & Storr 1998). Its diet consists primarily of bees (especially hive bees) and flies, but it is known to predate on other invertebrates.

The species nests in sandy banks and breeding occurs from August to November; however, breeding can occur at other times of year if environmental conditions are suitable. Four to six eggs are laid in an open chamber at the end of a burrow (Johnstone & Storr 1998).

Records and likely distribution in the study area: The Rainbow Bee-eater was recorded six times during the field survey is considered likely to frequently occur within the study area (Figure 5-8). The species was recorded four times from direct observations of one or two individuals and twice from calls. The species is likely to occur throughout the study area to forage and is likely to nest in areas where suitable substrates allowing construction of burrows are present. The species has previously been recorded approximately 5 km west of the study area (DPaW 2017d).

5.2.2.4.7 **Night Parrot**

Status: Endangered (EPBC Act); Critically Endangered (WC Act)

Distribution and ecology: The Night Parrot is the rarest bird in Australia. The species was thought to be extinct until a single road killed specimen was collected in Queensland in October 1990 (Boles *et al.* 1994). Since then, additional specimens have been recorded in Queensland (McDougall *et al.* 2009) and further sightings in the Pilbara and Kimberley regions of WA.

Little is known about the biology of the species. Most sightings occur at night, near water and it is assumed that birds come to drink prior feeding at night. The nest is located in tunnelled dense vegetation and can contain three to six eggs (Garnett *et al.* 2011). Chenopod grasslands, Spinifex plains and hummock grasslands in the proximity of salt lakes are likely to be its typical habitat. The map of historical records in WA indicates the species can potentially occur across a wide range of common habitat (Davis & Metcalf 2008).

Alteration of fire regime, predation by introduced species and over grazing by cattle are the main threat to the species, resulting in poor habitat quality and direct mortality of individuals.

Records and likely distribution in the study area: No night parrots were recorded during the field survey; however, the species is considered to possibly occur within the study area. Little is known of the species habitat preferences; however, previous records have been in in habitats consisting of spinifex or samphire vegetation. The species may possibly occur within the study area, particularly in areas of dense understory dominated by spinifex species. The nearest record of the species is

located approximately 380 km south of the study area (DPaW 2017d); however, the species has recently been recorded elsewhere in the Kimberley region, though precise locality has not been disclosed and its proximity to the study area is not known.

5.2.2.4.8 Princess Parrot

Status: Vulnerable (EPBC Act); Priority 4 (DPaW)

Distribution and ecology: The Princess Parrot is one of the most elusive Australian parrots. They are only found in the arid inland desert of central Australia with most of their range extending between the Great Victorian Desert and the Great Sandy Desert in WA.

Princess Parrots inhabit sandy deserts where they feed on seeds and flowers (Garnett & Crowley 2000). The species is highly irruptive and after important rainfall, can occur in numbers in areas previously unoccupied. They nest in large tree hollows and can produce three to six chicks per clutch. Threats to the species are not clearly identified and even the population trend is not clear given the irruptive fluctuating pattern of the populations. Changes in fire regimes and introduction of grazing mammals are listed as the main threats to the Princess Parrot (Garnett & Crowley 2000).

Records and likely distribution in the study area: The Princess Parrot wasn't recorded during the field survey; however, it is considered to possibly occur within the study area occasionally. Records of the species are sparse; however, it's occurrence and abundance is often dependent on rainfall events. Records of the species in the vicinity of the study area are sparse and the nearest record is located approximately 50 km southwest of the study area (DPaW 2017d).

5.2.2.4.9 Spectacled Hare-wallaby

Status: Priority 3 (DPaW)

Distribution and ecology: Once widespread in the northern section of the Australian continent, the Spectacled Hare-wallaby is now found across northern Queensland, Northern Territory and north WA (Kimberley and a small section of the Pilbara). A large population lives on Barrow Island where the species is relatively common.

In WA, Spectacled Hare-wallabies live in habitat dominated by spinifex, where large hummocks are available. They spend the day hidden in these hummocks in which they tunnel a shelter. At night, the species feeds on various plant materials. Matures at around one year and is capable of breeding throughout the year depending on conditions (Van Dyck & Strahan 2008).

Predation by Feral Cat and Red Fox is responsible for the decline and range constriction of the species. Altered fire regimes are also likely to reduce the number of large spinifex hummocks available (Van Dyck & Strahan 2008).

Records and likely distribution in the study area: No Spectacled Hare-wallabies were recorded during the field survey; however, the species is considered to possibly occur in habitat represented within the study area. Records of the species in the vicinity of the study area are sparse; however, the species has previously been recorded approximately 19 km southwest and 21 km northeast of the study area (DPaW 2017d).

5.2.2.4.10 **Short-tailed Mouse**

Status: Priority 4 (DPaW)

Distribution and ecology: This secretive species occurs in the Pilbara and the Kimberley regions of WA as well as the Northern Territory and Queensland. It occupies a variety of habitats including hummock and tussock grasslands, tropical woodlands, samphire, sedgelands and stony ranges (Moro & Kutt 2008). Its populations rise and fall dramatically, probably in response to climatic fluctuations and availability of seeds (Van Dyck & Strahan 2008).

Records and likely distribution in the study area: The Short-tailed Mouse was not recorded during the field survey; however, the species has previously been recorded approximately 23 km west of the study area and is considered to possibly occur (DPaW 2017d). Due to the influence of rainfall on the species occurrence and abundance the species may occasionally occur, particularly following rainfall events when resources are plentiful for the species.

5.2.2.4.11 **Bilby**

Status: Vulnerable (EPBC Act and WC Act)

Distribution and ecology: The Greater Bilby or Dalgyte is a rabbit-sized marsupial that originally occupied over 70% of the Australian mainland. It now occurs in less than 20% of its original range, with remaining WA populations predominantly in the Great Sandy and Gibson Deserts.

Habitat preferences of the Greater Bilby include hummock grassland in plains and alluvial areas, open tussock grassland on uplands and hills, and mulga woodland/shrubland on ridges and rises (Department of the Environment and Energy 2017c). The species is highly mobile and can have large foraging ranges. Home ranges in sandy deserts are usually temporary and may shift in response to changes in food availability (Van Dyck & Strahan 2008). The species can be identified through secondary evidence, such as scats, tracks and its typical burrow systems.

The massive decline in Greater Bilby distribution is thought to be due to effects on food availability from changing fire regimes, drought, grazing by rabbits and livestock, and predation by the Red Fox and feral Cat (Van Dyck & Strahan 2008).

Records and likely distribution in the study area: The Bilby was recorded five times during the field survey from foraging diggings. Two records were from within the study area and three within 1 km of the study area (Figure 5-8). No tracks or burrows of the species were recorded during the field survey and all foraging diggings recorded during the field survey appeared to be aged and weathered.

Habitat assessments at Bilby survey plots within and beyond the study area identified a mix high and low habitat suitability for the species. The majority of survey plots within the study area were rated low value for Bilby. Habitat considered of high suitability was recorded primarily along the eastern edge of the study area, including plots outside the eastern boundary, and along the western edge but mostly in plots outside the study area (Figure 5-8).

High habitat suitability consisted of areas supporting a range of vegetation structures lacking dense understory, where movement for the species would be restricted, and presence of substrates permitting burrowing by the species. Low suitability plots were typically characterised by very dense understory.

The species has previously been recorded approximately 1 km south west of the study area with multiple recorded within 10 km south of the study area (DPaW 2017d).

5.3 SURVEY LIMITATIONS

The limitations of the terrestrial fauna survey have been considered (Table 5-10) in accordance with Technical Guidance: Terrestrial fauna surveys (EPA 2016f). No major limitations were identified for the survey.

Table 5-10 Survey limitations from EPA Technical Guidance: Terrestrial fauna surveys (EPA 2016f)

Limitations	Limitation for this survey?	Comments
Competency/experience of survey personnel, including taxonomy	No	The field team and report authors have extensive experience in terrestrial fauna and flora and vegetation surveys within the region and across WA.
Scope and completeness - were all target groups sampled, were all planned survey methods implemented successfully, was the study area fully surveyed	No	All target groups, conservation significant species and habitats within the study area were surveyed adequately.
Intensity - in retrospect, was the intensity adequate	No	The survey intensity was appropriate for the areas that were surveyed and conservation significant species targeted.
Proportion of fauna identified, recorded and/or collected.	No	All fauna was identified to species level in the field with the exception of analysis of bat echolocation call recordings. Bat echolocation call recordings were analysed by an external expert on return to Perth.
Availability of adequate contextual information	Partial	With the exception of extensive shorebird surveys to the west of the study area there have been limited survey within the vicinity and broader region of the study area.
Timing, weather, season, cycle	No	Weather preceding and during the survey was comparable to annual averages for previous years.
Disturbances which affected the results of the survey	No	No disturbances occurred during the field survey which are considered to have impacted the results.
Remoteness and/or access problems	No	The whole of the study area was accessible by vehicle or foot.

The limitations of the flora and vegetation survey have been considered (Table 5-11) in accordance with Technical Guidance: Flora and vegetation surveys for Environmental Impact Assessment (EPA 2016d).

Table 5-11 Survey limitations for flora and vegetation survey (EPA 2016d)

Limitations	Limitation for this survey?	Comments
Availability of contextual information at a regional and local scale	Yes	In total only 4 flora and vegetation assessments from the Dampierland bioregion were available for comparison to the current assessment and the majority of project areas were located over 100 km from the current study area.
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed	No	The principal botanist Dr Grant Wells has undertaken numerous flora and vegetation surveys within the Kimberley including six years of research.
Proportion of flora recorded and/or collected, any identification issues	No	Only a small proportion (2.6%) of taxa could not be identified definitively to species level due to insufficient reproductive characters.
Effort and extent; was the appropriate area fully surveyed	Yes	Suitable survey methods were used based on EPA technical guidance (EPA 2016d). However, the minimal replicate of three sites per vegetation type defined was not maintained for all vegetation types due to the limited extent and distribution of some of the vegetation types encountered.
Access within the study area	No	There were no access problems.
Timing, rainfall, season	No	The survey was conducted at an appropriate time, following wet season and above average annual rainfall.
Disturbance that may have affected the results of the survey	No	There were no notable recent disturbances that may have impacted the survey.

6 DISCUSSION

In assessing development proposals, the EPA has the objective of protecting flora and vegetation, and terrestrial fauna so that biological diversity and ecological integrity are maintained (EPA 2016a, b). Considerations for flora, vegetation and terrestrial fauna in environmental impact assessment (EIA) at the State level include significance of values present, current state of knowledge of those values, potential impacts and the scale at which the impacts are assessed (EPA 2016a, b). At the Federal level, the Commonwealth publishes guidelines on assessing on significance of impacts to matters of NES (Department of the Environment 2013).

The potential biological values of the study area are discussed below to inform an EIA for the Project.

6.1 FLORA AND VEGETATION

The species diversity of the study area was comparable to that reported for one of the previous studies in the bioregion (Biota 2009), but substantially lower than other surveys for the bioregion (Table 6-1). The current survey and Biota (2009) reported approximately three species per 1 km^2 whereas the GHD (2009) reported 27 species and GHD (2013) 36 species per 1 km^2.

All of the studies were conducted in vegetation types dominated by Pindan vegetation (Biota 2009; GHD 2009, 2013), a shrubland with areas of *Acacia* thickets (GHD 2009). The higher diversity of the GHD (2013) study may in part be due to the study area comprising a long (>70 km) linear corridor that is likely to have intercepted several different habitat types and land systems with a greater species richness. Biota (2009) considered the number of native flora recorded to be moderate, "neither elevated nor reduced, but within the expected range for a study area of this size in this location, taking into account the habitats present and the dominance of pindan vegetation across the majority of the study site" comparable with the current survey. Conversely, in comparison to the GHD (2009, 2013) studies the species richness of the current study area may be considered low.

The current survey recorded all prominent families identified in previous surveys and these were similar throughout all flora and vegetation assessments (Table 6-2).

Table 6-1 Comparison of floristic data from the current survey with previous flora surveys

Survey	Area (km^2)	% of current study area	No. vegetation types	No. of identified species	No. of families	No. of genera	No. of weeds
GHD (2009)	3.5	9.9%	1	95	28	33	15
Biota (2009)	100.00	283.3%	12	305	67	175	[21]
GHD (2013)	3.73	10.6%	1	135	49	104	2
This survey	35.3	100 %	6	114	32	78	-

Table 6-2 Species numbers of the most dominant plant families recorded in the study area in comparison with other regional studies

Family	This study	GHD 2009	Biota 2009	GHD 2013
Malvaceae	13	12	10	11
Poaceae	10	13	43	15
Fabaceae	24	18	44	30
Amaranthaceae	4	6	11	6
Myrtaceae	4	6	12	7
Proteaceae	6	3	5	5
Total number of species	**61**	**58**	**125**	**74**
% dominant families comprise of all species recorded for the survey	**53.5**	**61.1**	**41.0**	**54.8**

6.1.1 Conservation significant flora

Two of the three of the Priority flora identified as potentially present in the study area in the desktop review, *Tephrosia andrewii* and *Triodia caelestialis,* were recorded during the field survey. No records of the third species, *Polymeria distigma* were found in the study area; however, two *Polymeria* species, *P. ambigua* and *P.* sp. Broome (Priority 1), were located.

Of the Priority flora recorded in the study area, the populations of *Tephrosia andrewii* represent new records for the species that is known from only a few locations in the vicinity of the Project. The populations of *Triodia caelestialis* also represent new records for the species but this is locally abundant. The records of *Polymeria* sp. Broome represent a southern range extension and therefore a significant new record for the species.

The three taxa that could be not be definitively identified to species level were considered unlikely to represent conservation significant flora. *Ipomoea tolmerana* subsp. *occidentalis* (P1) is the only conservation significant *Ipomoea* species recorded for the Dampierland bioregion (DPaW 2017b). This species is an annual vine whereas the unidentified *Ipomoea* sp. from the current survey was a robust perennial vine and did not resemble the Priority species. Two Priority 1 *Corymbia* species have been recorded for the Dampierland bioregion (DPaW 2017b); however, suitable habitat was not present in the study area for either of these species and the *Corymbia* specimens did not resemble those of the Priority 1 *Corymbia* spp. held at the WA Herbarium.

Notably, all significant species recorded during the field survey occur within the dominant vegetation type (Type 01) in the study area. This vegetation type extends over a vast area locally and therefore substantial suitable habitat for the Priority species occurs in the broader landscape.

6.1.2 Vegetation

The vegetation types defined for the study area are representative of the broad vegetation type mapped by Shepherd *et al.* (2002) Association 699, *Acacia* thicket with scattered low trees over spinifex, that covers the majority of the study area. Consequently, the vegetation in the study area represents a widespread community well represented at a regional level with 99% of pre-European extent remaining. Subsequently, the vegetation of the study area is considered to have low regional conservation significance, especially as species diversity was low in comparison to that recorded in other flora and vegetation studies conducted in the bioregion.

The majority of the vegetation in the study area was considered locally significant due to the presence of conservation significant flora and/or has a restricted distribution.

6.2 VERTEBRATE FAUNA

When considering the fauna field assessment results, together with the desktop study findings (i.e. historic or recent records of species or suitable habitat in the proximity of the study area) and known habitat preferences, 11 of the 70 significant fauna species identified in the desktop review were considered to have the potential to occur in the study area (Table 6-3). Two of these were recorded during the survey, the Bilby (VU) from secondary evidence and the Rainbow Bee-eater (Mig. – WC Act) from direct observations and calls. Five of the 11 species are listed under the EPBC Act and/or WC Act as Threatened, Conservation Dependent or Specially Protected and a further four as 'Migratory' under the EPBC Act and WC Act (Table 6-3). A further three species are listed as Priority species (Table 6-3).

A single terrestrial fauna habitat, tall shrubland thicket, was mapped within the study area; however, the variability in vegetation structure and density is likely to influence usage by fauna species. Areas of dense understory comprising thick low vegetation, often dominated by grasses, was scattered throughout the study area forming a mosaic amongst more open understory. In particular, along the eastern edge previous clearing and fire events have resulted in varying stages of regrowth.

The tall shrubland thicket habitat, or parts of it, is likely to provide suitable foraging and possible nesting or burrowing habitat for several conservation significant species, particularly Bilby, Spectacled Hare-wallaby, Short-tailed Mouse, Grey Falcon, Peregrine Falcon, Princess Parrot and some migratory bird species to varying extents (Table 6-3). Tall shrubland thickets are widely represented in the broader vicinity of the study area and habitat present within the study area is not likely to be critical to the survival of any significant species.

The survey results for Bilby indicate the majority of the study area is low value habitat for the species. Highest value habitat was located in an approximate 1 km corridor along the eastern boundary, partly within and partly outside the study area, with four of the five diggings recorded there and survey plots consistently rated high value (Figure 5-8). All recorded Bilby diggings corresponded with areas assessed as high value habitat for the species; these were areas where understory was open and areas of sparse vegetation were present. No Bilby records were obtained from areas where dense understory, that would limit ease of movement, was present. No Bilby burrows were recorded in the survey; however, the potential for burrowing by the species in the high value habitat of the study area cannot be ruled out as suitable digging substrate was present. Otherwise, Bilby may occasionally utilise the high value habitat of the study area to forage and for dispersal.

The Rainbow Bee-eater records (Figure 5-8) suggest the species is likely to occur frequently throughout the study area. It is likely to forage and nest where suitable sandy substrates permitting burrow construction are present. The species is frequently encountered in the broader vicinity of the study area and further afield across most of its distribution.

The list of conservation significant fauna from the desktop review included many migratory shorebirds and waterbirds which were returned in the database searches due to the proximity of the study area to important migratory bird areas including Roebuck Bay and Eighty Mile Beach. While suitable habitat is not present for migratory shorebirds and waterbirds in the study area, the installation of irrigated pasture may create suitable habitat for some wetland species and lead to foraging and possibly roosting depending on the abundance of water present.

Table 6-3 Summary of conservation significant vertebrate fauna species with likelihood of occurrence for the study area

Scientific name	Common name	Conservation status			Likelihood of occurrence	Summary of records and occurrence	Nearest record to the study area (Birdlife Australia 2017; DPaW 2017d)
		EPBC Act	WC Act	DPaW			
Fish							
Pristis pristis	Freshwater Sawfish			P3	Unlikely	Suitable habitat not present.	~80 km north
Reptiles							
Crocodylus porosus	Salt-water Crocodile		SP		Unlikely	Suitable habitat not present.	~60 km north
Ctenotus angusticeps	Airlie Island Ctenotus	VU	VU		Unlikely	Suitable habitat not present.	~25 km west
Lerista separanda	Dampierland Plain Slider			P2	Unlikely	Suitable habitat not present.	~23 km west
Birds							
Pandion haliaetus	Osprey	Mig.	Mig.		Unlikely	Suitable habitat not present.	~107 km north
Apus pacificus	Fork-tailed Swift	Mig.	Mig.		Likely	Likely to occasionally occur above the study are to forage; however, unlikely to land or nest within the study area.	~20 km north northeast and ~20 km southwest
Ardea ibis	Cattle Egret	Mig.	Mig.		Possible	May occasionally occur at the small dam located on the eastern edge of the study area when water is present.	~60 km north
Ardea modesta	Eastern Great Egret		Mig.		Possible	May occasionally occur at the small dam located on the eastern edge of the study area when water is present.	~13 km north
Charadrius bicinctus	Double-banded Plover	Mig.	Mig.		Unlikely	Study area north of species currently known Western Australian range. Suitable habitat not present.	over 1,500 km south
Charadrius leschenaultii	Greater Sand Plover	VU/Mig.	Mig.		Unlikely	Suitable habitat not present.	~13 km north
Charadrius mongolus	Lesser Sand Plover	EN/Mig.	EN/Mig.		Unlikely	Suitable habitat not present.	~13 km northwest
Charadrius veredus	Oriental Plover		Mig.		Unlikely	Suitable habitat not present.	~23 k m southwest
Pluvialis fulva	Pacific Golden Plover		Mig.		Unlikely	Suitable habitat not present.	~32 km north

Scientific name	Common name	Conservation status			Likelihood of occurrence	Summary of records and occurrence	Nearest record to the study area (Birdlife Australia 2017; DPaW 2017d)
		EPBC Act	WC Act	DPaW			
Pluvialis squatarola	Grey Plover		Mig.		Unlikely	Suitable habitat not present.	~31 km west
Cuculus optatus	Oriental Cuckoo	Mig.	Mig.		Unlikely	Suitable habitat not present.	~60 km north
Falco hypoleucos	Grey Falcon		VU		Likely	Likely to occasionally occur within study area to forage and may nest in areas where suitable tall trees are present.	~13 km north
Falco peregrinus	Peregrine Falcon		SP		Likely	Likely to occasionally occur within study area to forage, though unlikely to nest.	~13 km west
Fregata ariel	Lesser Frigatebird		Mig.		Unlikely	Suitable habitat not present.	~13 km north
Fregata minor	Greater Frigatebird		Mig.		Unlikely	Suitable habitat not present.	~62 km north
Glareola maldivarum	Oriental Pratincole		Mig.		Unlikely	Suitable habitat not present.	~19 km north
Hirundo rustica	Barn Swallow		Mig.		Unlikely	Suitable habitat not present.	~34 km north northeast
Oceanites oceanicus	Wilson's Storm Petrel	Mig.	Mig.		Unlikely	Suitable habitat not present.	~23 km west
Anous stolidus	Common Noddy		Mig.		Unlikely	Suitable habitat not present.	~60 km north
Chlidonias leucopterus	White-winged Black Tern	Mig.	Mig.		Unlikely	Suitable habitat not present.	~33 km north
Onychoprion anaethetus	Bridled Tern		Mig.		Unlikely	Suitable habitat not present.	~60 km north
Sterna albifrons	Little Tern	Mig.	Mig.		Unlikely	Suitable habitat not present.	~60 km north
Sterna caspia	Caspian Tern	Mig.	Mig.		Unlikely	Suitable habitat not present.	~60 km north
Sterna hirundo	Common Tern	Mig.	Mig.		Unlikely	Suitable habitat not present.	~13 km north
Merops ornatus	Rainbow Bee-eater		Mig.		Recorded	Recorded six times during the field survey from direct observation and call. Likely to frequently occur within the study area to forage and nest.	~5 km west
Motacilla cinerea	Grey Wagtail		Mig.		Unlikely	Suitable habitat not present.	~160 km north northeast

Scientific name	Common name	Conservation status			Likelihood of occurrence	Summary of records and occurrence	Nearest record to the study area (Birdlife Australia 2017; DPaW 2017d)
		EPBC Act	WC Act	DPaW			
Motacilla flava	Yellow Wagtail		Mig.		Unlikely	Suitable habitat not present.	~60 km north
Calonectris leucomelas	Streaked Shearwater	Mig.	Mig.		Unlikely	Suitable habitat not present.	~47 km north northeast
Puffinus pacificus	Wedge-tailed Shearwater	Mig.	Mig.		Unlikely	Suitable habitat not present.	~62 km north
Pezoporus occidentalis	Night Parrot	EN	CR		Possible	Little is known of the species habitat preferences; however, records of the species have often been in habitats consisting of spinifex or samphire vegetation. May possibly occur within the study area, particularly in areas of dense understory dominated by spinifex species. Recently recorded elsewhere in the Kimberley region, though precise locality not disclosed.	~380 km south
Polytelis alexandrae	Princess Parrot	VU		P4	Possible	May possibly occur within the study area; however, species sparsely recorded and occurrence and abundance often dependant on rainfall events.	~50 km southwest
Arenaria interpres	Ruddy Turnstone		Mig.		Unlikely	Suitable habitat not present.	~13 km north northwest
Calidris acuminata	Sharp-tailed Sandpiper		Mig.		Unlikely	Suitable habitat not present.	~21 km southwest
Calidris alba	Sanderling		Mig.		Unlikely	Suitable habitat not present.	~32 km north northeast
Calidris canutus	Red Knot	EN/Mig.	Mig.		Unlikely	Suitable habitat not present.	~32 km north northeast
Calidris ferruginea	Curlew Sandpiper	CR/Mig.	VU/Mig.		Unlikely	Suitable habitat not present.	~13 km north
Calidris ruficollis	Red-necked Stint		Mig.		Unlikely	Suitable habitat not present.	~21 km southwest
Calidris tenuirostris	Great Knot	CR/Mig.	VU/Mig.		Unlikely	Suitable habitat not present.	~13 km north

Scientific name	Common name	Conservation status			Likelihood of occurrence	Summary of records and occurrence	Nearest record to the study area (Birdlife Australia 2017; DPaW 2017d)
		EPBC Act	WC Act	DPaW			
Gallinago megala	Swinhoe's Snipe	Mig.	Mig.		Unlikely	Suitable habitat not present.	~60 km north
Gallinago stenura	Pin-tailed Snipe	Mig.	Mig.		Unlikely	Suitable habitat not present.	~60 km north
Heteroscelus brevipes	Grey-tailed Tattler			P4	Unlikely	Suitable habitat not present.	~14 km north
Limicola falcinellus	Broad-billed Sandpiper		Mig.		Unlikely	Suitable habitat not present.	~33 km north northeast
Limnodromus semipalmatus	Asian Dowitcher	Mig.	Mig.		Unlikely	Suitable habitat not present.	~55 km north northeast
Limosa lapponica	Bar-tailed Godwit		Mig.		Unlikely	Suitable habitat not present.	~25 km west
Limosa lapponica baueri	Bar-tailed Godwit (western Alaskan)	VU	VU/Mig.		Unlikely	Suitable habitat not present.	
Limosa lapponica menzbieri	Bar-tailed Godwit (northern Siberian)	CR	VU/Mig.		Unlikely	Suitable habitat not present.	
Limosa limosa	Black-tailed Godwit		Mig.		Unlikely	Suitable habitat not present.	~17 km north
Numenius madagascariensis	Eastern Curlew	CR/Mig.	VU/Mig.		Unlikely	Suitable habitat not present.	~24 km west
Numenius minutus	Little Curlew		Mig.		Unlikely	Suitable habitat not present.	~21 km southwest
Numenius phaeopus	Whimbrel		Mig.		Unlikely	Suitable habitat not present.	~13 km north northwest
Tringa brevipes	Grey-tailed Tattler			P4	Unlikely	Suitable habitat not present.	~18 km north
Tringa glareola	Wood Sandpiper		Mig.		Unlikely	Suitable habitat not present.	~60 km north
Tringa nebularia	Common Greenshank		Mig.		Unlikely	Suitable habitat not present.	~21 km southwest
Tringa stagnatilis	Marsh Sandpiper		Mig.		Unlikely	Suitable habitat not present.	~21 km southwest
Tringa totanus	Common Redshank	Mig.	Mig.		Unlikely	Suitable habitat not present.	~34 km north northeast
Xenus cinereus	Terek Sandpiper		Mig.		Unlikely	Suitable habitat not present.	~60 km north
Sula abbotti	Abbott's Booby	EN/Mig.			Unlikely	Suitable habitat not present.	~18 km north

Scientific name	Common name	Conservation status			Likelihood of occurrence	Summary of records and occurrence	Nearest record to the study area (Birdlife Australia 2017; DPaW 2017d)
		EPBC Act	WC Act	DPaW			
Sula dactylatra	Masked Booby	Mig.	Mig.		Unlikely	Suitable habitat not present.	~13 km northwest
Sula leucogaster	Brown Booby		Mig.		Unlikely	Suitable habitat not present.	~13 km north
Plegadis falcinellus	Glossy Ibis	Mig.	Mig.		Unlikely	Suitable habitat not present.	~21 km southwest
Mammals							
Saccolaimus saccolaimus nudicluniatus	Bare-rumped Sheath-tailed Bat	VU		P3	Unlikely	Suitable habitat not present.	~400 km east, possibly in error
Lagorchestes conspicillatus leichardti	Spectacled Hare-wallaby			P3	Possible	May possibly occur within the study area; however, mainland records sparse in Western Australia and species rarely recorded.	~19 km southwest and ~21 km northeast
Mormopterus loriae cobourgiana	Little North-western Mastiff Bat			P1	Unlikely	Suitable habitat not present.	~20 km west
Leggadina lakedownensis	Short-tailed Mouse			P4	Likely	Likely to occur in shrubland habitat recorded within the study area. Occurrence and abundance likely to be influenced by rainfall events.	~23 km west
Isoodon auratus auratus	Golden Bandicoot	VU	VU		Unlikely	Study area outside of species current known range.	~40 km southwest
Macrotis lagotis	Bilby	VU	VU		Recorded	Recorded from secondary evidence (foraging diggings) five times during the field survey. Likely to occur within study area where suitable vegetation cover with open areas present.	~1 km southwest and ~6km south

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Appendix 1 Flora, fauna and ecological community conservation codes and definitions (DEC 2013; DPaW 2017a)

Department of Parks and Wildlife

CONSERVATION CODES

For Western Australian Flora and Fauna

Specially protected fauna or flora[1] are species[2] which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such.

Categories of specially protected fauna and flora are:

T **Threatened species**

Published as Specially Protected under the *Wildlife Conservation Act 1950,* and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

Threatened fauna is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the Wildlife Conservation Act.

Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act.

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

CR **Critically endangered species**

Threatened species considered to be facing an extremely high risk of extinction in the wild. 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.

EN **Endangered species**

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.

VU **Vulnerable species**

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.

EX **Presumed extinct species**

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.

IA **Migratory birds protected under an international agreement**

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.

CD Conservation dependent fauna

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.

OS Other specially protected fauna

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.

P Priority species

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

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

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

1 Priority 1: Poorly-known species

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

2 Priority 2: Poorly-known species

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

3 Priority 3: Poorly-known species

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

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

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

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

Appendix 2 NVIC Information Hierarchy (ESCAVI 2003) and comparable WA current practice (from EPA 2016d)

Western Australia Current Practice			National Standard		
Hierarchy of terms	**Brief description in WA**	**Indicative scale**	**NVIS Level**	**Description**	**NVIS structural/floristic components required**
Vegetation formation	Structure and growth form – Forest, Woodland.	1:5 000 000	I	Class	Dominant growth form for the ecologically or structurally dominant stratum.
Vegetation sub-formation	Structural and dominant vegetation layer - Eucalypt Forest, Banksia Woodland.	1:2 500 000	II	Structural Formation	Dominant growth form, cover and height for the ecologically or structurally dominant stratum.
Vegetation association	Structural form and dominant species - Medium woodland; York gum (*Eucalyptus loxophleba*) & Wandoo	1:1 000 000 to 1:250 000	III	Broad Floristic Formation	Dominant growth form, cover, height and dominant land cover genus for the uppermost or dominant stratum.
Vegetation complex	Structural and floristic description linked to geomorphology – Quindalup Complex.	1:250 000 to 1:100 000	IV	Sub-Formation	Dominant growth form, cover, height and dominant genus and Family for the three traditional strata. (i.e. Upper, Mid and Ground).
Vegetation type	Floristic definition by strata with structural detail. Often represented with a code and floristic description.	1:100 000 to 1:10 000	V	Association	Dominant growth form, height, cover and up to 3 species for the three traditional strata. (i.e. Upper, Mid and Ground).
Plant community	Basic unit of vegetation classification, site specific and highly localised with detailed floristics for each stratum.	1:10 000	VI	Sub-Association	Dominant growth form, height, cover and up to 5 species for all layers/strata.
Floristic Community Type	Floristic composition definition; e.g. Northern banksia woodlands over herb rich shrublands on the Swan Coastal Plain.	No absolute scale			

Appendix 3 Flora survey site descriptions

Site:	S001	**Type:**	Quadrat (50 m x 50 m)
Date(s):	28 April 2017	**Position:**	-18.485719, 122.063644
Total vegetation cover (%):	70	**Topography:**	plain
Tree/shrub cover >2 m (%):	30	**Soil colour:**	red-brown
Shrub cover <2 m (%):	1	**Soil:**	sand; sandy loam
Grass cover (%):	50	**Rock type:**	none
Herb cover (%):	1	**Fire age:**	not evident
Disturbance details:	none		
Vegetation condition:	Excellent, EPA (2016)		
Vegetation description:	Isolated low *Corymbia hamersleyana* and *C. zygophylla* trees over tall *Acacia eriopoda* and *Bauhinia cunninghamii* shrubland over low *Aristida holathera*, *Sorghum plumosum* and *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	40.0	00.20		
Acacia eriopoda	30.0	04.00		
Aristida holathera	05.0	00.30		
Sorghum plumosum	05.0	00.30		
Corymbia hamersleyana	02.0	04.00		
Corymbia zygophylla	02.0	04.00		
Bauhinia cunninghamii	02.0	01.80		
Goodenia armitiana	01.0	00.40		
Zornia chaetophora	01.0	00.25		
Euphorbia hassallii	00.1	00.25		
Trianthema pilosum	00.1	00.05		
Calandrinia strophiolata	00.1	00.10		
Newcastelia cladotricha	00.1	00.40		
Phyllanthus maderaspatensis	00.1	00.50		
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	00.1	00.15		
Bulbostylis barbata	00.1	00.20		
Spermacoce occidentalis	00.1	00.25		
Senna notabilis	00.1	00.40		
Clerodendrum floribundum	00.1	00.50		
Cleome viscosa	00.1	00.30		

Abutilon otocarpum	00.1	00.25
Cucumis melo	00.1	01.20
Grewia retusifolia	00.1	01.50
Goodenia sepalosa var. *sepalosa*	00.1	00.15
Brachychiton diversifolius	00.1	01.20
Trichodesma zeylanicum var. *latisepaleum*	00.1	00.40
Indigofera monophylla	00.1	00.50
Crotalaria aridicola subsp. *densifolia*	00.1	00.40
Seringia nephrosperma	00.1	00.50
Corymbia sp. (white bark)	00.1	02.50
Grevillea pyramidalis	00.1	02.00
Waltheria indica	00.1	00.30

Site:	S002	**Type:**	Quadrat (50 m x 50 m)
Date(s):	28 April 2017	**Position:**	-18.49147, 122.055652
Total vegetation cover (%):	50	**Topography:**	plain
Tree/shrub cover >2 m (%):	30	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sand, sandy loam,
Grass cover (%):	30	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	1 – 5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016)		
Vegetation description:	Isolated low *Corymbia hamersleyana* and *C. zygophylla* trees over tall *Acacia eriopoda* and *Bauhinia cunninghamii* shrubland over low *Sorghum plumosum* and *Triodia caelestialis* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Acacia eriopoda	30.0	04.00		
Triodia caelestialis	20.0	00.25		P3 (WC Act)
Sorghum plumosum	10.0	00.30		
Bauhinia cunninghamii	01.0	03.00		
Newcastelia cladotricha	01.0	00.50		
Corymbia hamersleyana	01.0	04.00		
Corymbia zygophylla	01.0	04.00		
Goodenia sepalosa var. *sepalosa*	01.0	00.15		
Calandrinia strophiolata	00.1	00.10		
Halgania solanacea	00.1	00.30		
Senna notabilis	00.1	00.40		
Cleome uncifera	00.1	00.30		
Waltheria indica	00.1	00.25		
Grevillea pyramidalis	00.1	00.40		
Polycarpaea corymbosa	00.1	15.00		
Cucumis melo	00.1	00.10		
Heliotropium foliatum	00.1	00.30		
Gardenia pyriformis				

Site:	S003	**Type:**	Quadrat (50 m x 50 m)
Date(s):	29 April 2017	**Position:**	-18.536404, 122.062008
Total vegetation cover (%):	75	**Topography:**	plain
Tree/shrub cover >2 m (%):	35	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	5	**Soil:**	sandy loam,
Grass cover (%):	70	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Low open *Corymbia flavescens* and *C. zygophylla* woodland over tall open *Acacia eriopoda* and *Grevillea wickhamii* shrubland over mid sparse *Dodonaea hispidula* var. *arida* shrubland over low closed *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	70.0	00.30		
Acacia eriopoda	15.0	04.00		
Grevillea wickhamii	10.0	04.00		
Dodonaea hispidula var. *arida*	05.0	01.50		
Corymbia zygophylla	05.0	04.00		
Sorghum plumosum	02.0	00.40		
Corymbia flavescens	02.0	03.00		
Halgania solanacea	02.0	00.30		
Acacia colei	02.0	03.00		
Indigofera monophylla	01.0	00.50		
Zornia prostrata	01.0	00.40		
Fimbristylis oxystachya	01.0	00.30		
Corchorus sidoides subsp. *vermicularis*	01.0	00.40		
Waltheria indica	01.0	00.40		
Gardenia pyriformis	01.0	01.40		
Dolichandrone heterophylla	01.0	01.20		
Acacia adoxa var. *subglabra*	01.0	00.50		
Jacksonia aculeata	01.0	00.40		
Evolvulus alsinoides var. *decumbens*	00.1	00.40		

Cynanchum carnosum	00.1	03.00
Solanum cunninghamii	00.1	00.50
Spermacoce occidentalis	00.1	00.30
Goodenia sepalosa var. *sepalosa*	00.1	00.15
Calandrinia strophiolata	00.1	00.10
Grevillea pyramidalis	00.1	00.50
Euphorbia hassallii	00.1	00.20
Rhynchosia minima	00.1	00.20
Sida sp. Pindan (B.G. Thomson 3398)	00.1	00.50
Stackhousia intermedia	00.1	00.50
Chamaecrista symonii	00.1	00.45
Cassytha filiformis	00.1	03.00
Trichodesma zeylanicum var. *latisepaleum*	00.1	00.80
Cucumis melo	00.1	01.20
Phyllanthus maderaspatensis	00.1	00.40
Tephrosia leptoclada	00.1	00.30
Senna oligoclada	00.1	00.50
Hibiscus leptocladus	00.1	00.40
Yakirra australiensis	00.1	00.15
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	00.1	00.15

Site:	S004	**Type:**	Quadrat (50 m x 50 m)
Date(s):	02 May 2017	**Position:**	-18.488625, 122.069781
Total vegetation cover (%):	75	**Topography:**	plain
Tree/shrub cover >2 m (%):	25	**Soil colour:**	brown,
Shrub cover <2 m (%):	10	**Soil:**	sandy loam,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	not evident
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Isolated low *Corymbia zygophylla* trees over tall open *Acacia eriopoda* shrubland over low sparse *Jacksonia aculeata* shrubland over low closed *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	75.0	00.30		
Acacia eriopoda	20.0	03.50		
Jacksonia aculeata	05.0	00.60		
Corymbia zygophylla	02.0	04.00		
Grevillea pyramidalis	01.0	01.50		
Bauhinia cunninghamii	01.0	02.20		
Acacia colei	01.0	02.00		
Dolichandrone heterophylla	01.0	01.50		
Crotalaria aridicola subsp. *densifolia*	01.0	00.50		
Spermacoce occidentalis	01.0	00.40		
Polygala tepperi	00.1	00.50		
Phyllanthus maderaspatensis	00.1	00.40		
Newcastelia cladotricha	00.1	01.00		
Acacia adoxa var. *subglabra*	00.1	00.50		
Rhynchosia minima	00.1	00.30		
Calandrinia strophiolata	00.1	00.10		
Corchorus sidoides subsp. *vermicularis*	00.1	00.40		
Euphorbia hassallii	00.1	00.20		
Leptosema anomalum	00.1	00.20		
Halgania solanacea	00.1	00.40		

Cynanchum carnosum	00.1	00.50	
Ehretia saligna	00.1	01.40	
Crotalaria ramosissima	00.1	00.20	
? *Polymeria* sp. Broome	00.1	00.20	P1 (WC Act)
Cassytha filiformis	00.1	01.00	
Chamaecrista symonii	00.1	00.40	
Senna oligoclada	00.1	01.00	
Chrysopogon pallidus	00.1	00.40	
Cucumis melo	00.1	00.50	
Codonocarpus cotinifolius	00.1	00.70	
Indigofera monophylla	00.1	01.00	
Grevillea refracta	00.1	04.00	
Goodenia sepalosa	00.1	00.15	

Site:	S005	**Type:**	Quadrat (50 m x 50 m)
Date(s):	02 May 2017	**Position:**	-18.501109, 122.059946
Total vegetation cover (%):	70	**Topography:**	plain
Tree/shrub cover >2 m (%):	45	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	5	**Soil:**	sandy loam,
Grass cover (%):	60	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	1 – 5 years
Disturbance details:	none		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Isolated low *Corymbia hamersleyana* and *C. zygophylla* trees over tall *Acacia eriopoda* and *Grevillea wickhamii* shrubland over low *Triodia schinzii* and *Chrysopogon pallidus* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	40.0	00.30		
Acacia eriopoda	40.0	04.00		
Chrysopogon pallidus	20.0	00.40		
Grevillea wickhamii	10.0	04.00		
Calandrinia strophiolata	01.0	00.10		
Spermacoce occidentalis	01.0	00.40		
Grevillea pyramidalis	01.0	01.20		
Bauhinia cunninghamii	01.0	01.50		
Halgania solanacea	01.0	00.40		
Corymbia hamersleyana	01.0	03.00		
Corymbia zygophylla	01.0	04.00		
Yakirra australiensis	00.1	00.10		
Eriachne avenacea	00.1	00.40		
Fimbristylis oxystachya	00.1	00.20		
Corchorus sidoides subsp. *vermicularis*	00.1	00.30		
Crotalaria ramosissima	00.1	00.25		
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	00.1	00.15		
Senna notabilis	00.1	00.30		
Eragrostis eriopoda	00.1	00.10		
Newcastelia cladotricha	00.1	00.50		

Cucumis melo	00.1	00.30
Acacia stipuligera	00.1	01.40
Phyllanthus maderaspatensis	00.1	00.50
Goodenia sepalosa var. *sepalosa*	00.1	00.15
Acacia adoxa var. *subglabra*	00.1	00.50
Cleome uncifera	00.1	00.20
Heliotropium paniculatum	00.1	00.30
Polygala tepperi	00.1	00.50
Indigofera monophylla	00.1	01.20
Rhynchosia minima	00.1	00.30

Site:	S006	**Type:**	Quadrat (50 m x 50 m)
Date(s):	01 May 2017	**Position:**	-18.519761, 122.057905
Total vegetation cover (%):	75	**Topography:**	plain
Tree/shrub cover >2 m (%):	35	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	5	**Soil:**	sandy loam,
Grass cover (%):	70	**Rock type:**	none
Herb cover (%):	1	**Fire age:**	1 – 5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Isolated low *Corymbia zygophylla* trees over tall *Acacia eriopoda* shrubland over mid sparse *Bauhinia cunninghamii* and *Dolichandrone heterophylla* shrubland over low closed *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	70.0	00.30		
Acacia eriopoda	30.0	04.00		
Chrysopogon pallidus	05.0	00.40		
Corymbia zygophylla	05.0	07.00		
Bauhinia cunninghamii	04.0	01.80		
Dolichandrone heterophylla	01.0	01.50		
Heliotropium foliatum	01.0	00.25		
Dodonaea hispidula var. *arida*	01.0	01.50		
Spermacoce occidentalis	00.5	00.40		
Gardenia pyriformis	00.1	01.00		
Calandrinia strophiolata	00.1	00.10		
Trianthema pilosum	00.1	00.02		
Grevillea wickhamii	00.1	00.60		
Fimbristylis oxystachya	00.1	00.20		
Oldenlandia mitrasacmoides subsp. *mitrasacmoides*	00.1	00.20		
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	00.1	00.15		
Stackhousia intermedia	00.1	00.50		
Goodenia sepalosa	00.1	00.15		
Heliotropium paniculatum	00.1	00.30		
Triumfetta johnstonii	00.1	00.20		

Polygala tepperi	00.1	00.50

Site:	S007	**Type:**	Quadrat (50 m x 50 m)
Date(s):	01 May 2017	**Position:**	-18.517838, 122.035911
Total vegetation cover (%):	70	**Topography:**	plain
Tree/shrub cover >2 m (%):	25	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	10	**Soil:**	sand, sandy loam,
Grass cover (%):	65	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016)		
Vegetation description:	Isolated low *Corymbia hamersleyana* and *C. zygophylla* trees over tall open *Acacia eriopoda*, *A. colei* and *Grevillea wickhamii* shrubland over mid open *Erythrophleum chlorostachys* shrubland over low *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	60.0	03.00		
Acacia eriopoda	15.0	03.00		
Erythrophleum chlorostachys	10.0	01.80		
Grevillea wickhamii	05.0	04.00		
Acacia colei	05.0	03.00		
Chrysopogon pallidus	05.0	00.40		
Corymbia zygophylla	03.0	05.00		
Corymbia hamersleyana	02.0	05.00		
Jacksonia aculeata	02.0	00.50		
Aristida holathera	01.0	00.40		
Scaevola parvifolia subsp. *parvifolia*	00.1	00.20		
Acacia adoxa var. *subglabra*	00.1	00.50		
Tephrosia leptoclada	00.1	00.25		
Phyllanthus maderaspatensis	00.1	00.50		
Ptilotus astrolasius	00.1	00.50		
Euphorbia hassallii	00.1	00.20		
Polygala tepperi	00.1	00.60		
Polycarpaea corymbosa	00.1	00.20		
Eragrostis eriopoda	00.1	00.15		

Calandrinia strophiolata	00.1	00.10
Leptosema anomalum	00.1	00.25
Bulbostylis barbata	00.1	00.15
Goodenia sepalosa var. *sepalosa*	00.1	00.15
Eriachne avenacea	00.1	00.40
Indigofera monophylla	00.1	01.10
Spermacoce occidentalis	00.1	00.40

Site:	S008	**Type:**	Quadrat (50 m x 50 m)
Date(s):	02 May 2017	**Position:**	-18.524495, 122.082216
Total vegetation cover (%):	90	**Topography:**	plain
Tree/shrub cover >2 m (%):	90	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	20	**Soil:**	sand, sandy loam,
Grass cover (%):	10	**Rock type:**	none
Herb cover (%):	1	**Fire age:**	not evident
Disturbance details:	grazing – medium, livestock tracks,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Tall closed *Acacia eriopoda* and *A. monticola* shrubland over mid open *Trachymene oleracea* subsp. *oleracea* shrubland over low open *Chrysopogon pallidus* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Acacia monticola	80.0	02.50		
Acacia eriopoda	10.0	04.00		
Chrysopogon pallidus	10.0	00.40		
Trachymene oleracea subsp. oleracea	10.0	01.10		
Triumfetta johnstonii	05.0	00.30		
Zornia prostrata	01.0	00.15		
Oldenlandia mitrasacmoides subsp. *mitrasacmoides*	00.1	00.20		
Triodia schinzii	00.1	00.30		
Goodenia sepalosa var. *sepalosa*	00.1	00.15		
Dodonaea hispidula var. *arida*	00.1	01.50		
Euphorbia hassallii	00.1	00.15		
Evolvulus alsinoides var. *decumbens*	00.1	00.20		
Grevillea wickhamii	00.1	03.00		
Tephrosia leptoclada	00.1	00.25		
Paspalidium rarum	00.1	00.10		
Acacia colei	00.1	03.00		
Senna oligoclada	00.1	00.60		
Grevillea refracta	00.1	00.50		
Spermacoce occidentalis	00.1	00.40		

Site:	S009	**Type:**	Quadrat (50 m x 50 m)
Date(s):	01 May 2017	**Position:**	-18.513022, 122.061851
Total vegetation cover (%):	80	**Topography:**	plain
Tree/shrub cover >2 m (%):	40	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	10	**Soil:**	sandy loam,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Low *Corymbia hamersleyana*, *C. zygophylla* and *Dolichandrone heterophylla* woodland over tall *Acacia eriopoda*, *Bauhinia cunniinghamii* and *Grevillea pyramidalis* shrubland over low closed *Aristida holathera*, *Chrysopogon pallidus* and *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	65.0	00.10		
Acacia eriopoda	20.0	04.00		
Corymbia hamersleyana	10.0	08.00		
Chrysopogon pallidus	10.0	00.40		
Bauhinia cunninghamii	05.0	04.00		
Corymbia zygophylla	05.0	07.00		
Dolichandrone heterophylla	02.0	07.00		
Aristida holathera	02.0	00.40		
Zornia prostrata	01.0	00.20		
Grevillea pyramidalis	01.0	03.00		
Acacia colei	01.0	03.00		
Brachychiton diversifolius	01.0	02.50		
Spermacoce occidentalis	01.0	00.40		
Grevillea refracta	01.0	04.00		
Persoonia falcata	00.2	03.00		
Rhynchosia minima	00.1	00.30		
Calandrinia strophiolata	00.1	00.10		
Goodenia sepalosa var. *sepalosa*	00.1	00.15		
Eriachne avenacea	00.1	00.30		

Panicum effusum	00.1	00.15	
Scaevola parvifolia subsp. *parvifolia*	00.1	00.20	
Sida sp. Pindan (B.G. Thomson 3398)	00.1	00.50	
Crotalaria aridicola subsp. *densifolia*	00.1	00.40	
Acacia adoxa var. *subglabra*	00.1	00.50	
Fimbristylis oxystachya	00.1	00.25	
Phyllanthus maderaspatensis	00.1	00.50	
Euphorbia hassallii	00.1	00.20	
? *Polymeria* sp. Broome	00.1	00.25	P1 (WC Act)
Cleome viscosa	00.1	01.00	
Cucumis melo	00.1	00.20	
Hybanthus aurantiacus	00.1	00.50	
Ptilotus astrolasius	00.1	00.40	
Corchorus sidoides subsp. *vermicularis*	00.1	00.20	

Site:	S010	**Type:**	Quadrat (50 m x 50 m)
Date(s):	28 April 2017	**Position:**	-18.500572, 122.104345
Total vegetation cover (%):	85	**Topography:**	plain
Tree/shrub cover >2 m (%):	35	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	2	**Soil:**	sand, sandy loam,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	1	**Fire age:**	1 – 5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Isolated low *Corymbia hamersleyana* trees over tall *Acacia eriopoda*, *A. monticola* and *Grevillea wickhamii* shrubland over low closed *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	75.0	00.30		
Acacia eriopoda	20.0	03.00		
Grevillea wickhamii	10.0	03.00		
Acacia monticola	05.0	02.80		
Sorghum plumosum	05.0	00.30		
Dodonaea hispidula var. *arida*	01.0	01.00		
Seringia nephrosperma	01.0	00.60		
Dolichandrone heterophylla	01.0	01.20		
Corymbia hamersleyana	01.0	04.00		
Jacksonia aculeata	01.0	00.80		
Acacia colei	01.0	03.00		
Cucumis melo	00.1	00.20		
Goodenia sepalosa var. *sepalosa*	00.1	00.15		
Spermacoce occidentalis	00.1	00.30		
Triumfetta johnstonii	00.1	00.50		
Senna notabilis	00.1	00.40		
Halgania solanacea	00.1	00.40		
Waltheria indica	00.1	00.40		
Nauclea orientalis	00.1	00.60		
Corymbia zygophylla	00.1	02.00		

Goodenia stobbsiana	00.1	00.40	
Triodia caelestialis	00.1	00.40	P3 (WC Act)
Fimbristylis oxystachya	00.1	00.20	
Acacia adoxa var. *subglabra*	00.1	00.50	
Oldenlandia mitrasacmoides subsp. *mitrasacmoides*	00.1	00.30	
Acacia stipuligera	00.1	01.50	
Phyllanthus maderaspatensis	00.1	00.30	
Chamaecrista symonii	00.1	00.20	
Solanum cunninghamii	00.1	00.40	
Codonocarpus cotinifolius	00.1	01.00	
Grevillea refracta	00.1	02.50	
Calandrinia strophiolata	00.1	00.10	
Zornia prostrata	00.1	00.10	
Stackhousia intermedia	00.1	00.25	
Corymbia sp. (white bark)	00.1	04.00	
Hybanthus aurantiacus	00.1	00.40	

Site:	S011	**Type:**	Quadrat (50 m x 50 m)
Date(s):	30 April 2017	**Position:**	-18.498322, 122.093833
Total vegetation cover (%):	65	**Topography:**	plain
Tree/shrub cover >2 m (%):	40	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	10	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	60	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Isolated low *Corymbia zygophylla* trees over tall *Acacia eriopoda*, *Erythrophleum chlorostachys* and *Grevillea wickhamii* shrubland over low *Aristida holathera*, *Sorghum plumosum* and *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	50.0	00.30		
Acacia eriopoda	15.0	05.00		
Grevillea wickhamii	15.0	04.00		
Sorghum plumosum	10.0	00.40		
Erythrophleum chlorostachys	10.0	04.00		
Corymbia zygophylla	05.0	05.00		
Aristida holathera	05.0	00.40		
Halgania solanacea	01.0	00.30		
Brachychiton diversifolius	01.0	03.00		
Zornia prostrata	01.0	00.20		
Persoonia falcata	01.0	01.80		
Bulbostylis barbata	01.0	00.20		
Grevillea pyramidalis	01.0	01.50		
Acacia colei	01.0	03.00		
Grewia retusifolia	00.5	01.70		
Acacia adoxa var. *subglabra*	00.1	00.50		
Euphorbia hassallii	00.1	00.20		
Hibiscus leptocladus	00.1	00.25		
Mitrasacme connata	00.1	00.10		
Spermacoce occidentalis	00.1	00.40		

Calandrinia strophiolata	00.1	00.10
Rhynchosia minima	00.1	00.20
Bauhinia cunninghamii	00.1	02.50
Senna oligoclada	00.1	00.50
Denhamia cunninghamii	00.1	02.20
Scaevola parvifolia subsp. *parvifolia*	00.1	00.20
Jacksonia aculeata	00.1	00.60
Senna notabilis	00.1	00.40
Zornia chaetophora	00.1	00.30
Polycarpaea corymbosa	00.1	00.15
Goodenia armitiana	00.1	00.20
Dolichandrone heterophylla	00.1	01.50
Cucumis melo	00.1	00.50
Goodenia sepalosa var. *sepalosa*	00.1	00.10
Corymbia sp. (sterile)	00.1	01.00
Oldenlandia mitrasacmoides subsp. *mitrasacmoides*	00.1	00.20
Eriachne avenacea	00.1	00.40
Yakirra australiensis	00.1	00.10
Polygala tepperi	00.1	00.50

Site:	S012	**Type:**	Quadrat (50 m x 50 m)
Date(s):	29 April 2017	**Position:**	-18.517106, 122.09047
Total vegetation cover (%):	80	**Topography:**	plain
Tree/shrub cover >2 m (%):	30	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	5	**Soil:**	sandy loam,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years
Disturbance details:	none,		
Vegetation condition:	Very Good, EPA (2016)		
Vegetation description:	Tall *Acacia eriopoda*, *A. colei* and *Grevillea refracta* shrubland over isolated low *Corymbia zygophylla* mallee over low closed *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	75.0	00.30		
Acacia eriopoda	30.0	04.00		
Sorghum plumosum	10.0	00.30		
Bauhinia cunninghamii	05.0	01.80		
Corymbia zygophylla	05.0	02.00		
Acacia colei	02.0	03.00		
Halgania solanacea	02.0	00.40		
Indigofera monophylla	02.0	01.20		
Rhynchosia minima	02.0	03.00		
Grevillea refracta	01.0	03.00		
Seringia nephrosperma	01.0	00.40		
Bulbostylis barbata	00.1	00.20		
Tephrosia leptoclada	00.1	00.20		
Cleome viscosa	00.1	00.50		
Cucumis melo	00.1	01.50		
Phyllanthus maderaspatensis	00.1	00.50		
Spermacoce occidentalis	00.1	00.40		
Chamaecrista symonii	00.1	00.40		
Grewia retusifolia	00.1	01.50		
Heliotropium paniculatum	00.1	00.15		
Stackhousia intermedia	00.1	00.40		

Calandrinia strophiolata	00.1	00.10
Dolichandrone heterophylla	00.1	01.70
Yakirra australiensis	00.1	00.10
Grevillea pyramidalis	00.1	02.20
Goodenia sepalosa var. *sepalosa*	00.1	00.15
Trianthema pilosum	00.1	00.02
Dodonaea hispidula var. *arida*	00.1	01.20

Site:	S013	**Type:**	Quadrat (50 m x 50 m)
Date(s):	29 April 2017	**Position:**	-18.53283, 122.079714
Total vegetation cover (%):	60	**Topography:**	plain
Tree/shrub cover >2 m (%):	10	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	20	**Soil:**	sandy loam,
Grass cover (%):	60	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Low *Corymbia hamersleyana* and *C. zygophylla* woodland over tall open *Acacia eriopoda* shrubland over low *Aristida holathera*, *Sorghum plumosum* and *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	35.0	00.30		
Acacia eriopoda	25.0	03.00		
Sorghum plumosum	15.0	00.40		
Corymbia hamersleyana	15.0	08.00		
Aristida holathera	10.0	00.40		
Corymbia zygophylla	05.0	06.00		
Gardenia pyriformis	02.0	01.50		
Bauhinia cunninghamii	02.0	01.50		
Dodonaea hispidula var. *arida*	02.0	01.30		
Grevillea pyramidalis	02.0	01.80		
Cassytha filiformis	01.0	01.00		
Acacia adoxa var. *subglabra*	01.0	00.40		
Scaevola parvifolia subsp. *parvifolia*	01.0	00.25		
Rhynchosia minima	01.0	00.30		
Crotalaria ramosissima	01.0	00.25		
Ptilotus astrolasius	01.0	00.50		
Corchorus sidoides subsp. *vermicularis*	00.5	00.30		
Heliotropium paniculatum	00.1	00.30		
Trianthema cusackianum	00.1	00.02		
Polygala tepperi	00.1	00.40		

Stackhousia intermedia	00.1	00.30
Eriachne avenacea	00.1	00.15
Halgania solanacea	00.1	00.30
Panicum effusum	00.1	00.15
Polycarpaea corymbosa	00.1	00.15
Senna oligoclada	00.1	00.40
Cleome uncifera	00.1	00.20
Calandrinia strophiolata	00.1	00.10
Dolichandrone heterophylla	00.1	01.20
Bulbostylis barbata	00.1	00.20
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	00.1	00.15
Sida sp. Pindan (B.G. Thomson 3398)	00.1	00.50
Spermacoce occidentalis	00.1	00.30
Goodenia sepalosa var. *sepalosa*	00.1	00.15
Euphorbia hassallii	00.1	00.15

Site:	S014	**Type:**	Quadrat (50 m x 50 m)
Date(s):	29 April 2017	**Position:**	-18.541975, 122.065012
Total vegetation cover (%):	60	**Topography:**	plain
Tree/shrub cover >2 m (%):	10	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	20	**Soil:**	sandy loam,
Grass cover (%):	60	**Rock type:**	none
Herb cover (%):	3	**Fire age:**	1 – 5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Isolated low *Corymbia hamersleyana* and *C. zygophylla* trees over tall *Acacia eriopoda*, *Grevillea refracta* and *G. wickhamii* shrubland over low *Triodia caelestialis* and *Sorghum plumosum* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia caelestialis	50.0	00.40		P3 (WC Act)
Acacia eriopoda	20.0	03.00		
Grevillea wickhamii	10.0	03.00		
Sorghum plumosum	10.0	00.40		
Bauhinia cunninghamii	05.0	01.50		
Corymbia hamersleyana	02.0	04.00		
Halgania solanacea	02.0	00.30		
Aristida holathera	02.0	00.40		
Rhynchosia minima	02.0	00.50		
Corymbia zygophylla	02.0	04.00		
Grevillea refracta	02.0	03.00		
Eriachne avenacea	01.0	00.40		
Acacia adoxa var. *subglabra*	01.0	00.50		
Calandrinia strophiolata	01.0	00.10		
Grevillea pyramidalis	01.0	04.00		
Scaevola parvifolia subsp. *parvifolia*	01.0	00.15		
Dodonaea hispidula var. *arida*	01.0	01.20		
Ptilotus astrolasius	01.0	00.50		
Bulbostylis barbata	00.1	00.15		
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	00.1	00.15		

Euphorbia hassallii	00.1	00.25
Hybanthus aurantiacus	00.1	00.40
Heliotropium paniculatum	00.1	00.15
Clerodendrum floribundum	00.1	01.70
Oldenlandia mitrasacmoides subsp. *mitrasacmoides*	00.1	00.20
Trianthema pilosum	00.1	00.02
Tephrosia leptoclada	00.1	00.15
Yakirra australiensis	00.1	00.15
Leptosema anomalum	00.1	00.30
Hibiscus sturtii var. *campylochlamys*	00.1	00.70
Dolichandrone heterophylla	00.1	01.50
Cucumis melo	00.1	00.50
Phyllanthus maderaspatensis	00.1	00.40
Corchorus sidoides subsp. *vermicularis*	00.1	00.30
Goodenia sepalosa var. *sepalosa*	00.1	00.15

Site:	S015	**Type:**	Quadrat (50 m x 50 m)
Date(s):	30 April 2017	**Position:**	-18.538821, 122.072803
Total vegetation cover (%):	60	**Topography:**	plain
Tree/shrub cover >2 m (%):	30	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	10	**Soil:**	sand, sandy loam,
Grass cover (%):	55	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	1 – 5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Low open *Corymbia zygophylla* woodland over tall *Acacia eriopoda*, *Grevillea refracta* and *G. wickhamii* shrubland over low *Aristida holathera*, *Sorghum plumosum* and *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	45.0	00.30		
Acacia eriopoda	20.0	04.00		
Corymbia zygophylla	07.0	05.00		
Grevillea refracta	05.0	04.00		
Grevillea wickhamii	05.0	04.00		
Sorghum plumosum	05.0	00.40		
Aristida holathera	05.0	00.40		
Bauhinia cunninghamii	02.0	02.00		
Halgania solanacea	02.0	00.30		
Cleome uncifera	01.0	00.25		
Fimbristylis oxystachya	01.0	02.00		
Trianthema pilosum	01.0	00.02		
Corchorus sidoides subsp. *vermicularis*	01.0	00.30		
Ptilotus decalvatus	01.0	00.15		
Rhynchosia minima	01.0	00.30		
Calandrinia strophiolata	01.0	00.10		
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	01.0	00.15		
Triodia caelestialis	01.0	00.50		P3 (WC Act)
Indigofera monophylla	01.0	01.00		
Bulbostylis barbata	00.5	00.20		

Goodenia sepalosa var. *sepalosa*	00.5	00.15	
Ipomoea sp. sterile	00.1	00.40	
Polygala tepperi	00.1	00.40	
Acacia adoxa var. *subglabra*	00.1	00.50	
Sida sp. Pindan (B.G. Thomson 3398)	00.1	00.60	
Gyrostemon tepperi	00.1	00.80	
Gardenia pyriformis	00.1	01.20	
Dodonaea hispidula var. *arida*	00.1	01.00	
Solanum diversiflorum	00.1	00.30	
Solanum cunninghamii	00.1	00.40	
Hibiscus sturtii var. *campylochlamys*	00.1	00.80	
Waltheria indica	00.1	00.50	
Clerodendrum floribundum	00.1	01.80	
Polycarpaea corymbosa	00.1	00.20	
Cucumis melo	00.1	00.20	
Heliotropium paniculatum	00.1	00.25	
Grevillea pyramidalis	00.1	02.00	
Abutilon otocarpum	00.1	25.00	
Tephrosia leptoclada	00.1	00.15	
Yakirra australiensis	00.1	00.15	
Euphorbia hassallii	00.1	00.15	
? *Polymeria* sp. Broome	00.1	00.15	P1 (WC Act)
Panicum effusum	00.1	00.15	
Scaevola parvifolia subsp. *parvifolia*	00.1	00.15	
Senna oligoclada	00.1	00.40	
Zornia prostrata	00.1	00.15	
Senna notabilis	00.1	00.40	

Site:	S016	**Type:**	Quadrat (50 m x 50 m)
Date(s):	02 May 2017	**Position:**	-18.494817, 122.077724
Total vegetation cover (%):	80	**Topography:**	plain
Tree/shrub cover >2 m (%):	35	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	10	**Soil:**	sandy loam,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years
Disturbance details:	livestock tracks,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Tall *Acacia eriopoda* shrubland over sparse mid *Seringia nephrosperma* shrubland over low closed *Chrysopogon pallidus* and *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	45.0	00.30		
Chrysopogon pallidus	35.0	00.40		
Acacia eriopoda	30.0	04.00		
Seringia nephrosperma	07.0	00.60		
Bauhinia cunninghamii	02.0	02.50		
Corymbia zygophylla	01.0	04.00		
Grevillea pyramidalis	01.0	01.50		
Dodonaea hispidula var. *arida*	01.0	01.20		
Dolichandrone heterophylla	01.0	01.80		
Brachychiton diversifolius	01.0	02.00		
Halgania solanacea	01.0	00.40		
Corymbia hamersleyana	01.0	03.00		
Indigofera monophylla	00.1	01.20		
Trianthema pilosum	00.1	00.02		
Euphorbia hassallii	00.1	00.20		
Mitrasacme connata	00.1	00.20		
Scaevola parvifolia subsp. *parvifolia*	00.1	00.15		
Spermacoce occidentalis	00.1	00.40		
Acacia colei	00.1	02.00		
Grevillea pyramidalis subsp. *leucadendron*	00.1	01.50		

Calandrinia strophiolata	00.1	00.10
Leptosema anomalum	00.1	00.25
Senna notabilis	00.1	00.50
Newcastelia cladotricha	00.1	00.50
Heliotropium paniculatum	00.1	00.25
Hibiscus sturtii var. *campylochlamys*	00.1	00.30
Yakirra australiensis	00.1	00.10
Fimbristylis oxystachya	00.1	02.00
Goodenia sepalosa var. *sepalosa*	00.1	00.15
Cucumis melo	00.1	00.40
Ipomoea sp. sterile	00.1	00.40
Senna oligoclada	00.1	00.30
Zornia prostrata	00.1	00.20
Aristida holathera	00.1	00.40
Panicum effusum	00.1	00.15
Phyllanthus maderaspatensis	00.1	00.50
Tephrosia leptoclada	00.1	00.20
Cassytha filiformis	00.1	04.00

Site:	S017	**Type:**	Quadrat (50 m x 50 m)
Date(s):	30 April 2017	**Position:**	-18.513998, 122.085541
Total vegetation cover (%):	75	**Topography:**	plain
Tree/shrub cover >2 m (%):	40	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	5	**Soil:**	sand, sandy loam,
Grass cover (%):	70	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Low *Corymbia hamersleyana* and *C. zygophylla* woodland over tall *Acacia eriopoda*, *Bauhinia cunninghamii* and *Grevillea pyramidalis* shrubland over low closed *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	70.0	00.30		
Acacia eriopoda	30.0	04.00		
Bauhinia cunninghamii	10.0	02.00		
Corymbia zygophylla	10.0	05.00		
Corymbia hamersleyana	05.0	05.00		
Grevillea pyramidalis	05.0	02.00		
Aristida holathera	05.0	00.40		
Sorghum plumosum	05.0	00.40		
Dolichandrone heterophylla	03.0	01.50		
Halgania solanacea	02.0	00.40		
Acacia colei	02.0	03.00		
Spermacoce occidentalis	01.0	00.40		
Rhynchosia minima	01.0	00.30		
Indigofera monophylla	01.0	01.50		
Cassytha filiformis	01.0	02.50		
Bulbostylis barbata	00.1	00.15		
Yakirra australiensis	00.1	00.15		
Euphorbia hassallii	00.1	00.15		
Phyllanthus maderaspatensis	00.1	00.50		
Gomphrena canescens	00.1	00.25		

Eriachne avenacea	00.1	00.40
Goodenia sepalosa var. *sepalosa*	00.1	00.15
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	00.1	00.15
Cleome uncifera	00.1	00.30
Heliotropium paniculatum	00.1	00.25
Polycarpaea corymbosa	00.1	00.10
Zornia prostrata	00.1	00.15
Tephrosia leptoclada	00.1	00.25
Oldenlandia mitrasacmoides subsp. *mitrasacmoides*	00.1	00.30
Trianthema pilosum	00.1	00.02
Corchorus sidoides subsp. *vermicularis*	00.1	00.15
Clerodendrum floribundum	00.1	01.80
Calandrinia strophiolata	00.1	00.10
Chamaecrista symonii	00.1	00.40

Site:	S018	**Type:**	Quadrat (50 m x 50 m)
Date(s):	02 May 2017	**Position:**	-18.528515, 122.072198
Total vegetation cover (%):	80	**Topography:**	plain
Tree/shrub cover >2 m (%):	35	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	5	**Soil:**	sand, sandy loam,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years
Disturbance details:	grazing – low, livestock tracks,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Isolated low *Corymbia zygophylla* trees over tall *Acacia eriopoda* shrubland over low closed *Aristida holathera*, *Chrysopogon pallidus* and *Triodia schinzii* tussock grassland and sparse low *Fimbristylis oxystachya* sedgeland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Aristida holathera	55.0	00.40		
Acacia eriopoda	30.0	04.00		
Triodia schinzii	10.0	00.30		
Chrysopogon pallidus	10.0	00.40		
Corymbia zygophylla	05.0	05.00		
Fimbristylis oxystachya	05.0	00.25		
Zornia prostrata	02.0	00.20		
Acacia colei	01.0	05.00		
Dolichandrone heterophylla	01.0	01.80		
Jacksonia aculeata	01.0	01.00		
Bauhinia cunninghamii	00.5	02.00		
Rhynchosia minima	00.5	00.30		
? *Polymeria* sp. Broome	00.1	00.30		P1 (WC Act)
Heliotropium paniculatum	00.1	00.40		
Oldenlandia mitrasacmoides subsp. *mitrasacmoides*	00.1	00.20		
Senna oligoclada	00.1	00.50		
Goodenia sepalosa var. *sepalosa*	00.1	00.15		
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	00.1	00.25		
Euphorbia hassallii	00.1	00.20		
Waltheria indica	00.1	00.40		

Ehretia saligna	00.1	01.80
Corymbia hamersleyana	00.1	02.00
Scaevola parvifolia subsp. *parvifolia*	00.1	00.20
Indigofera monophylla	00.1	00.30
Solanum diversiflorum	00.1	00.30
Halgania solanacea	00.1	00.30
Acacia adoxa var. *subglabra*	00.1	00.40
Calandrinia strophiolata	00.1	00.10
Corchorus sidoides subsp. *vermicularis*	00.1	00.25
Grevillea pyramidalis	00.1	01.00
Spermacoce occidentalis	00.1	00.25
Clerodendrum floribundum	00.1	01.50
Mitrasacme connata	00.1	00.10
Ptilotus decalvatus	00.1	00.15
Dodonaea hispidula var. *arida*	00.1	01.00
Panicum effusum	00.1	00.20
Senna notabilis	00.1	00.40

Site:	S019	**Type:**	Quadrat (50 m x 50 m)
Date(s):	30 April 2017	**Position:**	-18.507179, 122.095085
Total vegetation cover (%):	70	**Topography:**	plain
Tree/shrub cover >2 m (%):	40	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	5	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	60	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years

Disturbance details: grazing – low, livestock tracks,

Vegetation condition: Excellent, EPA (2016) Eremaean

Vegetation description: Low *Corymbia hamersleyana* and *C. zygophylla* woodland over tall *Acacia colei*, *A. eriopoda* and *Grevillea refracta* shrubland over low *Aristida holathera*, *Sorghum plumosum* and *Triodia schinzii* tussock grassland.

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	45.0	00.30		
Acacia eriopoda	20.0	04.00		
Sorghum plumosum	10.0	00.40		
Corymbia hamersleyana	05.0	05.00		
Acacia colei	05.0	04.00		
Grevillea refracta	05.0	04.00		
Aristida holathera	05.0	00.40		
Corymbia zygophylla	05.0	04.00		
Bauhinia cunninghamii	04.0	02.00		
Grevillea pyramidalis	02.0	01.80		
Dolichandrone heterophylla	02.0	01.80		
Halgania solanacea	02.0	00.40		
Grevillea wickhamii	01.0	04.00		
Gardenia pyriformis	01.0	01.50		
Persoonia falcata	01.0	01.80		
Rhynchosia minima	01.0	00.30		
Zornia prostrata	00.5	00.15		
Trianthema pilosum	00.5	00.02		
Spermacoce occidentalis	00.5	00.40		
Grewia retusifolia	00.5	01.70		

Chamaecrista symonii	00.2	00.40	
Scaevola parvifolia subsp. *parvifolia*	00.1	00.15	
Euphorbia hassallii	00.1	00.10	
Fimbristylis oxystachya	00.1	00.20	
Oldenlandia mitrasacmoides subsp. *mitrasacmoides*	00.1	00.20	
Seringia nephrosperma	00.1	00.40	
Corchorus sidoides subsp. *vermicularis*	00.1	00.30	
Ipomoea sp. sterile	00.1	03.00	
Mitrasacme connata	00.1	00.10	
Zornia chaetophora	00.1	00.20	
Brachychiton diversifolius	00.1	03.00	
Calandrinia strophiolata	00.1	00.10	
Portulaca bicolor	00.1	00.01	
Panicum effusum	00.1	00.15	
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	00.1	00.10	
Cassytha filiformis	00.1	04.00	
Heliotropium paniculatum	00.1	00.30	
Cucumis melo	00.1	00.40	
Polycarpaea corymbosa	00.1	00.10	
Bulbostylis barbata	00.1	00.10	
? *Polymeria* sp. Broome	00.1	00.20	P1 (WC Act)
Eriachne avenacea	00.1	00.40	
Leptosema anomalum	00.1	00.25	
Goodenia sepalosa var. *sepalosa*	00.1	00.15	
Yakirra australiensis	00.1	00.10	

Site:	S020	**Type:**	Quadrat (50 m x 50 m)
Date(s):	30 April 2017	**Position:**	-18.513349, 122.075449
Total vegetation cover (%):	80	**Topography:**	plain
Tree/shrub cover >2 m (%):	30	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	5	**Soil:**	sand, sandy loam,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Low open *Corymbia hamersleyana* and *C. zygophylla* woodland over tall *Acacia eriopoda* and *Grevillea refracta* shrubland over low closed *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	75.0	00.40		
Acacia eriopoda	20.0	04.00		
Grevillea refracta	10.0	04.00		
Corymbia hamersleyana	05.0	05.00		
Bauhinia cunninghamii	05.0	01.80		
Sorghum plumosum	05.0	00.40		
Dolichandrone heterophylla	02.0	01.50		
Acacia colei	02.0	04.00		
Rhynchosia minima	01.0	00.30		
Calandrinia strophiolata	01.0	00.10		
Spermacoce occidentalis	01.0	00.40		
Indigofera monophylla	01.0	01.00		
Zornia prostrata	01.0	02.00		
Corymbia zygophylla	01.0	04.00		
Halgania solanacea	01.0	00.30		
Triodia caelestialis	01.0	00.50		P3 (WC Act)
Grevillea pyramidalis	01.0	01.50		
Bulbostylis barbata	00.5	00.20		
Goodenia sepalosa var. *sepalosa*	00.2	00.10		
Heliotropium paniculatum	00.1	00.25		

Phyllanthus maderaspatensis	00.1	00.50
Cleome viscosa	00.1	00.40
Trianthema pilosum	00.1	00.02
Acacia adoxa var. *subglabra*	00.1	00.60
Clerodendrum floribundum	00.1	01.50
Ipomoea sp. sterile	00.1	02.00
Grewia retusifolia	00.1	01.50
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	00.1	00.15

Site:	S021	**Type:**	Quadrat (50 m x 50 m)
Date(s):	01 May 2017	**Position:**	-18.523624, 122.046517
Total vegetation cover (%):	80	**Topography:**	plain
Tree/shrub cover >2 m (%):	35	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	5	**Soil:**	sandy loam,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	1 – 5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Isolated low *Corymbia hamersleyana* and *C. zygophylla* trees over tall *Acacia eriopoda*, *Grevillea refracta* and *G. wickhamii* shrubland over low closed *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	70.0	00.30		
Acacia eriopoda	20.0	03.00		
Grevillea wickhamii	07.0	04.00		
Corymbia zygophylla	04.0	06.00		
Grevillea refracta	03.0	04.00		
Chrysopogon pallidus	01.0	00.40		
Bauhinia cunninghamii	01.0	02.00		
Gardenia pyriformis	01.0	01.40		
Acacia monticola	01.0	02.00		
Dodonaea hispidula var. *arida*	01.0	01.50		
Corymbia hamersleyana	01.0	04.00		
Sida sp. Pindan (B.G. Thomson 3398)	00.1	00.70		
Senna notabilis	00.1	00.30		
Goodenia sepalosa var. *sepalosa*	00.1	00.15		
Spermacoce occidentalis	00.1	00.40		
Tephrosia andrewii	00.1	00.50		P1 (WC Act)
Acacia colei	00.1	02.00		
Cleome uncifera	00.1	00.30		
Cucumis melo	00.1	01.80		
Phyllanthus maderaspatensis	00.1	00.50		

Waltheria indica	00.1	00.20
Ptilotus astrolasius	00.1	00.60
Ipomoea sp. sterile	00.1	03.00
Seringia nephrosperma	00.1	00.40
Corchorus sidoides subsp. *vermicularis*	00.1	00.30
Euphorbia hassallii	00.1	00.15
Calandrinia strophiolata	00.1	00.10
Yakirra australiensis	00.1	00.10
Hybanthus aurantiacus	00.1	00.40
Dolichandrone heterophylla	00.1	01.00

Site:	S022	**Type:**	Quadrat (50 m x 50 m)
Date(s):	01 May 2017	**Position:**	-18.505915, 122.045015
Total vegetation cover (%):	70	**Topography:**	plain
Tree/shrub cover >2 m (%):	25	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	10	**Soil:**	sandy loam,
Grass cover (%):	65	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years
Disturbance details:	livestock tracks,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Low open *Corymbia hamersleyana* and *C. zygophylla* woodland over tall open *Acacia eriopoda*, *Grevillea refracta* and *G. wickhamii* shrubland over low closed *Aristida holathera*, *Chrysopogon pallidus* and *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	55.0	00.30		
Acacia eriopoda	20.0	04.00		
Chrysopogon pallidus	10.0	00.40		
Aristida holathera	05.0	00.40		
Halgania solanacea	05.0	00.40		
Corymbia hamersleyana	05.0	04.00		
Grevillea refracta	04.0	04.00		
Acacia adoxa var. *subglabra*	02.0	00.50		
Gardenia pyriformis	01.0	02.50		
Dolichandrone heterophylla	01.0	01.50		
Acacia colei	01.0	02.00		
Bauhinia cunninghamii	01.0	01.80		
Rhynchosia minima	01.0	00.30		
Zornia prostrata	01.0	00.20		
Corymbia zygophylla	01.0	04.00		
Spermacoce occidentalis	01.0	00.40		
Grevillea wickhamii	01.0	04.00		
Bulbostylis barbata	01.0	00.20		
Phyllanthus maderaspatensis	00.1	00.50		
Fimbristylis oxystachya	00.1	00.20		

Calandrinia strophiolata	00.1	00.10	
Polycarpaea corymbosa	00.1	00.20	
Goodenia sepalosa var. *sepalosa*	00.1	00.15	
Acacia monticola	00.1	01.80	
Cleome viscosa	00.1	00.50	
Polygala tepperi	00.1	00.40	
Indigofera monophylla	00.1	00.70	
Yakirra australiensis	00.1	00.25	
Solanum cunninghamii	00.1	00.40	
Cucumis melo	00.1	00.10	
Abutilon macrum	00.1	00.30	
Heliotropium paniculatum	00.1	00.30	
Cynanchum carnosum	00.1	01.20	
Triumfetta johnstonii	00.1	00.25	
Cassytha filiformis	00.1	04.00	
Dodonaea hispidula var. *arida*	00.1	01.00	
Grevillea pyramidalis	00.1	01.50	
Panicum effusum	00.1	00.15	
Ptilotus astrolasius	00.1	00.40	
Euphorbia hassallii	00.1	00.20	
Scaevola parvifolia subsp. *parvifolia*	00.1	00.15	
? *Polymeria* sp. Broome	00.1	00.20	P1 (WC Act)

Site:	S023	**Type:**	Quadrat (50 m x 50 m)
Date(s):	29 April 2017	**Position:**	-18.53461, 122.056411
Total vegetation cover (%):	80	**Topography:**	plain
Tree/shrub cover >2 m (%):	25	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	5	**Soil:**	sand, sandy loam,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	>5 years
Disturbance details:	none,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Isolated low *Corymbia hamersleyana* and *C. zygophylla* trees over tall open *Acacia eriopoda*, *Grevillea pyramidalis* and *G. wickhamii* shrubland over low closed *Sorghum plumosum* and *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	75.0	00.30		
Grevillea wickhamii	10.0	03.00		
Acacia eriopoda	10.0	03.00		
Sorghum plumosum	05.0	00.40		
Jacksonia aculeata	02.0	00.50		
Acacia adoxa var. *subglabra*	02.0	00.50		
Bauhinia cunninghamii	02.0	01.80		
Zornia prostrata	01.0	00.15		
Halgania solanacea	01.0	00.30		
Grevillea pyramidalis subsp. *pyramidalis*	01.0	02.00		
Gardenia pyriformis	01.0	01.50		
Indigofera monophylla	01.0	00.70		
Corymbia zygophylla	01.0	05.00		
Corymbia hamersleyana	01.0	05.00		
Grevillea pyramidalis	01.0	02.00		
Goodenia sepalosa var. *sepalosa*	00.5	00.15		
Wrightia saligna	00.1	01.20		
Waltheria indica	00.1	00.80		
Spermacoce occidentalis	00.1	00.20		
Ptilotus astrolasius	00.1	00.50		

Acacia platycarpa	00.1	01.00	
Brachychiton diversifolius	00.1	01.40	
Phyllanthus maderaspatensis	00.1	00.30	
Euphorbia hassallii	00.1	00.20	
Dolichandrone heterophylla	00.1	01.20	
Tephrosia andrewii	00.1	00.40	P1 (WC Act)
Hibiscus sturtii var. *campylochlamys*	00.1	00.20	
Cynanchum carnosum	00.1	01.20	
Codonocarpus cotinifolius	00.1	01.50	
Stackhousia intermedia	00.1	00.50	
Calandrinia strophiolata	00.1	00.10	
Hybanthus aurantiacus	00.1	00.40	
Fimbristylis oxystachya	00.1	00.40	
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	00.1	03.00	
Solanum diversiflorum	00.1	00.60	
Grevillea refracta	00.1	03.00	
Eriachne avenacea	00.1	00.50	
Trianthema pilosum	00.1	00.05	
Senna oligoclada	00.1	00.30	
Dodonaea hispidula var. *arida*	00.1	01.20	
Cucumis melo	00.1	00.50	
Aristida holathera	00.1	00.40	
Heliotropium paniculatum	00.1	00.30	
Cassytha filiformis	00.1	00.50	
Corchorus sidoides subsp. *vermicularis*	00.1	00.20	
Senna notabilis	00.1	00.30	

Site:	S024	**Type:**	Quadrat (50 m x 50 m)
Date(s):	03 May 2017	**Position:**	-18.545435, 122.065837
Total vegetation cover (%):	30	**Topography:**	plain
Tree/shrub cover >2 m (%):	7	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	10	**Soil:**	sand, sandy loam,
Grass cover (%):	15	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	1 – 5 years
Disturbance details:	grazing – low, livestock tracks,		
Vegetation condition:	Excellent, EPA (2016) Eremaean		
Vegetation description:	Low *Corymbia hamersleyana* and *C. zygophylla* woodland over low sparse *Indigofera monophylla*, *Tephrosia andrewii* and *T.* sp. D Kimberley Flora shrubland over low open *Aristida holathera*, *Chrysopogon pallidus* and *Triodia schinzii* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Triodia schinzii	10.0	00.20		
Corymbia zygophylla	10.0	05.00		
Corymbia hamersleyana	05.0	05.00		
Tephrosia andrewii	05.0	00.30		P1 (WC Act)
Chrysopogon pallidus	05.0	00.30		
Indigofera monophylla	03.0	00.70		
Corymbia flavescens	02.0	05.00		
Acacia eriopoda	01.0	00.40		
Aristida holathera	01.0	00.40		
Rhynchosia minima	01.0	00.15		
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	01.0	00.20		
Corchorus sidoides subsp. *vermicularis*	01.0	00.20		
Bauhinia cunninghamii	00.5	01.00		
Trianthema pilosum	00.5	00.02		
Bulbostylis barbata	00.1	00.15		
Acacia colei	00.1	00.30		
Heliotropium paniculatum	00.1	00.30		
Solanum diversiflorum	00.1	00.25		
Calandrinia strophiolata	00.1	00.10		

Cleome uncifera	00.1	00.15
Leptosema anomalum	00.1	00.20
Polycarpaea corymbosa	00.1	00.10
Grevillea refracta	00.1	00.30
Tephrosia leptoclada	00.1	00.20
Goodenia sepalosa var. *sepalosa*	00.1	00.15
Acacia adoxa var. *subglabra*	00.1	00.15
Gardenia pyriformis	00.1	00.20
Evolvulus alsinoides var. *decumbens*	00.1	00.20
Fimbristylis nuda	00.1	00.10
Panicum effusum	00.1	00.20
Ptilotus decalvatus	00.1	00.10
Grevillea pyramidalis	00.1	00.70
Sida sp. Pindan (B.G. Thomson 3398)	00.1	00.30
Tephrosia remotiflora	00.1	00.30
Indigofera colutea	00.1	00.05
Zornia prostrata	00.1	00.15
Senna notabilis	00.1	00.50
Polymeria ambigua	00.1	00.10
Cucumis melo	00.1	00.30
Solanum cunninghamii	00.1	00.40
Dolichandrone heterophylla	00.1	01.00
Ptilotus astrolasius	00.1	00.15
Euphorbia hassallii	00.1	00.10
Tribulopis angustifolia	00.1	00.02
Mitrasacme connata	00.1	00.10
Spermacoce occidentalis	00.1	00.20
Hybanthus aurantiacus	00.1	00.15
Scaevola parvifolia subsp. *parvifolia*	00.1	00.15
Chamaecrista symonii	00.1	00.20
Triumfetta johnstonii	00.1	00.10

Site:	S025	**Type:**	Quadrat (50 m x 50 m)
Date(s):	05 May 2017	**Position:**	-18.513064, 122.094386
Total vegetation cover (%):	50	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	25	**Soil:**	sandy loam,
Grass cover (%):	30	**Rock type:**	none
Herb cover (%):	5	**Fire age:**	not evident

Disturbance details: current operations, excavation, grazing – low, historic clearing, livestock tracks, vehicle tracks,

Vegetation condition: Very Good, EPA (2016) Eremaean

Vegetation description: Isolated low *Corymbia zygophylla* mallee over mid open *Acacia eriopoda*, *A. colei* and *Senna notabilis* shrubland over low open *Aristida holathera* and *Chrysopogon pallidus* tussock grassland.

Species	Cover (%)	Height (m)	Weeds	Conservation status
Aristida holathera	20.0	00.20		
Acacia eriopoda	15.0	01.50		
Chrysopogon pallidus	05.0	00.30		
Acacia colei	02.0	01.00		
Senna notabilis	02.0	01.30		
Corymbia zygophylla	02.0	01.50		
Bauhinia cunninghamii	01.0	01.00		
Trianthema pilosum	01.0	00.02		
Zornia prostrata	01.0	00.15		
Corchorus sidoides subsp. *vermicularis*	01.0	00.15		
Calandrinia strophiolata	01.0	00.10		
Polymeria ambigua	01.0	00.02		
Waltheria indica	00.5	00.50		
Spermacoce occidentalis	00.5	03.00		
Goodenia sepalosa var. *sepalosa*	00.5	00.15		
Fimbristylis oxystachya	00.2	00.20		
Bulbostylis barbata	00.2	00.20		
Polycarpaea corymbosa	00.1	00.10		
Panicum effusum	00.1	00.15		

Chamaecrista symonii	00.1	00.20
Eriachne avenacea	00.1	00.20
Tribulopis angustifolia	00.1	00.02
Polygala tepperi	00.1	00.30
Hibiscus sturtii var. *campylochlamys*	00.1	00.40
Trichodesma zeylanicum var. *latisepaleum*	00.1	01.00
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	00.1	00.15
Hybanthus aurantiacus	00.1	00.30
Grewia retusifolia	00.1	01.00
Gardenia pyriformis	00.1	01.00
Tephrosia leptoclada	00.1	00.10
Scaevola parvifolia subsp. *parvifolia*	00.1	00.15
Yakirra australiensis	00.1	00.10
Indigofera monophylla	00.1	00.80
Rhynchosia minima	00.1	00.10
Mitrasacme connata	00.1	00.10
Solanum cunninghamii	00.1	00.40
Euphorbia hassallii	00.1	00.20
Eragrostis eriopoda	00.1	00.10
Heliotropium paniculatum	00.1	00.15
Grevillea refracta	00.1	00.30
Dolichandrone heterophylla	00.1	00.60
Sida rohlenae subsp. *rohlenae*	00.1	00.30
Sida sp. Pindan (B.G. Thomson 3398)	00.1	00.40

Appendix 4 Terrestrial fauna survey site descriptions

Site: **0A001 (Quadrat) (-18.534139, 122.065455)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: sandy loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – medium, livestock tracks
Habitat description: Tall shrubland. Scattered patches of tall dhrubs and isolated *Corymbia* sp. to 5 m, over sparsely scattered small to medium shrubs to 1.5 m, over dense hummock and tussock grasses to 0.75 m, on sandy, loam substrate.

Site: **0A002 (Quadrat) (-18.513174, 122.039736)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: sandy loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – medium, livestock tracks
Habitat description: Tall shrubland. Scattered tall shrubs to 4 m, over sparsely scattered small to medium shrubs to 2 m, over scattered patches of tussock grasses to 0.5 m. Scattered patches of sparse vegetation with exposed sandy, loam substrate. Scatered patches of dense shrub or grassy understorey.

Site: **0A003 (Quadrat) (-18.518625, 122.050946)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: sandy loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – medium, livestock tracks
Habitat description: Tall shrubland. Sparsely scattered *Corymbia sp.* to 5 m, over scattered patches of tall shrubs to 4 m, over sparsely scattered small shrubs to 1.5 m and dense tussock grass patches to 0.5 m, on sandy, loam substrate.

Site: **0A004 (Quadrat) (-18.503146, 122.053587)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: sandy loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – low, livestock tracks
Habitat description: Tall shrubland. Sparaely scattered *Corymbia* sp. to 8 m, over scattered patches of tall shrubs to 4 m, over dense hummock and tussock grasses to 0.5 m, on sandy, loam substrate.

Site: **0A005 (Quadrat) (-18.517135, 122.077506)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: sandy clay
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – medium, livestock tracks
Habitat description: Tall shrubland. Sparsely scattered *Corymbia* sp. to 5 m, over scattered patches of tall shrubs to 4 m, over scattered patches of small shrubs and dense tussock grasses to 0.5 m, on sandy, clay substrate.

Site: **0A007 (Quadrat) (-18.521882, 122.064434)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: sandy loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – medium, livestock tracks
Habitat description: Tall shrubland with sparsely scattered corymbias to 6 m over cattered patches of tall shrubs to 4 m over dense hummock and tussock grasses to .75 m on sandy, loam substrate.

Site: **0A008 (Quadrat) (-18.511068, 122.063357)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: clay loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: none
Habitat description: Tall shrubland with sparsely scattered corymbias to 6 m over scattered patches of tall shrubs to 4 m over scattered dense patches of hummock and tussock grasses on, clay loam substrate.

Site: **0B001 (Quadrat) (-18.529383, 122.094662)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: sandy loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – low, livestock tracks
Habitat description: Tall sheubland with scatteres patches of tall shrubs to 4 m over mixed small to medium sbrubs to 1.5 m over scattered dense patches of hummock and tussock grasses and herbs on a sandy loam substrate. Scattered areas of open vegetation with exposes aubatrate.

Site: **0B002 (Quadrat) (-18.536693, 122.040192)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: clay loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – medium, livestock tracks
Habitat description: Tall shrubland with sparsely scattered corymbias to 6 m over scattered patchea of dense tall shrubs to 4 m over scattered patches of dense hummock an tussock grassea to .75 m on clay, loam substrate.

Site:	**0B003 (Quadrat) (-18.54762, 122.066755)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Tall shrubland. Sparaely scattered *Corymbia* sp. to 6 m and tall shrubs to 4 m, over scattered small to medium shrubs to 1.5 m, over scattered patches of hummock and tussock grasses to 0.75 m. Scattered areas of open vegetation with exposed clay, loam substrate.

Site:	**0B004 (Quadrat) (-18.504485, 122.029281)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	sandy loam
Soil colour:	red–brown
Rock type:	none
Fire age:	1–5 years
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Tall shrubland. Sparsely scattered *Corymbia* sp. to 6 m over scattered patches of tall shrubs tp 3 m, over scattered understory of post fire regrowth shrubs and grasses to 0.5 m, with scattered areas of exposed substrate.

Site:	**0B005 (Quadrat) (-18.471799, 122.069061)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Tall shrubland. Scattered patches of tall shrubs to 4 m, over scattered small to medium shrubs to 1.5 m, over tussock grasses to 0.5 m, on clay loam substrate. Scattered areas of sparse vegetation with exposed substrate.

Site: **0B006 (Quadrat) (-18.488072, 122.101646)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: clay loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – medium, livestock tracks
Habitat description: Tall shrubland. Scattered tall shrubs to 4 m, over sparsely scattered patches of small to medium shrubs to 1.5 m, over scattered tussock grasses to 0.5 m, on clay, loam substrate.

Site: **0B009 (Quadrat) (-18.481112, 122.051583)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – medium, livestock tracks
Habitat description: Tall shrubland. Sparsely scattered *Corymbia* sp. over scattered patches of tall shrubs to 4 m, over scattered small shrubs to 1.5 m, over hummock and tussock grasses to 0.5 m, with scattered patches of sparse vegetation and exposed loam substrate.

Site: **A006 (Quadrat) (-18.493011, 122.071813)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: clay loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – low, livestock tracks
Habitat description: Tall shrubland. Scattered patches of tall shrubs to 5 m, over sparsely scattered patches of medium shrubs to 2 m, over dense hummock an tussock grasses to 0.75 m. Sparse patches of exposed clay, loam substrate.

Site:	**A009 (Quadrat) (-18.492539, 122.057807)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Tall shrubland. Shrub overstory to 4 m, over scattered patches of dense hummock and tussock grasses on clay, loam substrate. With scattered areas of sparse vegetation and exposed substrate.

Site:	**A010 (Quadrat) (-18.482241, 122.0697)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	none
Habitat description:	Tall shrubland. Scattered shrubs to 5 m, over dense tussock grass understory, on clay, loam substrate. Scattered open areas with exposed substrate.

Site:	**A011 (Quadrat) (-18.504033, 122.082941)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	sandy loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Tall shrubland. Sparsely scattered *Corymbia* sp. to 6 m, over scattered tall shrubs to 4 m, over scattered patches of tussock grasses to 0.5 m, on sandy, loam substrate. Scattered small areas of sparse vegetation and exposed substrate.

Site: **A012 (Quadrat) (-18.501244, 122.093565)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: sandy loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – medium, livestock tracks
Habitat description: Tall shrubland. Scattered patches of tall shrubs to 4 m, over sparse small to medium shrubs to 1.5 m over dense tussock grassea to 0.5 m, on sandy, loam substrate.

Site: **A013 (Quadrat) (-18.534431, 122.053089)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: clay loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: none
Habitat description: Tall shrubland. Scattered patches of tall shrubs to 5 m, over dense hummock and tussock grass understorey to 0.5 m, on clay, loam substrate.

Site: **A014 (Quadrat) (-18.515993, 122.090971)**

Habitat type: shrubland
Topography: plain
Slope: negligible
Soil: clay loam
Soil colour: red–brown
Rock type: none
Fire age: Not recorded
Disturbance: grazing – medium, livestock tracks
Habitat description: Tall shrubland. Scattered patches of tall shrubs to 4 m, over sparsely scattered small to medium ahrubs to 1 m, over scattered patches of tussock grasses and herbs to 0.5 m, with scattered small patches of exposed clay, loam substrate.

Site:	**A015 (Quadrat) (-18.491106, 122.083519)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	sandy loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Tall shrubland. Scattered patches of tall shrubs to 5 m, over scattered patches of dense tussock grasses, on sandy, loam substrate. Scattered patches of sparse vegatation with exposed substrate.

Site:	**A016 (Quadrat) (-18.533751, 122.07942)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Tall shrubland. Sparsely scattered *Corymbia* sp. to 8 m, over scattered mixed medium-large shrubs to 4 m, over scattered patches of low shrubs to 1.5 m and hummock and tussock grasses to 0.5 m. Also scattered patches of exposed clay, loam substrate.

Site:	**A017 (Quadrat) (-18.516913, 122.028468)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Tall shrubland. Sparsely scattered *Corymbia* sp. to 10 m, over scattered patches of tall shrubs to 4 m, over scattered patches of hummock and tussock grasses to 0.5 m, on clay, loam substrate.

Site:	**A018 (Quadrat) (-18.525373, 122.038174)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	sandy loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Tall shrubland. Scattered patches of tall shrubs to 4 m, over scattered patches of dense hummock and tussock grasses to 0.5 m, with scattered areas of sparse vegetation with exposed sandy, loam substrate.

Site:	**B010 (Quadrat) (-18.479658, 122.088641)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Tall shrubland. Scattered patches of tall ahrubs to 3 m, over dense patches of hummock and tussock grasses, on clay, loam substrate.

Site:	**B011 (Quadrat) (-18.528155, 122.025964)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	sandy loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Tall shrubland. Sparsely scattered corymbias to 6 m over scattered patches of tall shrubs to 4 m over dense small shrubs and hummock and tussock grasses to .5 m on sandy loam substrate.

Site:	**B012 (Quadrat) (-18.511138, 122.104484)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Tall shrubland. Sparsely scattered *Corymbia* sp. and tall shrubs to 4 m, over scattered patches of small-medium shrubs to 2 m, over scattered patches of tussock grasses, on clay, loam substrate. Scattered patches of sparse vegetation with exposed substrate also present.

Site:	**B07 New (Quadrat) (-18.493809, 122.041106)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – low, livestock tracks
Habitat description:	Tall shrubland. Sparsely scattered *Corymbia* sp. to 8 m, over scattered patches of tall shrubs to 4 m, over sparsely scattered small shrubs to 1 m and scattered dense patches of tussock grasses to 0.5 m, on clay, loam substrate.

Site:	**B08New (Quadrat) (-18.503175, 122.10873)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	grazing – medium, livestock tracks
Habitat description:	Medium shrubland. Sparsely scattered *Corymbia* sp. over scattered medium-large shrubs to 4 m, over scattered patches of hummock and tussock grasses, on clay, loam substrate. Scattered patches of sparse vegetation with exposed subatrate.

Site:	**FAU001 (Opportunistic Fauna Site) (-18.532816, 122.083995)**
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	sandy loam
Soil colour:	red–brown
Rock type:	none
Fire age:	Not recorded
Disturbance:	current operations, erosion channels, excavation, grazing – high, large-scale clearing, livestock tracks, vehicle tracks
Habitat description:	Large cleared area for well and small dam at track intersection with sparsely scattered *Corymbia* sp. to 10 m, over sparsely scattered medium-large ahrubs to 4 m, over sparse, small patches of heavily grazed grasses. Also with large areas of sparse vegetation on exposed sandy, loam substrate. Surrounding vegetation tall shrubland with sparse to dense understorey.

Appendix 5 DPaW correspondence regarding Bilby survey methods

Government of **Western Australia**
Department of **Parks and Wildlife**
Science and Conservation Division

Your ref:
Our ref:
Enquiries: Fran Stanley
Phone: 9219 9977
Email: fran.stanley@dpaw.wa.gov.au

Mrs Karen Crews
General Manager
Phoenix Environmental Sciences Pty Ltd
1/511 Wanneroo Road
BALCATTA WA 6021

Dear Mrs Crews

RE: METHODOLODGY FOR BILBY SURVEY AT SHAMROCK STATION

I refer to your email dated 30 March 2017 to Bruce Greatwich in the Department of Parks and Wildlife's West Kimberley District regarding proposed greater bilby survey methodology to inform a native vegetation clearing application for a proposed irrigation project on Shamrock Station.

Parks and Wildlife is satisfied with the proposed greater bilby survey methodology that you have supplied.

Yours sincerely

Margaret Byrne
DIRECTOR SCIENCE AND CONSERVATION

13 April 2017

Science and Conservation Directorate
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983
Phone: (08) 9219 9943 Email: Margaret.edwards@dpaw.wa.gov.au
www.dpaw.wa.gov.au

Appendix 6 Flora species inventory

Family	Species
Aizoaceae	*Trianthema cusackianum*
Aizoaceae	*Trianthema pilosum*
Amaranthaceae	*Gomphrena canescens*
Amaranthaceae	*Ptilotus astrolasius*
Amaranthaceae	*Ptilotus decalvatus*
Apocynaceae	*Carissa lanceolata*
Apocynaceae	*Cynanchum carnosum*
Apocynaceae	*Marsdenia angustata*
Apocynaceae	*Wrightia saligna*
Araliaceae	*Trachymene oleracea* subsp. *oleracea*
Bignoniaceae	*Dolichandrone heterophylla*
Boraginaceae	*Ehretia saligna*
Boraginaceae	*Halgania solanacea*
Boraginaceae	*Heliotropium foliatum*
Boraginaceae	*Heliotropium paniculatum*
Boraginaceae	*Trichodesma zeylanicum* var. *latisepaleum*
Caryophyllaceae	*Polycarpaea corymbosa*
Celastraceae	*Denhamia cunninghamii*
Celastraceae	*Stackhousia intermedia*
Cleomaceae	*Cleome uncifera*
Cleomaceae	*Cleome viscosa*
Commelinaceae	*Murdannia graminea*
Convolvulaceae	*Polymeria* sp. Broome (P1 WC Act)
Convolvulaceae	*Evolvulus alsinoides* var. *decumbens*
Convolvulaceae	*Ipomoea* sp. sterile
Convolvulaceae	*Polymeria ambigua*
Cucurbitaceae	*Cucumis melo*
Cyperaceae	*Bulbostylis barbata*
Cyperaceae	*Fimbristylis nuda*
Cyperaceae	*Fimbristylis oxystachya*
Euphorbiaceae	*Euphorbia hassallii*

Fabaceae	*Acacia adoxa* var. *subglabra*
Fabaceae	*Acacia colei*
Fabaceae	*Acacia eriopoda*
Fabaceae	*Acacia monticola*
Fabaceae	*Acacia platycarpa*
Fabaceae	*Acacia stipuligera*
Fabaceae	*Bauhinia cunninghamii*
Fabaceae	*Chamaecrista symonii*
Fabaceae	*Crotalaria medicaginea* var. *neglecta*
Fabaceae	*Crotalaria ramosissima*
Fabaceae	*Erythrophleum chlorostachys*
Fabaceae	*Indigofera colutea*
Fabaceae	*Indigofera monophylla*
Fabaceae	*Jacksonia aculeata*
Fabaceae	*Leptosema anomalum*
Fabaceae	*Rhynchosia minima*
Fabaceae	*Senna costata*
Fabaceae	*Senna notabilis*
Fabaceae	*Senna oligoclada*
Fabaceae	*Tephrosia andrewii (*P1 WC Act)
Fabaceae	*Tephrosia leptoclada*
Fabaceae	*Tephrosia remotiflora*
Fabaceae	*Tephrosia* sp. D Kimberley Flora (R.D. Royce 1848)
Fabaceae	*Zornia chaetophora*
Fabaceae	*Zornia prostrata*
Goodeniaceae	*Goodenia armitiana*
Goodeniaceae	*Goodenia sepalosa*
Goodeniaceae	*Goodenia sepalosa* var. *sepalosa*
Goodeniaceae	*Goodenia stobbsiana*
Goodeniaceae	*Scaevola parvifolia* subsp. *parvifolia*
Gyrostemonaceae	*Codonocarpus cotinifolius*
Gyrostemonaceae	*Gyrostemon tepperi*
Lamiaceae	*Clerodendrum floribundum*

Lamiaceae	*Clerodendrum tomentosum* var. *mollissima*
Lamiaceae	*Newcastelia cladotricha*
Lauraceae	*Cassytha filiformis*
Loganiaceae	*Mitrasacme connata*
Malvaceae	*Abutilon macrum*
Malvaceae	*Abutilon otocarpum*
Malvaceae	*Brachychiton diversifolius*
Malvaceae	*Corchorus sidoides* subsp. *vermicularis*
Malvaceae	*Grewia retusifolia*
Malvaceae	*Hibiscus leptocladus*
Malvaceae	*Hibiscus sturtii* var. *campylochlamys*
Malvaceae	*Seringia nephrosperma*
Malvaceae	*Sida rohlenae* subsp. *rohlenae*
Malvaceae	*Sida* sp. Pindan (B.G. Thomson 3398)
Malvaceae	*Triumfetta johnstonii*
Malvaceae	*Waltheria indica*
Myrtaceae	*Corymbia flavescens*
Myrtaceae	*Corymbia hamersleyana*
Myrtaceae	*Corymbia* sp. (sterile)
Myrtaceae	*Corymbia* sp. (white bark)
Myrtaceae	*Corymbia zygophylla*
Phyllanthaceae	*Phyllanthus maderaspatensis*
Poaceae	*Aristida holathera*
Poaceae	*Chrysopogon pallidus*
Poaceae	*Eragrostis eriopoda*
Poaceae	*Eriachne avenacea*
Poaceae	*Panicum effusum*
Poaceae	*Paspalidium rarum*
Poaceae	*Sorghum plumosum*
Poaceae	*Triodia caelestialis* (P3 WC Act)
Poaceae	*Triodia schinzii*
Poaceae	*Yakirra australiensis*
Polygalaceae	*Polygala tepperi*

Portulacaceae	*Calandrinia strophiolata*
Portulacaceae	*Portulaca bicolor*
Proteaceae	*Grevillea pyramidalis*
Proteaceae	*Grevillea pyramidalis* subsp. *leucadendron*
Proteaceae	*Grevillea pyramidalis* subsp. *pyramidalis*
Proteaceae	*Grevillea refracta*
Proteaceae	*Grevillea wickhamii*
Proteaceae	*Persoonia falcata*
Rubiaceae	*Gardenia pyriformis*
Rubiaceae	*Nauclea orientalis*
Rubiaceae	*Oldenlandia mitrasacmoides* subsp. *mitrasacmoides*
Rubiaceae	*Spermacoce occidentalis*
Sapindaceae	*Dodonaea hispidula* var. *arida*
Solanaceae	*Solanum cunninghamii*
Solanaceae	*Solanum diversiflorum*
Violaceae	*Hybanthus aurantiacus*
Zygophyllaceae	*Tribulopis angustifolia*

Appendix 7 Vertebrate species records from desktop review and this survey

Class	Family	Species	Common Name	BirdData	EPBC Act Protected Matters	NatureMap	DPaW Threatened & Priority Fauna	This survey
Elasmobranchii	Pristidae	*Pristis pristis*	Freshwater Sawfish		●			
Amphibia	Hylidae	*Litoria caerulea*	Green Tree Frog			●		
Amphibia	Hylidae	*Litoria rubella*	Little Red Tree Frog			●		
Amphibia	Hylidae	*Cyclorana longipes*	Long-footed Frog			●		
Reptilia	Agamidae	*Ctenophorus nuchalis*	Central Netted Dragon			●		
Reptilia	Agamidae	*Ctenophorus isolepis isolepis*	Crested Dragon			●		
Reptilia	Agamidae	*Diporiphora pindan*	Pindan Dragon			●		●
Reptilia	Agamidae	*Amphibolurus gilberti*	Ta-ta Dragon			●		
Reptilia	Agamidae	*Pogona minor mitchelli*	Western Bearded Dragon			●		
Reptilia	Boidae	*Antaresia stimsoni stimsoni*	Stimson's Python			●		
Reptilia	Crocodylidae	*Crocodylus porosus*	Salt-water Crocodile		●			
Reptilia	Diplodactylidae	*Diplodactylus conspicillatus*	Fat-tailed Gecko			●		
Reptilia	Diplodactylidae	*Strophurus ciliaris aberrans*	Northern Spiny-tailed Gecko			●		
Reptilia	Diplodactylidae	*Strophurus jeanae*	Southern Phasmid Gecko			●		
Reptilia	Diplodactylidae	*Rhynchoedura ornata*	Western Beaked Gecko			●		
Reptilia	Diplodactylidae	*Amalosia rhombifer*	Zigzag velvet gecko			●		
Reptilia	Elapidae	*Simoselaps anomalus*	Desert Banded Snake			●		
Reptilia	Elapidae	*Acanthophis pyrrhus*	Desert Death Adder			●		
Reptilia	Elapidae	*Furina ornata*	Moon Snake			●		
Reptilia	Elapidae	*Pseudechis australis*	Mulga Snake			●		

Class	Family	Species	Common Name	BirdData	EPBC Act Protected Matters	NatureMap	DPaW Threatened & Priority Fauna	This survey
Reptilia	Elapidae	*Demansia angusticeps*	Narrow-headed Whipsnake			●		
Reptilia	Elapidae	*Pseudonaja modesta*	Ringed Brown Snake			●		
Reptilia	Elapidae	*Pseudonaja mengdeni*	Western Brown Snake			●		
Reptilia	Gekkonidae	*Heteronotia binoei*	Bynoe's Gecko			●		●
Reptilia	Gekkonidae	*Gehyra pilbara*	Pilbara Gehyra			●		
Reptilia	Gekkonidae	*Gehyra variegata*	Variegated Gehyra			●		
Reptilia	Pygopodidae	*Lialis burtonis*	Burton's Legless Lizard			●		
Reptilia	Pygopodidae	*Delma tincta*	Excitable Delma			●		
Reptilia	Scincidae	*Ctenotus angusticeps*	Airlie Island Ctenotus		●	●	●	
Reptilia	Scincidae	*Ctenotus inornatus*	Bar-shouldered Ctenotus			●		
Reptilia	Scincidae	*Tiliqua multifasciata*	Central Blue-tongue			●		
Reptilia	Scincidae	*Lerista separanda*	Dampierland Plain Slider			●	●	
Reptilia	Scincidae	*Carlia triacantha*	Desert Rainbow Skink			●		
Reptilia	Scincidae	*Ctenotus colletti*	Fine-snout Ctenotus			●		
Reptilia	Scincidae	*Morethia ruficauda ruficauda*	Lined Fire-tailed Skink			●		
Reptilia	Scincidae	*Eremiascincus isolepis*	Northern Bar-lipped Skink			●		
Reptilia	Scincidae	*Proablepharus tenuis*	Northern Soil-crevice Skink			●		
Reptilia	Scincidae	*Lerista bipes*	Northwestern Slider			●		
Reptilia	Scincidae	*Cryptoblepharus tytthos*	Pygmy Snake-eyed Skink			●		
Reptilia	Scincidae	*Ctenotus serventyi*	Severenti's Ctenotus			●		
Reptilia	Scincidae	*Cryptoblepharus ruber*	Tawny Snake-eyed Skink			●		

Class	Family	Species	Common Name	BirdData	EPBC Act Protected Matters	NatureMap	DPaW Threatened & Priority Fauna	This survey
Reptilia	Varanidae	*Varanus tristis*	Black-headed Monitor			●		
Reptilia	Varanidae	*Varanus gouldii*	Gould's Monitor			●		●
Reptilia	Varanidae	*Varanus gilleni*	Pygmy Mulga Monitor			●		
Reptilia	Varanidae	*Varanus brevicauda*	Short-tailed Pygmy Monitor			●		
Reptilia	Varanidae	*Varanus acanthurus*	Spiny-tailed Monitor			●		
Aves	Acanthizidae	*Gerygone tenebrosa*	Dusky Gerygone	●		●		
Aves	Acanthizidae	*Gerygone levigaster*	Mangrove Gerygone	●		●		
Aves	Acanthizidae	*Smicrornis brevirostris*	Weebill					●
Aves	Acanthizidae	*Gerygone olivacea*	White-throated Gerygone	●				
Aves	Accipitridae	*Milvus migrans*	Black Kite	●		●		
Aves	Accipitridae	*Hamirostra melanosternon*	Black-breasted Buzzard	●		●		
Aves	Accipitridae	*Elanus caeruleus*	Black-shouldered Kite	●		●		
Aves	Accipitridae	*Haliastur indus*	Brahminy Kite	●		●		
Aves	Accipitridae	*Accipiter fasciatus*	Brown Goshawk	●		●		●
Aves	Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk	●		●		
Aves	Accipitridae	*Hieraaetus morphnoides*	Little Eagle	●				
Aves	Accipitridae	*Pandion haliaetus*	Osprey	●	●	●		
Aves	Accipitridae	*Circus assimilis*	Spotted Harrier	●				
Aves	Accipitridae	*Circus approximans*	Swamp Harrier	●		●		
Aves	Accipitridae	*Aquila audax*	Wedge-tailed Eagle	●		●		
Aves	Accipitridae	*Haliastur sphenurus*	Whistling Kite	●		●		●

Class	Family	Species	Common Name	BirdData	EPBC Act Protected Matters	NatureMap	DPaW Threatened & Priority Fauna	This survey
Aves	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	●	●	●		
Aves	Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar	●		●		
Aves	Alaudidae	*Mirafra javanica*	Horsfield's Bushlark	●		●		
Aves	Anatidae	*Anas gracilis*	Grey Teal	●		●		
Aves	Anatidae	*Aythya australis*	Hardhead	●		●		
Aves	Anatidae	*Anas superciliosa*	Pacific Black Duck	●		●		
Aves	Anatidae	*Malacorhynchus membranaceus*	Pink-eared Duck	●		●		
Aves	Anatidae	*Dendrocygna eytoni*	Plumed Whistling Duck	●		●		
Aves	Anatidae	*Dendrocygna arcuata*	Wandering Whistling Duck	●		●		
Aves	Anhingidae	*Anhinga novaehollandiae*	Australasian Darter	●				
Aves	Anseranatidae	*Anseranas semipalmata*	Magpie Goose		●			
Aves	Apodidae	*Apus pacificus*	Fork-tailed Swift	●	●	●	●	
Aves	Ardeidae	*Ardea ibis*	Cattle Egret		●			
Aves	Ardeidae	*Ardea modesta*	Eastern Great Egret	●	●	●	●	
Aves	Ardeidae	*Egretta sacra*	Eastern Reef Egret	●				
Aves	Ardeidae	*Ardea intermedia*	Intermediate Egret	●		●		
Aves	Ardeidae	*Ardea garzetta*	Little Egret	●		●		
Aves	Ardeidae	*Nycticorax caledonicus*	Rufous Night Heron	●		●		
Aves	Ardeidae	*Butorides striata*	Striated Heron	●				
Aves	Ardeidae	*Ardea novaehollandiae*	White-faced Heron	●		●		
Aves	Ardeidae	*Ardea pacifica*	White-necked Heron					●

Class	Family	Species	Common Name	BirdData	EPBC Act Protected Matters	NatureMap	DPaW Threatened & Priority Fauna	This survey
Aves	Artamidae	*Artamus cinereus*	Black-faced Woodswallow	●		●		●
Aves	Artamidae	*Artamus minor*	Little Woodswallow	●		●		
Aves	Artamidae	*Artamus personatus*	Masked Woodswallow	●		●		
Aves	Artamidae	*Artamus leucorynchus*	White-breasted Woodswallow	●		●		●
Aves	Burhinidae	*Esacus magnirostris*	Beach Stone-curlew	●		●		
Aves	Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	●		●		●
Aves	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	●		●		●
Aves	Campephagidae	*Lalage tricolor*	White-winged Triller					●
Aves	Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar	●		●		
Aves	Centropodidae	*Centropus phasianinus*	Pheasant Coucal	●		●		●
Aves	Charadriidae	*Charadrius melanops*	Black-fronted Dotterel			●		
Aves	Charadriidae	*Charadrius bicinctus*	Double-banded Plover		●			
Aves	Charadriidae	*Charadrius leschenaultii*	Greater Sand Plover	●	●	●	●	
Aves	Charadriidae	*Pluvialis squatarola*	Grey Plover	●	●	●	●	
Aves	Charadriidae	*Charadrius mongolus*	Lesser Sand Plover	●	●	●	●	
Aves	Charadriidae	*Vanellus miles*	Masked Lapwing	●		●		
Aves	Charadriidae	*Charadrius veredus*	Oriental Plover	●	●	●	●	
Aves	Charadriidae	*Pluvialis fulva*	Pacific Golden Plover	●	●	●	●	
Aves	Charadriidae	*Charadrius ruficapillus*	Red-capped Plover	●	●	●		
Aves	Charadriidae	*Erythrogonys cinctus*	Red-kneed Dotterel	●		●		
Aves	Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	●		●		

Class	Family	Species	Common Name	BirdData	EPBC Act Protected Matters	NatureMap	DPaW Threatened & Priority Fauna	This survey
Aves	Columbidae	*Geopelia humeralis*	Bar-shouldered Dove	●		●		●
Aves	Columbidae	*Phaps chalcoptera*	Common Bronzewing					●
Aves	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	●		●		●
Aves	Columbidae	*Geopelia cuneata*	Diamond Dove	●		●		●
Aves	Columbidae	*Geopelia striata*	Peaceful Dove	●		●		●
Aves	Coraciidae	*Eurystomus orientalis*	Dollarbird	●		●		
Aves	Corvidae	*Corvus bennetti*	Little Crow	●		●		●
Aves	Corvidae	*Corvus orru*	Torresian Crow	●		●		
Aves	Cracticidae	*Cracticus torquatus*	Grey Butcherbird	●		●		
Aves	Cracticidae	*Cracticus nigrogularis*	Pied Butcherbird	●		●		●
Aves	Cuculidae	*Chrysococcyx osculans*	Black-eared Cuckoo	●				
Aves	Cuculidae	*Cacomantis variolosus*	Brush Cuckoo	●		●		
Aves	Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	●		●		
Aves	Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze Cuckoo	●				●
Aves	Cuculidae	*Cuculus optatus*	Oriental Cuckoo		●			
Aves	Cuculidae	*Cacomantis pallidus*	Pallid Cuckoo	●		●		●
Aves	Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird	●		●		
Aves	Dicruridae	*Myiagra ruficollis*	Broad-billed Flycatcher	●		●		
Aves	Dicruridae	*Rhipidura albiscapa*	Grey Fantail	●				
Aves	Dicruridae	*Grallina cyanoleuca*	Magpie-lark	●		●		●
Aves	Dicruridae	*Rhipidura phasiana*	Mangrove Grey Fantail	●		●		

Class	Family	Species	Common Name	BirdData	EPBC Act Protected Matters	NatureMap	DPaW Threatened & Priority Fauna	This survey
Aves	Dicruridae	*Myiagra inquieta*	Restless Flycatcher	●		●		
Aves	Dicruridae	*Rhipidura leucophrys*	Willie Wagtail	●		●		●
Aves	Dromaiidae	*Dromaius novaehollandiae*	Emu					●
Aves	Estrilidae	*Taeniopygia bichenovii*	Double-barred Finch	●		●		
Aves	Estrilidae	*Emblema pictum*	Painted Finch	●		●		
Aves	Estrilidae	*Heteromunia pectoralis*	Pictorella Mannikin			●		
Aves	Estrilidae	*Taeniopygia guttata*	Zebra Finch	●		●		●
Aves	Falconidae	*Falco longipennis*	Australian Hobby	●				●
Aves	Falconidae	*Falco cenchroides*	Australian Kestrel	●		●		
Aves	Falconidae	*Falco berigora*	Brown Falcon	●		●		
Aves	Falconidae	*Falco hypoleucos*	Grey Falcon	●		●	●	
Aves	Falconidae	*Falco peregrinus*	Peregrine Falcon			●	●	
Aves	Fregatidae	*Fregata minor*	Greater Frigatebird		●			
Aves	Fregatidae	*Fregata ariel*	Lesser Frigatebird	●	●	●	●	
Aves	Glareolidae	*Stiltia isabella*	Australian Pratincole	●		●		
Aves	Glareolidae	*Glareola maldivarum*	Oriental Pratincole	●	●	●	●	
Aves	Gruidae	*Grus rubicunda*	Brolga	●		●		
Aves	Haematopodidae	*Haematopus longirostris*	Pied Oystercatcher	●		●		
Aves	Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	●		●		
Aves	Halcyonidae	*Dacelo leachii*	Blue-winged Kookaburra	●		●		
Aves	Halcyonidae	*Todiramphus chloris*	Collared Kingfisher	●		●		

Class	Family	Species	Common Name	BirdData	EPBC Act Protected Matters	NatureMap	DPaW Threatened & Priority Fauna	This survey
Aves	Halcyonidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher	●		●		
Aves	Halcyonidae	*Todiramphus sanctus*	Sacred Kingfisher	●		●		
Aves	Hirundinidae	*Hirundo rustica*	Barn Swallow	●	●	●	●	
Aves	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	●		●		
Aves	Hydrobatidae	*Oceanites oceanicus*	Wilson's Storm Petrel	●		●	●	
Aves	Laridae	*Sterna nilotica affinis*	Asian Gull-billed Tern			●		
Aves	Laridae	*Onychoprion anaethetus*	Bridled Tern	●				
Aves	Laridae	*Sterna caspia*	Caspian Tern	●		●		
Aves	Laridae	*Anous stolidus*	Common Noddy		●			
Aves	Laridae	*Sterna hirundo*	Common Tern	●		●	●	
Aves	Laridae	*Sterna bergii*	Crested Tern	●		●		
Aves	Laridae	*Sterna nereis*	Fairy Tern	●				
Aves	Laridae	*Sterna bengalensis*	Lesser Crested Tern	●		●		
Aves	Laridae	*Sterna albifrons*	Little Tern	●	●	●		
Aves	Laridae	*Larus novaehollandiae*	Silver Gull	●		●		
Aves	Laridae	*Sterna hybrida*	Whiskered Tern	●				
Aves	Laridae	*Chlidonias leucopterus*	White-winged Black Tern	●			●	
Aves	Maluridae	*Malurus melanocephalus*	Red-backed Fairy-wren	●		●		
Aves	Maluridae	*Malurus lamberti*	Variegated Fairy-wren	●		●		●
Aves	Meliphagidae	*Sugomel niger*	Black Honeyeater	●		●		
Aves	Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	●		●		●

Class	Family	Species	Common Name	BirdData	EPBC Act Protected Matters	NatureMap	DPaW Threatened & Priority Fauna	This survey
Aves	Meliphagidae	*Epthianura tricolor*	Crimson Chat	●		●		
Aves	Meliphagidae	*Philemon citreogularis*	Little Friarbird	●		●		
Aves	Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater	●		●		
Aves	Meliphagidae	*Myzomela erythrocephala*	Red-headed Honeyeater	●		●		
Aves	Meliphagidae	*Conopophila rufogularis*	Rufous-throated Honeyeater	●		●		
Aves	Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater	●				●
Aves	Meliphagidae	*Lichenostomus unicolor*	White-gaped Honeyeater	●				
Aves	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	●				
Aves	Meliphagidae	*Manorina flavigula*	Yellow-throated Miner	●		●		
Aves	Meliphagidae	*Lichenostomus flavescens*	Yellow-tinted Honeyeater	●				
Aves	Meropidae	*Merops ornatus*	Rainbow Bee-eater	●		●	●	●
Aves	Motacillidae	*Anthus australis*	Australian Pipit	●				
Aves	Motacillidae	*Motacilla cinerea*	Grey Wagtail		●			
Aves	Motacillidae	*Motacilla flava*	Yellow Wagtail		●			
Aves	Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	●		●		
Aves	Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	●		●		
Aves	Otididae	*Ardeotis australis*	Australian Bustard	●		●		●
Aves	Pachycephalidae	*Oreoica gutturalis*	Crested Bellbird	●		●		
Aves	Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	●		●		●
Aves	Pachycephalidae	*Pachycephala melanura*	Mangrove Golden Whistler	●		●		
Aves	Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	●		●		●

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Aves	Pachycephalidae	*Pachycephala lanioides*	White-breasted Whistler	●		●		
Aves	Pardalotidae	*Pardalotus rubricatus*	Red-browed Pardalote	●		●		
Aves	Pardalotidae	*Pardalotus striatus*	Striated Pardalote	●		●		●
Aves	Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	●		●		
Aves	Petroicidae	*Microeca fascinans*	Jacky Winter	●		●		
Aves	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	●		●		
Aves	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	●		●		
Aves	Phalacrocoracidae	*Phalacrocorax melanoleucos*	Little Pied Cormorant	●		●		
Aves	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	●		●		
Aves	Phasianidae	*Coturnix ypsilophora*	Brown Quail	●		●		
Aves	Podargidae	*Podargus strigoides*	Tawny Frogmouth	●		●		●
Aves	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe	●		●		
Aves	Pomatostomidae	*Pomatostomus temporalis*	Grey-crowned Babbler	●		●		●
Aves	Procellariidae	*Calonectris leucomelas*	Streaked Shearwater		●			
Aves	Procellariidae	*Puffinus pacificus*	Wedge-tailed Shearwater	●		●		
Aves	Psittacidae	*Melopsittacus undulatus*	Budgerigar	●		●		●
Aves	Psittacidae	*Nymphicus hollandicus*	Cockatiel	●		●		
Aves	Psittacidae	*Cacatua roseicapilla*	Galah	●		●		
Aves	Psittacidae	*Cacatua sanguinea*	Little Corella	●		●		●
Aves	Psittacidae	*Cacatua leadbeateri*	Major Mitchell's Cockatoo			●		
Aves	Psittacidae	*Pezoporus occidentalis*	Night Parrot		●			

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Aves	Psittacidae	*Polytelis alexandrae*	Princess Parrot		●			
Aves	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	●		●		
Aves	Psittacidae	*Calyptorhynchus banksii*	Red-tailed Black-Cockatoo	●		●		●
Aves	Psittacidae	*Aprosmictus erythropterus*	Red-winged Parrot	●		●		●
Aves	Psittacidae	*Cacatua galerita*	Sulphur-crested Cockatoo	●		●		
Aves	Ptilonorhynchidae	*Ptilonorhynchus nuchalis*	Great Bowerbird	●		●		
Aves	Ptilonorhynchidae	*Ptilonorhynchus maculatus guttatus*	Western Bowerbird	●		●		
Aves	Rallidae	*Gallinula ventralis*	Black-tailed Native-hen			●		
Aves	Rallidae	*Porphyrio porphyrio*	Purple Swamphen	●		●		
Aves	Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	●	●	●		
Aves	Recurvirostridae	*Recurvirostra novaehollandiae*	Red-necked Avocet		●			
Aves	Rostratulidae	*Rostratula australis*	Australian Painted Snipe		●			
Aves	Rostratulidae	*Rostratula benghalensis*	Painted Snipe		●			
Aves	Scolopacidae	*Limnodromus semipalmatus*	Asian Dowitcher	●	●			
Aves	Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit	●	●	●	●	
Aves	Scolopacidae	*Limosa lapponica menzbieri*	Bar-tailed Godwit (northern Siberian)		●			
Aves	Scolopacidae	*Limosa lapponica baueri*	Bar-tailed Godwit (western Alaskan)		●			
Aves	Scolopacidae	*Limosa limosa*	Black-tailed Godwit	●	●	●	●	
Aves	Scolopacidae	*Limicola falcinellus*	Broad-billed Sandpiper	●	●	●	●	
Aves	Scolopacidae	*Tringa nebularia*	Common Greenshank	●	●	●	●	
Aves	Scolopacidae	*Tringa totanus*	Common Redshank	●	●	●	●	

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Aves	Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	●	●	●		
Aves	Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	●	●	●	●	
Aves	Scolopacidae	*Numenius madagascariensis*	Eastern Curlew	●	●	●	●	
Aves	Scolopacidae	*Calidris tenuirostris*	Great Knot	●	●	●	●	
Aves	Scolopacidae	*Tringa brevipes*	Grey-tailed Tattler	●	●			
Aves	Scolopacidae	*Numenius minutus*	Little Curlew	●	●	●	●	
Aves	Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper	●	●		●	
Aves	Scolopacidae	*Gallinago stenura*	Pin-tailed Snipe		●			
Aves	Scolopacidae	*Calidris canutus*	Red Knot	●	●	●	●	
Aves	Scolopacidae	*Calidris ruficollis*	Red-necked Stint	●	●	●	●	
Aves	Scolopacidae	*Arenaria interpres*	Ruddy Turnstone	●	●	●	●	
Aves	Scolopacidae	*Calidris alba*	Sanderling	●	●	●	●	
Aves	Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper	●	●	●	●	
Aves	Scolopacidae	*Gallinago megala*	Swinhoe's Snipe		●			
Aves	Scolopacidae	*Xenus cinereus*	Terek Sandpiper	●	●			
Aves	Scolopacidae	*Numenius phaeopus*	Whimbrel	●	●	●	●	
Aves	Scolopacidae	*Tringa glareola*	Wood Sandpiper		●			
Aves	Strigidae	*Ninox connivens*	Barking Owl	●		●		
Aves	Strigidae	*Ninox novaeseelandiae*	Boobook Owl	●		●		
Aves	Sulidae	*Papasula abbotti*	Abbott's Booby	●		●		
Aves	Sulidae	*Sula leucogaster*	Brown Booby	●		●	●	

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Aves	Sulidae	*Sula dactylatra*	Masked Booby	●		●	●	
Aves	Sylviidae	*Cincloramphus cruralis*	Brown Songlark	●		●		
Aves	Sylviidae	*Cisticola exilis*	Golden-headed Cisticola	●		●		
Aves	Sylviidae	*Cincloramphus mathewsi*	Rufous Songlark	●		●		
Aves	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	●		●		●
Aves	Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	●		●	●	
Aves	Threskiornithidae	*Platalea regia*	Royal Spoonbill	●		●		
Aves	Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	●		●		
Aves	Turnicidae	*Turnix velox*	Little Button-quail	●		●		●
Aves	Zosteropidae	*Zosterops lateralis*	Grey-breasted White-eye	●		●		
Aves	Zosteropidae	*Zosterops luteus*	Yellow White-eye	●		●		
Mammalia	Bovidae	*Bos taurus*	European Cattle					●
Mammalia	Camelidae	*Camelus dromedarius*	Dromedary		●			
Mammalia	Canidae	*Canis lupus*	Dog					●
Mammalia	Canidae	*Vulpes vulpes*	Red Fox		●			
Mammalia	Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat			●		
Mammalia	Emballonuridae	*Saccolaimus saccolaimus nudicluniatus*	Yellow-bellied Sheathtail-bat		●			
Mammalia	Equidae	*Equus asinus*	Donkey		●			
Mammalia	Equidae	*Equus caballus*	Horse		●			
Mammalia	Felidae	*Felis catus*	Cat		●	●		
Mammalia	Macropodidae	*Macropus agilis*	Agile Wallaby			●		

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Mammalia	Macropodidae	*Onychogalea unguifera*	Northern Nailtail Wallaby			●		
Mammalia	Macropodidae	*Lagorchestes conspicillatus leichardti*	Spectacled Hare-wallaby			●	●	
Mammalia	Molossidae	*Mormopterus loriae cobourgiana*	Little North-western Mastiff Bat			●	●	
Mammalia	Molossidae	*Chaerephon jobensis*	Northern Freetail-bat			●		●
Mammalia	Muridae	*Pseudomys delicatulus*	Delicate Mouse			●		
Mammalia	Muridae	*Mus musculus*	House Mouse		●	●		
Mammalia	Muridae	*Rattus tunneyi*	Pale Field-rat			●		
Mammalia	Muridae	*Leggadina lakedownensis*	Short-tailed Mouse			●	●	
Mammalia	Peramelidae	*Isoodon auratus auratus*	Golden Bandicoot			●	●	
Mammalia	Pteropodidae	*Pteropus scapulatus*	Little Red Flying-fox			●		
Mammalia	Thylacomyidae	*Macrotis lagotis*	Bilby		●	●	●	●
Mammalia	Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat			●		●
Mammalia	Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat			●		●
Mammalia	Vespertilionidae	*Scotorepens greyii*	Little Broad-nosed Bat			●		●
Mammalia	Vespertilionidae	*Scotorepens sanborni*	Northern Broad-nosed Bat			●		●