PHOENIX
ENVIRONMENTAL SCIENCES

Detailed flora and vegetation survey for the Mardie Project

Prepared for BCI Minerals Ltd

March 2020

Final Report

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Final Report

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EXECUTIVE SUMMARY

Mardie Minerals Pty Ltd (Mardie Minerals) is seeking to develop the Mardie Project (the Project) in the Pilbara region of Western Australia. Mardie Minerals is a wholly-owned subsidiary of BCI Minerals Ltd (BCI). The Project is a proposed solar salt operation that will utilise seawater and evaporation to produce a concentrated salt product and other associated products. The Project will produce Sulphate of Potash (SoP) products by pumping seawater to unlined evaporation ponds via an inlet pipe located offshore. A series of evaporation and crystallisation ponds will produce a Sodium Chloride (NaCl) salt product, as well as a K2SO4 by-product. The only waste product will be bitterns.

Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by BCI to undertake a detailed flora and vegetation survey for the Project in 2017 and 2018. Phoenix undertook a desktop study and site reconnaissance to inform the MSP Pre-Feasibility Study (PFS) for the Project in 2017. The key findings of the desktop study and site reconnaissance with respect to flora and vegetation were:

- the desktop assessment indicated that
    - the Study Area potentially supports highly diverse flora
    - the Study Area potentially supports a high number of vegetation types
    - 43 significant flora may occur within the Study Area, including one species listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Eleocharis papillosa*
    - the Priority Ecological Community (PEC; Priority 3), Horseflat Land System of the Roebourne Plain may occur in the Study Area
- the field reconnaissance survey determined that
    - a lower floristic and vegetation type diversity was present in the Study Area than that indicated from the desktop assessment
    - suitable habitat for 14 of the 43 significant flora identified in the desktop assessment may be present in the Study Area
    - no suitable habitat for *Eleocharis papillosa* was present in the Study Area
    - one vegetation type, low mixed grassland, *Eragrostis* spp., may align with the Horseflat Land System of the Roebourne Plains PEC
    - large infestations of the Declared Pest, **Prosopis* spp. were present in the Study Area.

Based on these findings, Phoenix was subsequently commissioned by BCI to undertake a detailed survey for the Project. The final Study Area for the detailed flora and vegetation survey was 29,020.4 ha in size and encompassed a 16,023.1 ha Development Envelope (DE) (excluding some of the marine areas). An addition to the Study Area (1,110.8 ha) was made following completion of the surveys; vegetation mapping within this area was extrapolated from adjacent mapped areas.

Survey design, methodology and report-writing adhered to relevant principles and guidelines and was conducted over two seasons May and August 2018. In total, 64 quadrats, 11 transects and 20 relevé surveys were conducted. In addition, searches for significant flora were conducted at previous records for species identified by the desktop review and in suitable habitat encountered while traversing the Study Area. Quadrat and transect data were analysed (separately) and sites grouped by hierarchical cluster analyses (UPGMA). Vegetation types were then defined by clusters of quadrats, supplemented by field observations based on species composition, structure and dominance at the stratum level.

A total of 238 flora taxa representing 41 families and 115 genera identified to species level were recorded in the Study Area during the field surveys. The assemblage comprised 230 native species and

eight introduced species, including 169 perennial species, 66 annual or short-lived species and three unknown lifecycles. The most prominent families were Fabaceae (48 species), Chenopodiaceae (29 species), Poaceae (28 species), Amaranthaceae (18 species) and Malvaceae (14 species).

One EPBC Act listed flora species, *Minuria tridens* (listed as Priority (P) 1 flora in Western Australia) and one other Priority flora *Goodenia nuda* (P4) were recorded in the Study Area during the survey. A search was conducted at the location of a record for *Owenia acidula* (P3) in the Study Area but no plants of the species were found. Assessment of the likelihood of occurrence of the remaining 33 significant flora identified from the desktop assessment determined one Priority flora, *Owenia acidula* (P3), was likely to be present in the Study Area, seven Priority flora as possible and 25 unlikely.

The Study Area represents a north-east extension to the mapped distribution of *Cassytha aurea* var. *aurea* which subsequently is considered a significant record for the species. One samphire taxon identified as *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate was considered by taxonomic specialist, Dr Kelly Shepherd, to represent an undescribed species and is therefore considered a significant species. Four other *Tecticornia* specimens could not be identified to species level and may also represent undescribed taxa.

In total, 14 vegetation types were defined for the Study Area and comprised a complex of *Tecticornia* spp. shrublands, a mangrove community, four spinifex (*Triodia* spp.) steppe, a *Spinifex longifolia* grassland, a *Melaleuca argentea* and *Sesbania formosa* woodland, a shrubland over *Triodia* spp. grassland, two low open *Eucalyptus* spp. woodland over *Acacia* spp. shrubland over *Triodia* spp. hummock grassland, a low mixed grassland (*Eragrostis* spp.), a **Prosopis* spp. tall shrubland and a low shrubland over *Sporobolus virginicus* grassland. The *Tecticornia* spp. shrublands were the most widespread accounting for 33.3% of vegetation, followed by PgvAsTl (20.2%, a mid isolated **Prosopis glandulosa* x *velutina* over isolated low shrubland over *Triodia* spp. grassland).

Areas naturally devoid of vegetation within the Study Area comprised 13,163.3 ha (45.4%) and a further 241.6 ha (0.8%) comprised cleared areas rated as Completely Degraded. Vegetated areas ranged in condition from Excellent to Degraded, with the majority (12,088.2 ha or 80.6% of vegetated areas in the detailed survey area) recorded to be in Excellent to Very Good condition, largely as a result of the *Tecticornia* spp. shrublands and mangroves on the tidal mudflats being subject to little or no disturbance. Degraded to Good condition was assigned elsewhere primarily due to disturbance in the form of weed infestations, particularly **Prosopis* spp. and **Cenchrus ciliaris*. Mardie station is recognised as the largest infestation of the Declared Pest **Prosopis* spp. in the State, with a large infestation present in the Study Area.

Nine of the 14 vegetation types defined for the Study Area (representing 58% of vegetated areas) align with vegetation types defined for other surveys in the region indicating a broader distribution outside of the Study Area and DE.

None of the vegetation described in the Study Area was considered representative of a Commonwealth or State-listed Threatened Ecological Community (TEC). Areas of one vegetation type recorded for the Study Area, PgvExCt, in Very Good or Excellent condition were considered to be representative of the Horseflat Land System of the Roebourne Plains PEC. Seven vegetation types were considered locally significant as they had restricted distribution in the Study Area and/or represented a refuge for species not recorded elsewhere in the Study Area. Vegetation type AcAjTe was considered significant as it represented habitat for the P1 species *Minuria tridens*; this vegetation was recorded both within and outside of the DE. Similarly, the *Tecticornia* spp. shrublands recorded both within and outside of the DE were considered significant as they represent habitat for a taxon considered new to science.

Vegetation type AcAjTe (Soak) requires confirmation and description from field surveys. Should this be confirmed as a unique vegetation type it would be considered locally significant due to restricted distribution.

1 INTRODUCTION

Mardie Minerals Pty Ltd (Mardie Minerals) is seeking to develop the Mardie Project (the Project) in the Pilbara region of Western Australia (Figure 1-1). Mardie Minerals is a wholly-owned subsidiary of BCI Minerals Ltd (BCI).

Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by BCI to undertake a detailed flora and vegetation survey for the Project in 2018, following an initial desktop study and reconnaissance survey in 2017. Supplementary survey work was conducted in 2019, following the detailed survey. This report presents the findings of all baseline flora and vegetation surveys conducted for the Project to date.

1.1 BACKGROUND

The Project is a proposed solar salt operation that will utilise seawater and evaporation to produce a concentrated salt product and other associated products. The Project will produce Sulphate of Potash (SoP) products by pumping seawater to unlined evaporation ponds via an inlet pipe located offshore. A series of evaporation and crystallisation ponds will produce a Sodium Chloride (NaCl) salt product, as well as a K2SO4 by-product. The only waste product will be bitterns.

Phoenix undertook a desktop study and site reconnaissance to inform the MSP Pre-Feasibility Study (PFS) for the Project in 2017 (Phoenix 2017a). The key findings of the desktop study and site reconnaissance with respect to flora and vegetation were:

- the desktop assessment indicated that
    - the Study Area potentially supports highly diverse flora
    - the Study Area potentially supports a high number of vegetation types
    - 43 significant flora may occur within the Study Area, including one species listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Eleocharis papillosa*
    - the Priority Ecological Community (PEC; Priority 3), Horseflat Land System of the Roebourne Plain may occur in the Study Area
    - the scale and nature of potential impacts from the proposed Project on flora and vegetation are likely to be significant
- the field reconnaissance survey determined that
    - a lower floristic and vegetation type diversity was present in the Study Area than that indicated from the desktop assessment
    - suitable habitat for 14 of the 43 significant flora identified in the desktop assessment may be present in the Study Area
    - no suitable habitat *Eleocharis papillosa* was present in the Study Area
    - one vegetation type, low mixed grassland, *Eragrostis* spp., may align with the Horseflat Land System of the Roebourne Plains PEC
    - large infestations of the Declared Pest, **Prosopis* spp. were present in the Study Area.

The detailed flora and vegetation survey was commissioned by BCI based on the desktop and reconnaissance findings. The results of the detailed survey were initially reported in April 2019 (Phoenix 2019). Following the finalisation of this report, supplementary surveys were commissioned

to ground truth areas of extrapolated vegetation mapping and undertake targeted searches for a significant flora species, *Minuria tridens* (Vulnerable under the EPBC Act; Priority 1 at State level), recorded in the detailed survey. The areas of extrapolated vegetation mapping resulted from changes to the Project Development Envelope post-survey which consequently extended outside the initial Study Area for the detailed survey. The *M. tridens* record represented an 800 km range extension for the species and required further survey to define and measure the newly discovered population.

1.2 SCOPE OF WORK

The detailed flora and vegetation survey was conducted over three seasons. The scope of works for each seasonal survey are descibed below.

1.2.1 Scope 1 – autumn 2018

The scope of work for the autumn flora and vegetation survey was to conduct a detailed flora and vegetation field survey of the Study Area comprising –

- establishment and sampling of permanent quadrats or transects in terrestrial vegetation and, salt flat and coastal samphire vegetation
- targeted searches for significant flora
- mapping of the extent of the Declared Pest, Mesquite (**Prosopis* spp.), in the Study Area
- preliminary description of vegetation communities and evaluation of their conservation status
- preliminary mapping of salt flat and coastal samphire communities within the Study Area
- preliminary description and mapping of vegetation condition.

1.2.2 Scope 2 – spring 2018

The scope of work for the spring flora and vegetation survey was to:

- conduct a detailed flora and vegetation field survey of the Study Area comprising –
    - re-visit quadrats and transects established in autumn 2018 to search for seasonal annual species not present in spring, recollect specimens of taxa not identifiable to species level from spring collections, review vegetation condition rating
    - establish further quadrats and transects to provide sufficient replication of vegetation types defined from the spring survey
    - further target significant flora recorded in autumn 2018 and as needed if Project plans have changed
    - map, describe and determine regional significance of flora in the survey area
    - update descriptions of vegetation communities and their conservation status
    - update mapping of salt flat and coastal samphire communities within the Study Area
    - update descriptions and mapping of vegetation condition
- update data sets and identify species collected during the field surveys
- identify key environmental assets
- prepare a comprehensive flora and vegetation technical report and supporting digital data.

1.2.3 Scope 3 – spring 2019

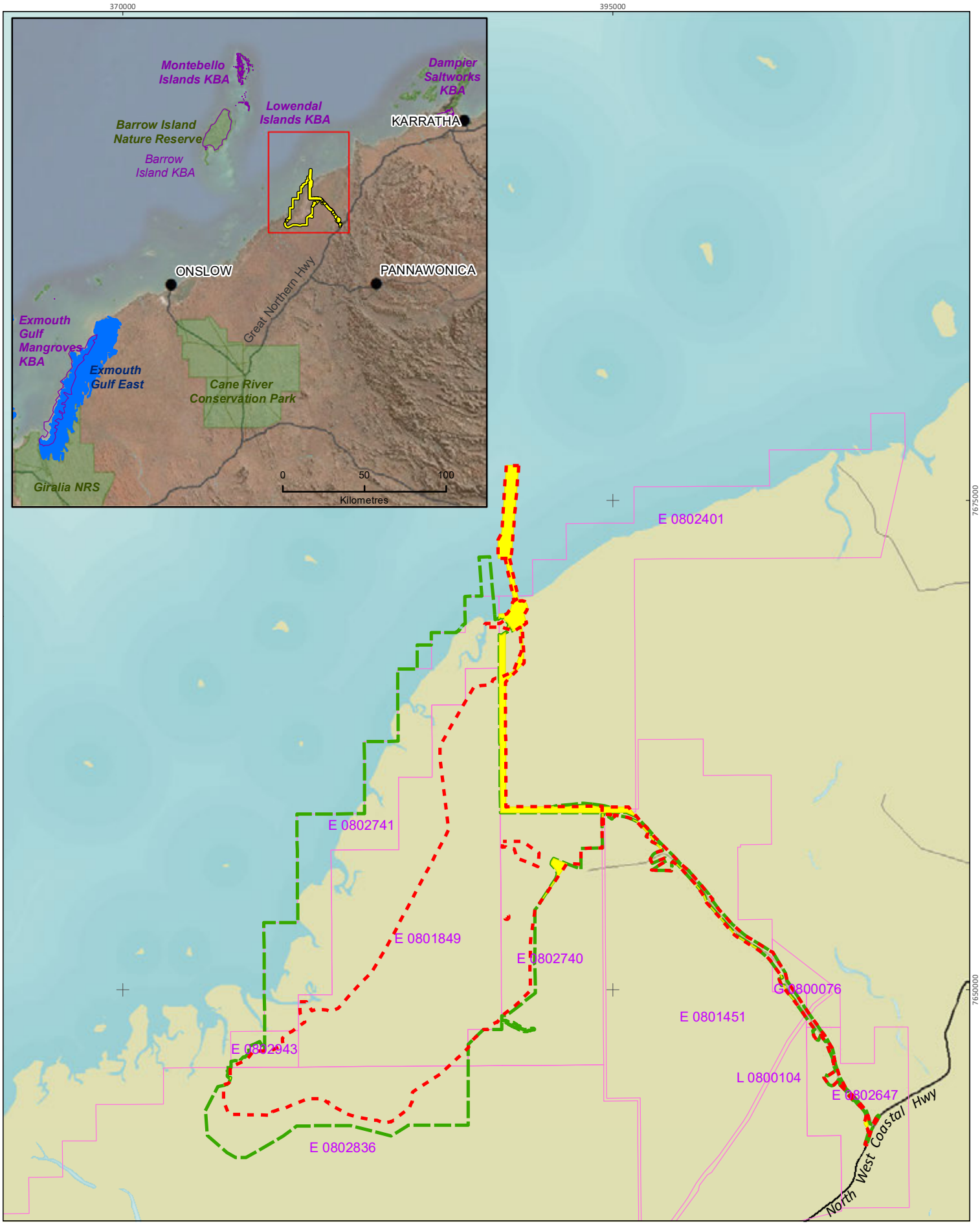
The scope of work for the spring 2019 flora and vegetation survey was:

- undertake targeted surveys for *Minuria tridens* (P1)
- conduct a flora and vegetation survey of the extended Study Area including
    - quadrat sampling
    - ground-truthing of previously extrapolated vegetation type and condition mapping
    - ground-truthing of previously extrapolated Horseflats Land System PEC mapping
    - targeted searches for significant flora and vegetation.
- update data sets and identify species collected during the field surveys
- update the flora and vegetation technical report and supporting digital data.

1.3 STUDY AREA

The final Study Area for the detailed flora and vegetation survey was 29,020.4 ha in size and occurred within tenements E08/2741, E08/1849, E08/2740, E08/2943, E08/2401, E08/1451, E08/2647, E08/2836, G08/0076 and L08/0104 (Figure 1-1). The Project will be developed within three separate Development Envelopes (DEs) – Ponds DE, Marine DE and Terrestrial Infrastructure DE, shown collectively as the Development Envelope (DE) in this report which is 16,023.1 ha in total (Figure 1-1).

The Study Area encompasses the land-based components of the DE (Figure 1-1), but partly extends into the marine areas. A small extension to the Study Area (1,110.8 ha, 3.8%) was made following completion of the most recent surveys; vegetation mapping within this area was extrapolated from adjacent mapped areas; this area is delineated in Figure 1-1 as ‘extrapolated area’ within the Study Area.



BCI Minerals Ltd
Biological surveys for the Mardie Project

Project No	1189-1279
Date	05-Feb-20
Drawn by	AJ
Map author	JC

0 5 10
Kilometres

1:250,000 (at A4) GDA 1994 MGA Zone 50

P:\GIS\Projects\MardieSalt\Project\1279-MSP-BCI-BOT\Mapping\MapDocuments\Figures\1189-1279_1-1_ProjectLocation.mxd

- Tenements
- Important Bird Areas
- Nationally important wetlands
- Conservation reserves
- Development Envelope

Study Area

- Detailed survey
- Extrapolated area

Figure 1–1

Project location and Study Area

PHOENIX ENVIRONMENTAL SCIENCES

2 LEGISLATIVE CONTEXT

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

- Commonwealth EPBC Act
- State *Biodiversity Conservation Act 2016* (BC Act)
- State *Environmental Protection Act 1986* (EP Act).

2.1 COMMONWEALTH

The EPBC Act is administered by the Federal Department of the Environment and Energy (DoEE). 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 and threatened ecological communities (TECs) as matters of NES.

Conservation categories applicable to Threatened Flora 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, Endangered or Critically Endangered.

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.

2.2 STATE

2.2.1 Threatened and Priority species

In WA, the BC Act provides for the listing of threatened flora species in the following categories:

- critically endangered – species facing an extremely high risk of extinction in the wild in the immediate future[2]
- endangered – species facing a very high risk of extinction in the wild in the near future[2]
- vulnerable – species facing a high risk of extinction in the wild in the medium-term future[2].

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

[2] As determined in accordance with criteria set out in the ministerial guidelines.

Species may also be listed as specially protected under the BC Act in the one or more of the following categories:

- species of special conservation interest – species with a naturally low population, restricted natural range, of special interest to science, or subject to or recovering from a significant population decline or reduction in natural range
- migratory species
- cetaceans
- species subject to international agreement
- the category of species otherwise in need of special protection.

The Department of Biodiversity Conservation and Attractions (DBCA) administers the BC Act and also maintains a non-statutory list of Priority flora. 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 list are assigned to one of four Priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

2.2.2 Threatened and Priority Ecological Communities

The BC Act provides for the listing of TECs in the following categories:

- critically endangered ecological community – facing an extremely high risk of becoming eligible for listing as a collapsed ecological community in the immediate future[2]
- endangered ecological community – facing a very high risk of becoming eligible for listing as a collapsed ecological community in the near future[2]
- vulnerable ecological community – facing a high risk of becoming eligible for listing as a collapsed ecological community in the medium-term future[2].

An ecological community may be listed as a collapsed ecological community under the BC Act if there is no reasonable doubt that the last occurrence of the ecological community has collapsed or the ecological community has been so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure.

The DBCA also maintains a non-statutory list of PECs, which may become TECs in the future, however, do not currently 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 Critical habitat

Under the BC Act, habitat is eligible for listing as critical habitat if it is critical to the survival of a threatened species or a TEC and its listing is otherwise in accordance with the ministerial guidelines.

2.2.4 Significant flora and vegetation

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

- 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 TECs or PECs
  - 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.

2.2.5 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 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.

2.3 INTRODUCED FLORA

Introduced flora pose threats to biodiversity and natural values by 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 (DPIRD 2018).
- 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 Study Area is situated primarily (91.7%) within the Roebourne subregion (PIL4) of the Pilbara bioregion. An insignificant proportion (0.2%) falls within the Chichester subregion (PIL1) of the Pilbara bioregion and about 4.5% intersects non-terrestrial areas occupied by marine habitats (Figure 3-1). The Roebourne subregion is described as (Kendrick & Stanley 2001):

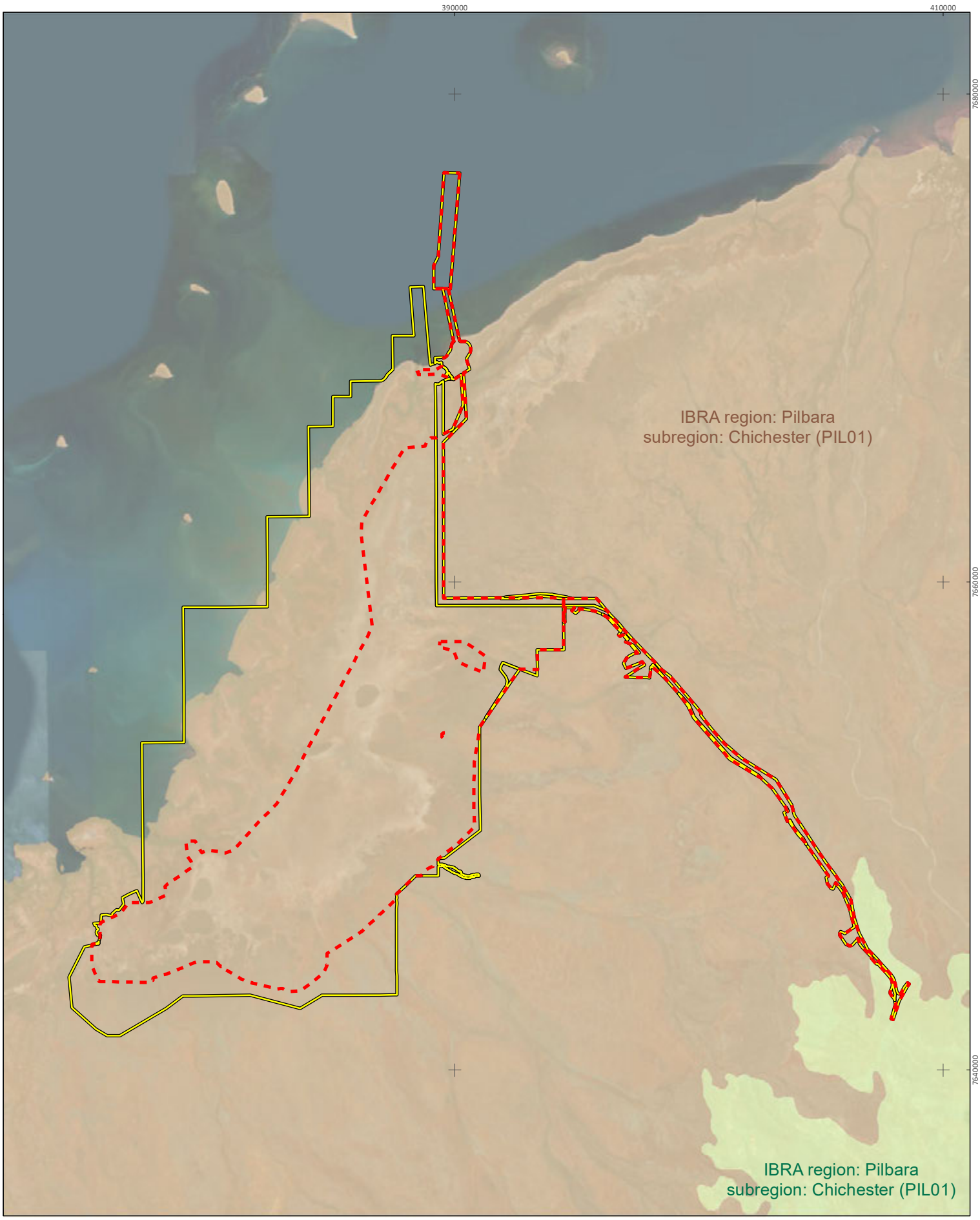
> Quaternary alluvial and older colluvial coastal and subcoastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub-steppe of *Acacia stellaticeps* or *A. pyrifolia* and *A. inaequilatera*. Uplands are dominated by *Triodia* hummock grasslands. Ephemeral drainage lines support *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands. Samphire, *Sporobolus* and mangal occur on marine alluvial flats and river deltas. Resistant linear ranges of basalts occur across the coastal plains, with minor exposures of granite. Islands are either Quaternary sand accumulations, or composed of basalt or limestone, or combinations of any of these three. The subregion experiences an arid (semi-desert) tropical climate with highly variable rainfall, often influenced by cyclonic activity in the northwest of WA and falling during summer.

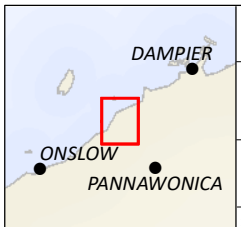
3.2 LAND SYSTEMS

The Study Area intersects eight land systems, as mapped by the Department of Agriculture and Food Western Australia (Figure 3-2). The Littoral system is the dominant land system of the Study Area occupying approximately 61.4%, followed by the Onslow system (19.0%), with the remaining six systems occupying less than 10% of the Study Area (Table 3-1). Nearly 8% of the Study Area occurs in un-mapped non-terrestrial areas occupied by marine habitats (Table 3-1).

Table 3-1 Description of land systems intersecting the Study Area

Land system	Land system description	Area (ha)	% of Study Area
Littoral	Bare coastal mudflats (unvegetated), samphire flats, sandy islands, coastal dunes and beaches, supporting samphire low shrublands, sparse *Acacia* shrublands and mangrove forests.	17,814.8	61.4
Onslow	Undulating sandplains, dunes and level clay plains supporting soft spinifex grasslands and minor tussock grasslands.	5,518.3	19.0
Un-mapped	Ocean and marine areas.	2,217.9	7.6
Horseflat	Gilgaied clay plains supporting Roebourne Plains grass grasslands and minor grassy snakewood shrublands.	1,838.5	6.3
Yamerina	Flood plains and deltaic deposits supporting tussock grasslands, woodlands with Buffel Grass and minor halophytic low shrublands.	1,463.6	5.0
Rocklea	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex and occasionally soft spinifex grasslands with scattered shrubs.	81.2	0.3
Ruth	Hills and ridges of volcanic and other rocks supporting shrubby hard spinifex and occasionally soft spinifex grasslands.	49.7	0.2
Peedamulla	Gravelly plains supporting hard spinifex grasslands and minor snakewood shrublands.	33.3	0.1
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands.	3.2	<0.1
Total		**29,020.4**	**100**





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Biological surveys for the Mardie Project

Project No	1189-1279
Date	05-Feb-20
Drawn by	AJ
Map author	JC

0 4 8

Kilometres

1:200,000 (at A4) GDA 1994 MGA Zone 50

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Development Envelope

Study Area

IBRA subregion

Chichester (PIL01)

Roebourne (PIL04)

Figure 3–1

IBRA regions and subregions of the Study Area

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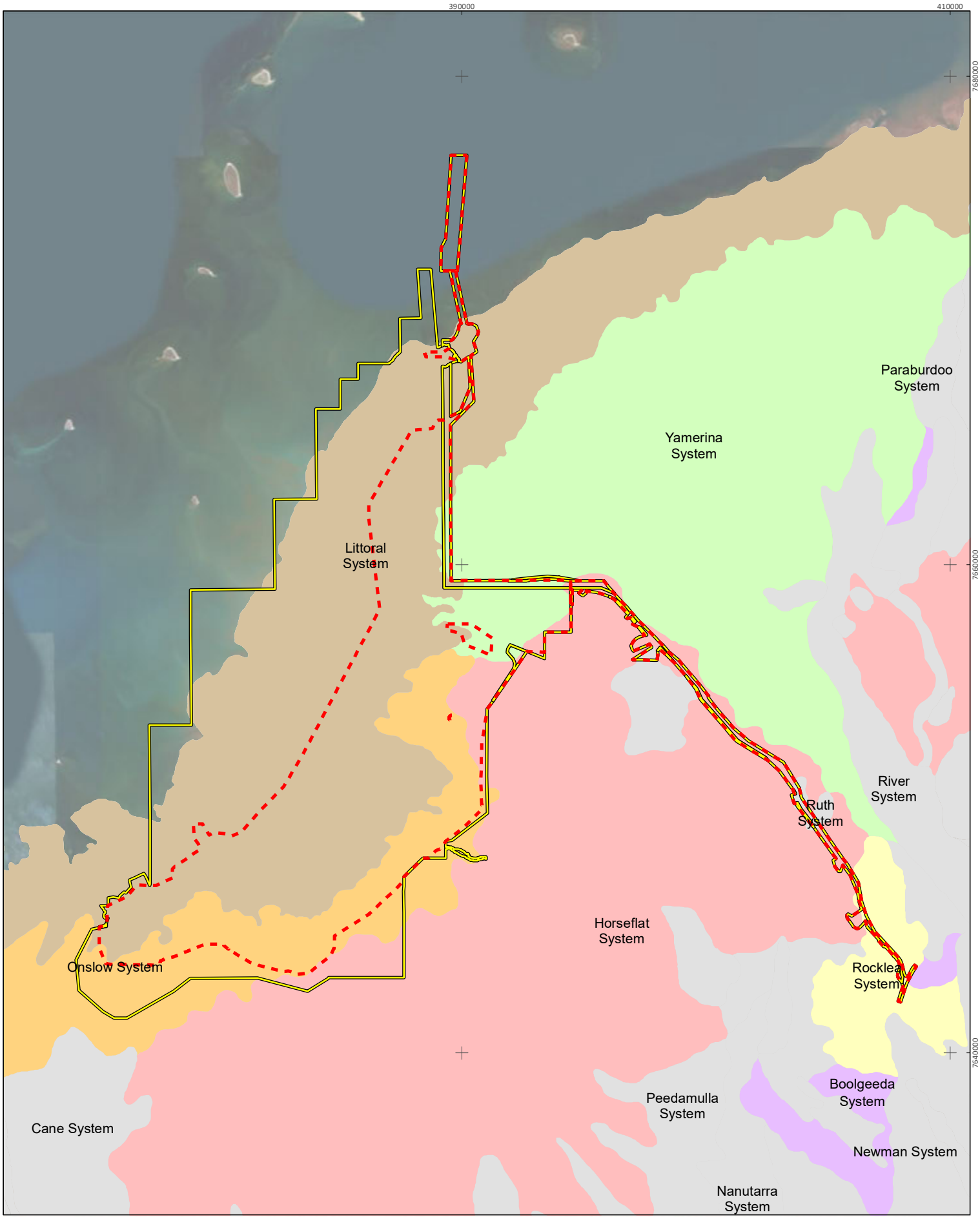

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Map author	JC

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Kilometres

1:200,000 (at A4) GDA 1994 MGA Zone 50

Development Envelope
Study Area

Land system
- Boolgeeda System
- Horseflat System
- Littoral System
- Onslow System
- Rocklea System
- Yamerina System
- Other land systems

Figure 3–2

Land systems of the Study Area

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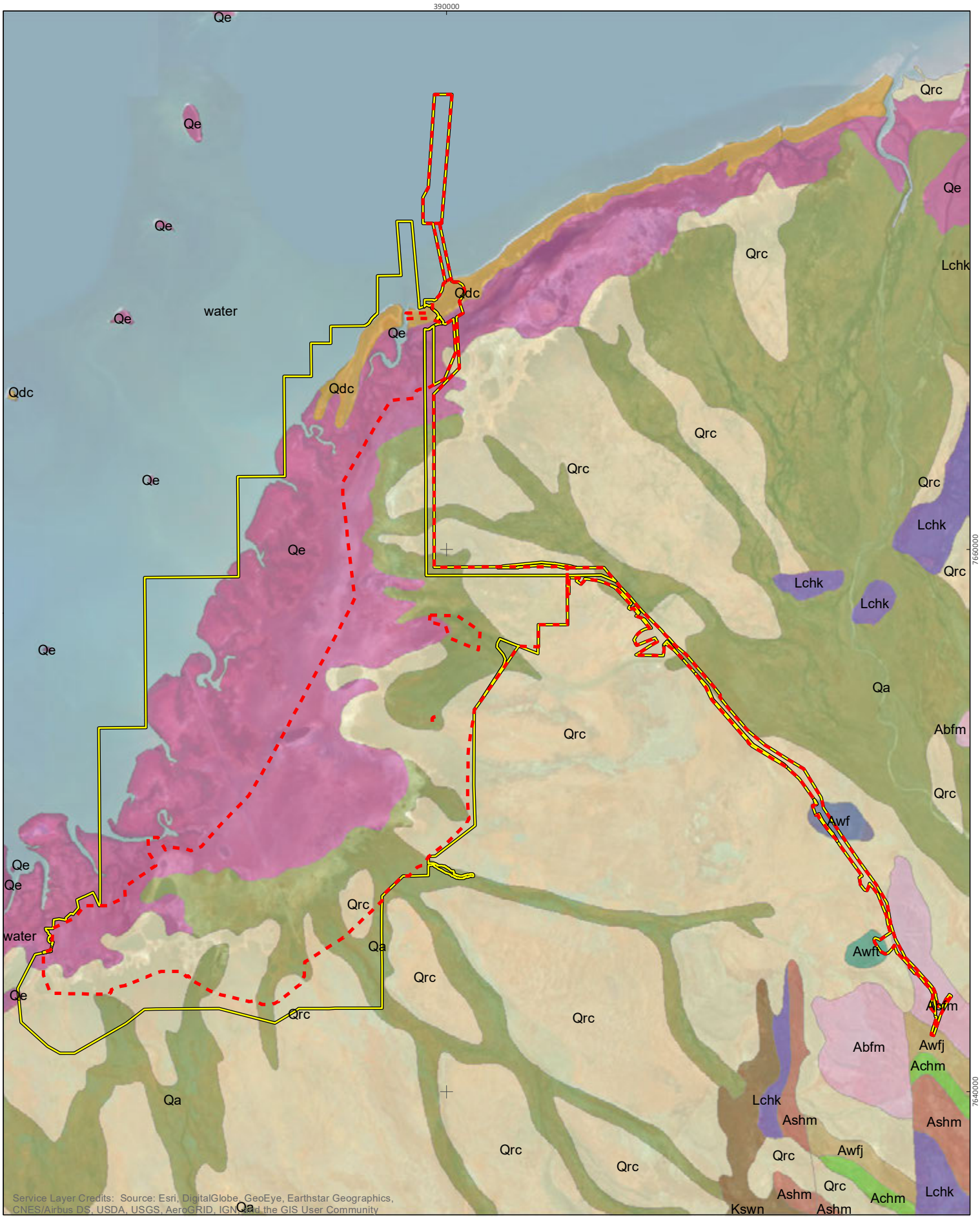
3.3 GEOLOGY

The surface geology of the Study Area is dominated by Quaternary deposits formed during the Cainozoic to late Mesozoic era, namely estuarine and delta deposits – coastal silt and evaporite deposits; estuarine, lagoonal, and lacustrine deposits (Qe), alluvium – channel and flood plain alluvium; gravel, sand, silt, clay, locally calcreted (Qa), and colluvium – sheetwash, talus; gravel piedmonts and aprons over and around bedrock; clay-silt-sand with sheet and nodular kankar; alluvial and aeolian sand-silt-gravel in depressions and broad valleys in Canning Basin; local calcrete, reworked laterite (Qrc) (Table 3-2; Figure 3-3) (CQ Group 2014).

Smaller parts of the Study Area are covered by coastal sand dunes (Qdc) and Archaean Maddina Formation – massive, vesicular and amygdaloidal basalt, basaltic andesite, and andesite, minor dacite, dolerite sills; bedded lapilli, vitric, crystal and lithic tuff, volcaniclastic siltstone, shale, chert, sandstone, dolomite (Abfm) (Table 3-2; Figure 3-3) (see also Williiams 1968).

Table 3-2 Surface geology of the Study Area, extent by deposit type

Surface geology	Abbreviation	Description	Area (ha)
Colluvium	Qrc	Colluvium, sheetwash, talus; gravel piedmonts and aprons over and around bedrock; clay-silt-sand with sheet and nodular kankar; alluvial and aeolian sand-silt-gravel in depressions and broad valleys in Canning Basin; local calcrete, reworked laterite.	6,770.1
Alluvium	Qa	Channel and flood plain alluvium; gravel, sand, silt, clay, locally calcreted.	5,516.2
Estuarine and delta deposits	Qe	Coastal silt and evaporite deposits; estuarine, lagoonal, and lacustrine deposits.	13,242.0
Maddina Formation	Abfm	Massive, vesicular and amygdaloidal basalt, basaltic andesite, and andesite, minor dacite, dolerite sills; bedded lapilli, vitric, crystal and lithic tuff, volcaniclastic siltstone, shale, chert, sandstone, dolomite.	74.9
Coastal sand dunes	Qdc	Beach sand, sand dunes, coastal dunes, beaches, and beach ridges; calcareous and siliceous, locally shelly and/or cemented (beach rock); locally reworked.	549.9
Neoarchean	Awf	Massive, vesicular and amygdaloidal basalt, basaltic andesite, and andesite, minor dacite, dolerite sills; bedded lapilli, vitric, crystal and lithic tuff, volcaniclastic siltstone, shale, chert, sandstone, dolomite.	52.7
Neoarchean	Awft	Pisolitic tuff, siliceous limestone and dolomite, mudstone, tuffaceous shale, siltstone, sandstone, volcaniclastic sandstone and siltstone, calcareous sandstone, local basalt and basaltic breccia, chert, local conglomerate, shale, jasper.	16.1
Jeerinah Formation	Awftj	Shale, sandstone, siltstone, mudstone, dolomite, local microbanded chert, jaspilite, conglomerate; fine-grained massive rhyolite; mafic tuff with local accretionary lapilli and agglomerate; thin basalt/dolerite and andesitic basalt flows	2.8
Water	water	water	2,795.7
Total			**29,020.4**



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Biological surveys for the Mardie Project

Project No	1189-1279
Date	05-Feb-20
Drawn by	AJ
Map author	JC

0 3 6
Kilometres

1:180,000 (at A4) GDA 1994 MGA Zone 50

Development Envelope
Study Area

Surface geology

Abfm, Achm, Ashm, Awf, Awfj, Awft, Kswn, Lchk, Qa, Qdc, Qe, Qrc, water

Figure 3–3

Surface geology of the Study Area

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3.4 HYDROLOGY

3.4.1 Groundwater

Hydrological studies of relevance to the Study Area have been conducted for both the Robe River and Fortescue River alluvials to the north-east and south-west of the Study Area (Commander 1994a, b). The lower Fortescue alluvial aquifer intersects the northern section of the Study Area (CGG Consulting 2014). More recently, groundwater models have been compiled for the Balmoral South and Sino Iron Ore Projects to the north-east of the Study Area in the Fortescue River estuary (Bennelongia 2008; CloudGMS 2017).

Depth to groundwater at the Fortescue River mouth is 5–15 m; depth to groundwater within the Balmoral South Project is about 20–35 m. Groundwater is mostly fresh (1,500-7,000 mg/L TDS), although more saline water has also been recorded (Bennelongia 2008). This is consistent with results from other studies in the Fortescue River aquifer, that show salinity in the aquifer rises from 345 mg/L TDS close to the river to more than 1,000 mg/L near the tidal flats where there is a saltwater interface (Commander 1994a).

The majority of the Mardie tenement is mapped as Acid Sulphate Soil (ASS) risk Class 1 (CGG Consulting 2014). The tenement sits atop the Pilbara groundwater resource allocation area, which is divided into the Ashburton and East Pilbara Groundwater sub-areas (CGG Consulting 2014).

3.4.2 Surface water

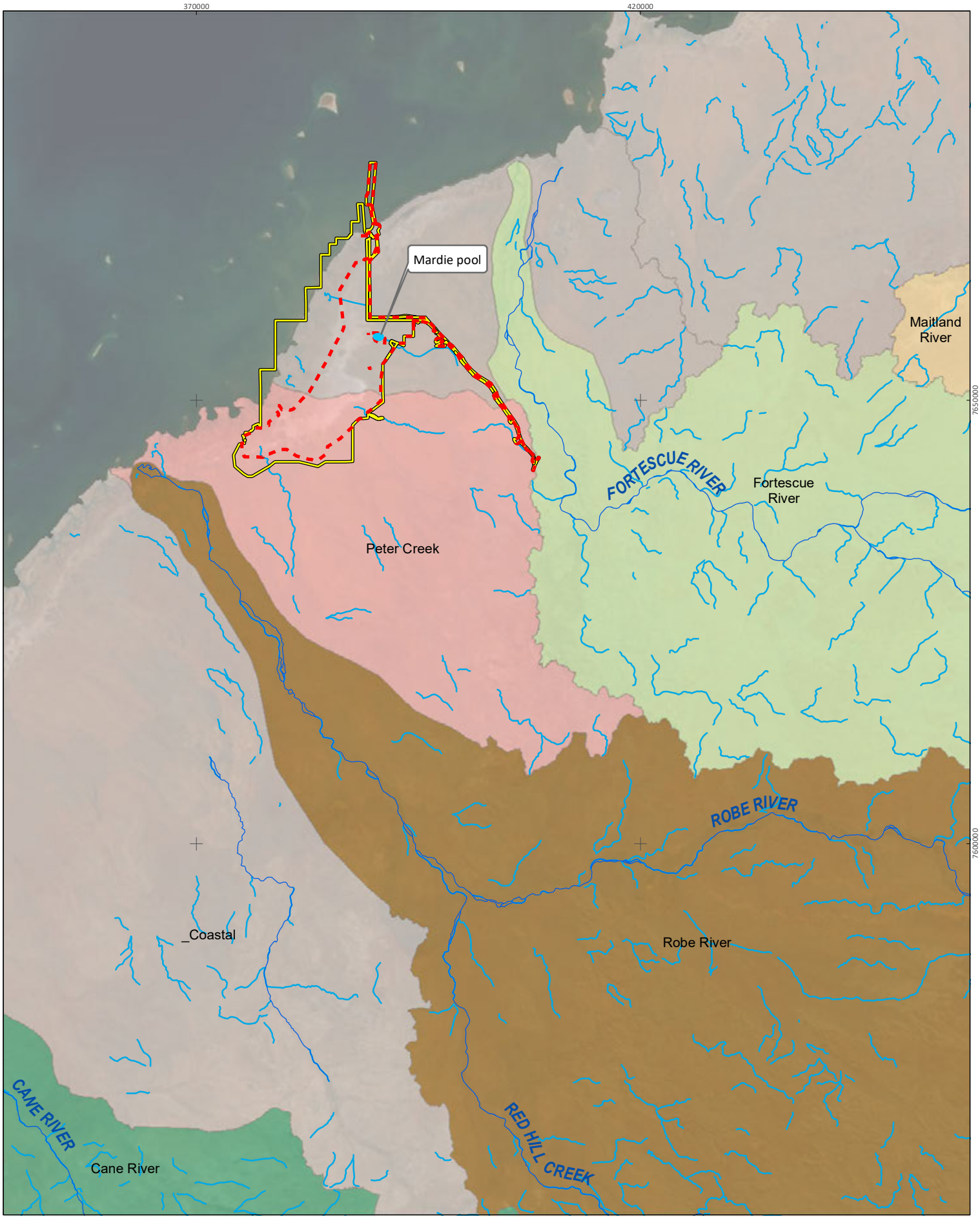
The Study Area is situated between the Robe River in the south and Fortescue River in the north (Figure 3-4). The Fortescue River in the West Pilbara has a catchment area of 20,000 km^2 and is a major drainage system of the region (Figure 3-4). Flow in the lower Fortescue River is seasonal and generated primarily by rainfall runoff from the river catchment, with the highest flows occurring between December and March. Low or no flow is typically experienced from July through to November (CloudGMS 2017).

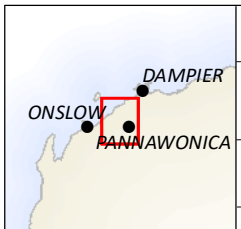
A number of smaller ephemeral wetlands (e.g. Six Mile Creek, Seven Mile Creek) drain from the Hamersley Ranges into the tidal flats of the Study Area (Williiams 1968). Similar to the Fortescue River, the hydrological regime is likely characterised by seasonal rainfalls. One permanent freshwater pool, Mardie Pool, is present in the Study Area.

3.5 CONSERVATION RESERVES AND ENVIRONMENTALLY SENSITIVE AREAS

There are no nature conservation reserves of ESAs on the mainland within or immediately adjacent to the Study Area. The nearest reserves are the numerous offshore islands associated with the Great Sandy Island Nature Reserve (Class B), within the Passage Island Archipelago (Figure 1-1); several of these are also mapped as ESAs. These are managed by DBCA for the conservation of flora and fauna and are vested with the Conservation Commission of WA. Two of these, Cowle Island (R 33831) and Solitary Island (R) are located within 10 km west of the Study Area (Figure 1-1).

The closest mainland reserve is Cane River Conservation Park (Class B), located 77 km south of the Study Area (Figure 1-1).





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Biological surveys for the Mardie Project

Project No	1189-1279
Date	10-Feb-20
Drawn by	AJ
Map author	JC

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Kilometres

1:550,000 (at A4) GDA 1994 MGA Zone 50

- Development Envelope
- Study Area
- Major watercourses
- Minor watercourses

River catchments
- Cane River
- Fortescue River
- Maitland River
- Peter Creek
- Robe River
- Coastal (non-river catchments)

Figure 3–4

Surface water systems in vicinity of Study Area

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3.6 CLIMATE AND WEATHER

The Pilbara bioregion has an arid to tropical climate with average maximum temperatures over 40°C from November to February and an average maximum of 25°C during the winter months (Leighton 2004; McKenzie *et al.* 2009). Annual rainfall across the broader Pilbara region averages approximately 290 mm and is most prevalent over the summer months in association with cyclonic activity to the north and northwest, though annual rainfall is highly variable (McKenzie *et al.* 2009). The climate of the Roebourne subregion is defined as arid (semi-desert) tropical with highly variable rainfall and cyclonic activity, primarily over summer (Kendrick & Stanley 2001).

The nearest Bureau of Meteorology (BOM) weather station is located at Mardie (Site number 005008) (Latitude**:** 21.19°S Longitude**:** 115.98°E), within 1 km east of the Project. Mardie records the highest maximum mean monthly temperature (37.9°C) in January and lowest (25.3°C) in February and highest minimum mean (27.7°C) and lowest (11.8°C) in July. Average annual rainfall is 278.7, with highest average rainfall recorded in February (62.7 mm) and March (49.0 mm) (BoM 2018) (Figure 3-5).

During the period August 2017–July 2018, mean daily maximum and mean daily minimum temperatures were close to long term averages aside from in March and April, which had higher than average maximum and minimum temperatures (Figure 3-5). Rainfall was well below the long term average with only 39% of the average annual rainfall recorded in the 12 months preceding the 2018 field survey. In the three months before the May detailed field survey rainfall was below average in the summer wet season and the first two months of autumn. The second detailed field survey was undertaken in August, six weeks following above average rainfall June which received a total of 41 mm.

During the period September 2018-August 2019, mean daily maximum temperatures were close to long term averages (Figure 3-6). Rainfall was well below the long term average with only 27% of the average annual rainfall recorded in the 12 months preceding the 2019 field survey. Overall, the study area has been subject to high temperatures and well below average rainfall over the period of the surveys conducted by Phoenix.

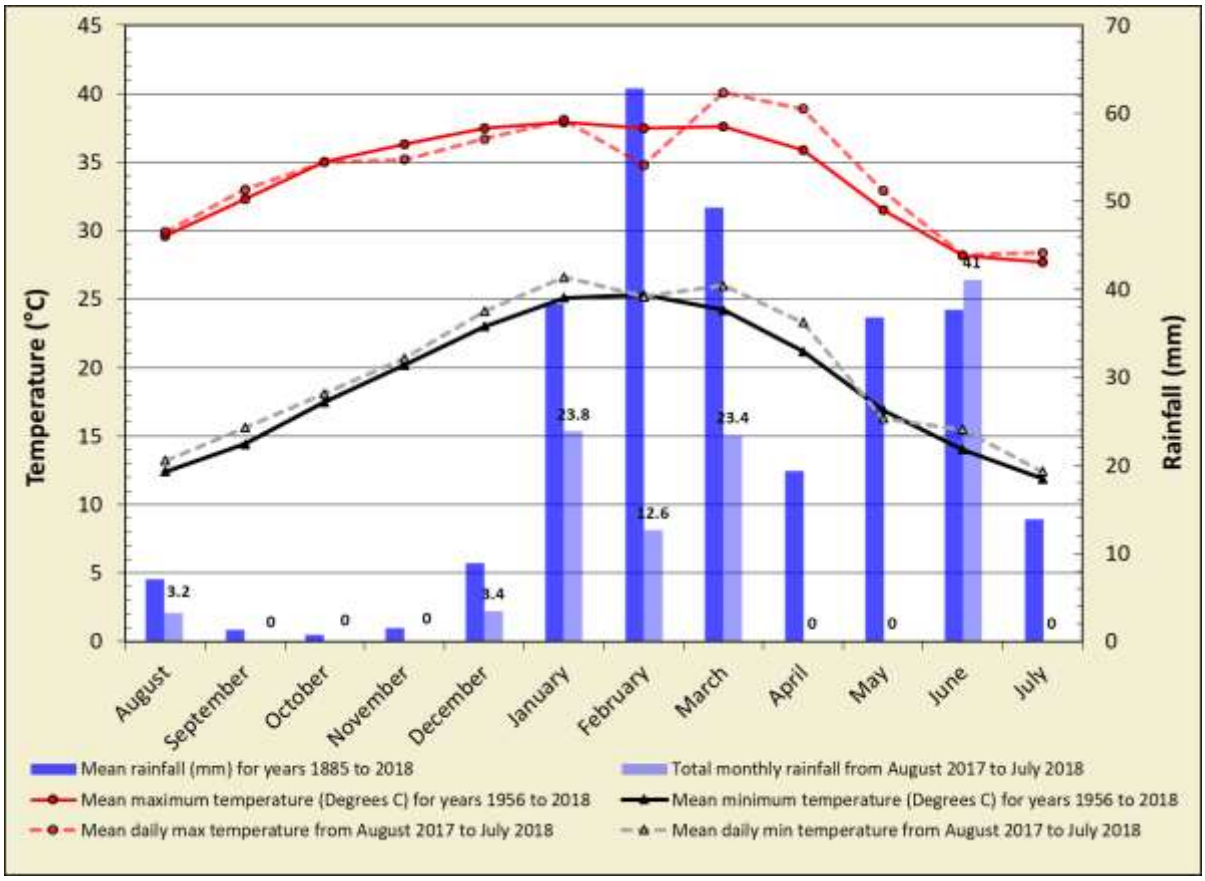


Figure 3-5 **2018 climate data (average monthly temperatures and rainfall records) and weather (temperature and rainfall) preceding the survey for Mardie (BoM 2018)**

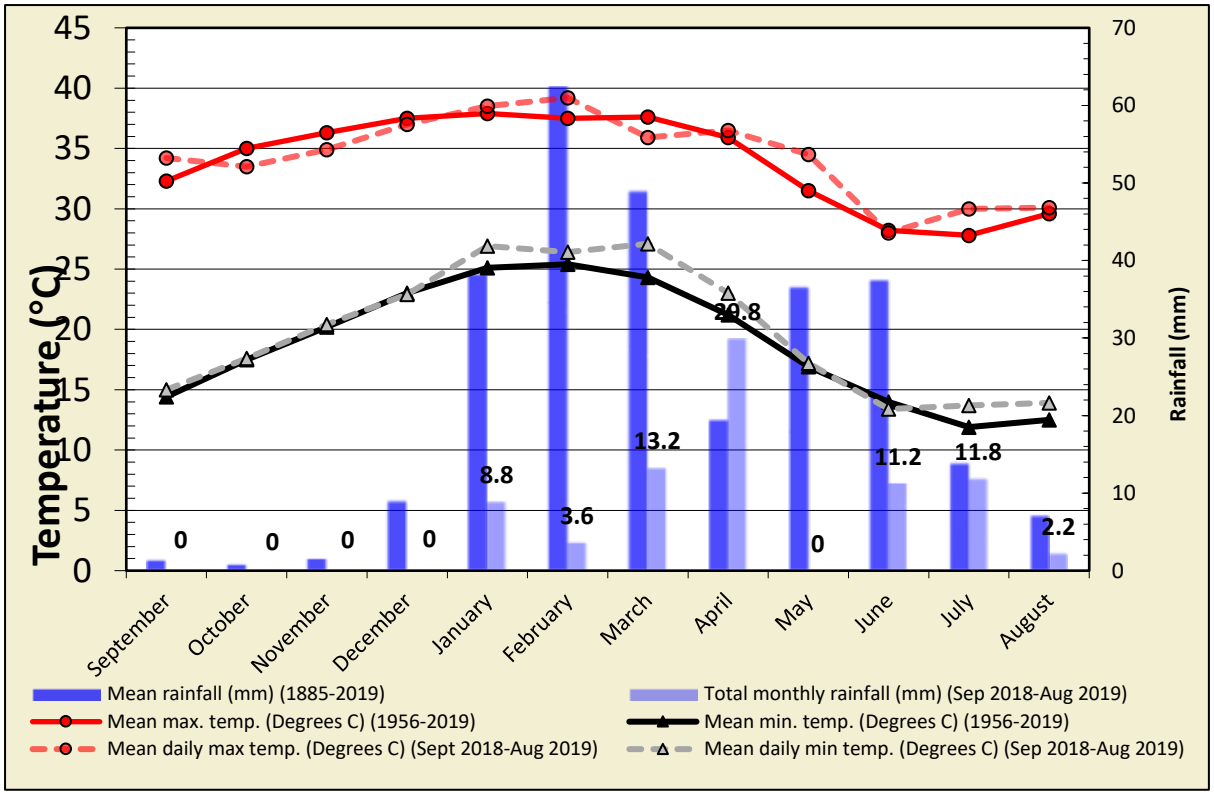


Figure 3-6 **2019 climate data (average monthly temperatures and rainfall records) and weather (temperature and rainfall) preceding the survey for Mardie (BoM 2020)**

4 METHODS

4.1 DESKTOP REVIEW

For the purposes of EIA, flora is defined as *native vascular plants* and vegetation is defined as *groupings of different flora patterned across the landscape that occur in response to environmental conditions* (EPA 2016a). The EPA's objective for the factor flora and vegetation is: *to protect flora and vegetation so that biological diversity and ecological integrity are maintained* (EPA 2016a).

A desktop review was undertaken previously in September 2017 (Phoenix 2017a). There are several considerations for EIA for the factor flora and vegetation (EPA 2016a); however, the focus of this desktop study was on identifying significant flora and vegetation that may be present in the Study Area, in particular:

- Threatened Flora listed as matters of NES under the EPBC Act
- Threatened Flora listed under the BC Act
- Priority flora listed by DBCA
- TECs listed as matters of NES under the EPBC Act
- TECs listed under the BC Act
- PECs listed by DBCA.

The following database searches were undertaken for the Study Area:

- EPBC Act Protected Matters Search Tool for Threatened Flora and TECs listed as MNES
- DBCA/WA Museum NatureMap for Threatened and Priority flora records
- DBCA and WA Herbarium Threatened and Priority flora Databases
- DBCA Threatened and Priority Ecological Communities Database for TECs and PECs.

The search extent for the database searches was the Study Area plus a 40 km buffer.

The following technical reports from surveys undertaken in the vicinity of the Study Area were reviewed:

- Cape Preston Mining Estate consolidated vegetation, flora and fauna assessment (Maunsell AECOM 2008b)
- Balmoral South. Consolidated vegetation, flora and fauna assessment (Maunsell AECOM 2008a)
- Balmoral North and Balmoral South Stage 2 flora and vegetation assessment (AECOM 2009)
- Austeel biological survey. Phase I (Biota & Trudgen & Associates 2001)
- Draft environmental impact statement/environmental review and management programme for the proposed Wheatstone Project. Volume 1 (Chapters 1 to 6) (Chevron 2010)
- Cape Preston East Environmental Studies. Flora and fauna review (GHD 2013)
- Literature and desktop review flora and vegetation. Proposed Cape Preston Transport Corridor (Onshore Environmental 2013)
- Targeted flora survey and Vegetation Management Plan for the Buckland Project: Stage 2 Haul Road (Phoenix 2017b)

Initial vegetation characterisation was undertaken using various remote geographical tools, including aerial photography (incl. Google Earth®), land system maps and topographic maps. Initial survey sites were then selected to record apparent changes in the vegetation.

The potential for occurrence in the Study Area of the significant flora and vegetation identified in the database searches was assessed based on reviewed information relating to habitat preference (soils, landforms, elevation and vegetation associations) and locality records from the database searches. This assessment informed the targeted searches during the field surveys.

4.2 FIELD SURVEY

A total of five field surveys were conducted over the Study Area comprising:

- a single day site reconnaissance by helicopter, 17 August 2017
- three day site reconnaissance by helicopter, 8-10 December 2017
- six day first phase detailed flora survey, 14-19 May 2018
- nine day second phase detailed flora survey, 15-23 August 2018
- four day survey of extended survey areas 10-13 September 2019.

The initial reconnaissance survey was conducted by Jarrad Clark to broadly define habitats within the Study Area and determine site access requirements. This survey identified three broad vegetation types, mangroves, samphire shrublands on tidal mudflats and 'terrestrial' vegetation (grasslands, woodlands and shrublands) on sand dunes, sand islands, plains and riparian (creek) areas. The initial survey identified that a large portion of the Study Area would only be readily accessible by helicopter and all subsequent surveys utilised a helicopter to ensure access to the entire Study Area.

The second reconnaissance survey was conducted by Dr Grant Wells and Alice Watt. The survey was conducted to determine the broad 'terrestrial' vegetation types and samphire communities on tidal mudflats from relevé surveys to facilitate site selection for the detailed flora survey and to ground-truth pre-selected survey locations undertaken in the desktop review. In addition, collection of specimens of *Tecticornia* species observed to be fruiting and/or flowering was undertaken. The survey identified that numerous apparent changes in vegetation on aerial imagery actually represented changes in soil colour of large areas of mudflats virtually devoid of any vegetation.

A detailed survey of the Study Area was conducted over two seasons in accordance with the recommendations in the Technical Guidance (EPA 2016b) for the Eremaean botanical province. The initial detailed survey was conducted in May 2018 by Dr Grant Wells and Alice Watt in May, six weeks post-wet season, with the second survey conducted in August 2018 by Dr Grant Wells, Alice Watt and Laurinda Timmins approximately six weeks following the highest winter rainfall in June. The supplementary survey of the extended Study Area and targeted searches for *Minuria tridens* was conducted by Martin Henson and Alice Watt in September 2019.

Field methods for the detailed flora and vegetation survey included:

- surveying of quadrats, relevés and transects (see 4.2.1)
- focused flora searches (see 4.2.2)
- vegetation type mapping (see 4.2.3)
- vegetation condition mapping (see 4.2.5).

4.2.1 Quadrats, relevés and transects

Survey site locations were selected to ensure that the vegetation types within the Study Area were sampled adequately as per EPA technical guidance (EPA 2016b). Preliminary survey 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 survey locations were re-assessed during the second reconnaissance survey. Some preliminary locations were moved to locations which better represented vegetation types. Quadrats (50 m x 50 m) and transect surveys were used to record data to define the vegetation types present in the Study Area. These surveys were supplemented with unbounded relevé surveys, where dominant species from each canopy stratum was recorded, to provide further records to facilitate accurate vegetation mapping

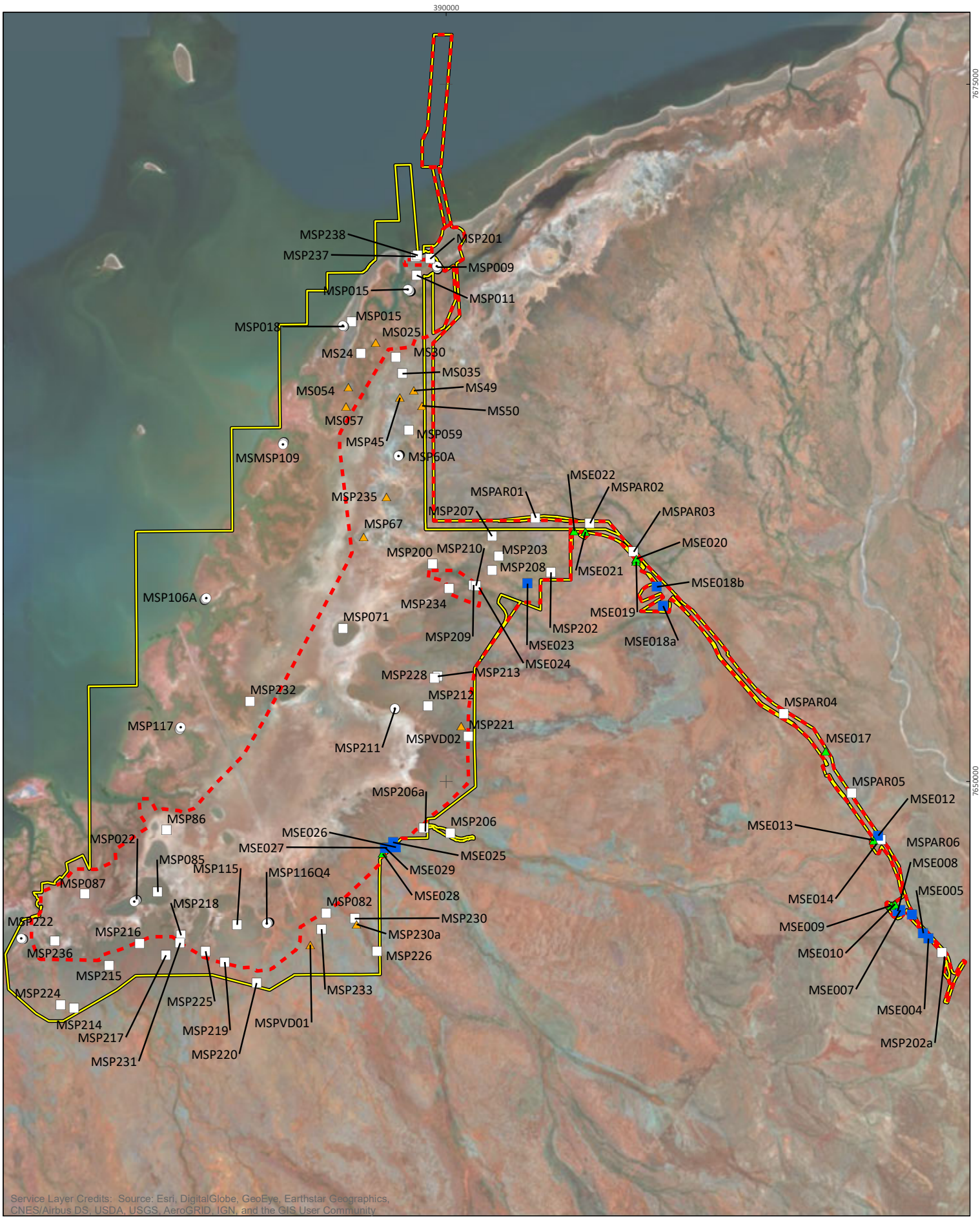
In accordance with EPA (2016b) transect surveys utilising 3 x 3 m (9 m^2) quadrats spaced evenly along linear transects were used to sample the riparian vegetation of tidal creeks and samphire communities that occurred around the 'shores' of islands and sand dunes arising from the tidal mudflats (Figure 4-1). At some locations samphire communities occurred across a large area of tidal mudflat, at these locations a 50 m x 50 m quadrat was used to define the vegetation.

In total, 64 quadrats, 11 *Tecticornia* transects (incorporating 30 quadrats) and 20 relevés were surveyed across the Study Area (Figure 4-1) providing a total of 114 survey locations (Appendix 1).

The following information was recorded for each quadrat[3] (Appendix 2):

- location – the geographic coordinates of all four corners of each quadrat and single point for relevé 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 (2016b)
- 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 appropriate condition scale for the Eremaean botanical province in EPA (2016b) (Table 4-1)
- height and percentage foliage cover (PFC) – a visual estimate of the canopy cover of each species present within the 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 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.

[3] For both 50 x 50 m quadrats and 3 x 3 m quadrats along transects.



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Biological surveys for the Mardie Project

Project No	1189-1279
Date	6/02/2020
Drawn by	AJ
Map author	GW

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Kilometres

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Development Envelope
Study Area

2018 sites
- Quadrat
- Relevé
- Transect
- Transect quadrat

2019 sites
- Quadrat
- Relevé

Figure 4-1

Survey sites

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The following information was recorded for each relevé:

- location – the geographic coordinates of a single point 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 (2016b)
- 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 appropriate condition scale for the Eremaean botanical province in EPA (2016b) (Table 4-1)
- flora species list – list of dominant species for each canopy stratum
- photograph – a colour photograph of the vegetation within each quadrat in a south-easterly direction from the north-west corner of the quadrat.

4.2.2 Significant flora searches

Targeted searches were undertaken for significant species identified in the desktop review. The searches focused on habitats considered likely to support significant flora, in addition to previously recorded locations of significant plants or populations in close proximity to the Study Area. Following the second phase survey conducted in spring 2018, a specimen was identified to be *Minuria tridens* (VU EPBC Act; P1 at State level). This species was not included in the desktop assessment as the only previous record of the species in Western Australia occurred well outside the desktop search area. Targeted searches for this species were subsequently undertaken in the 2019 spring survey.

A helicopter was used to access areas for targeted searches that could not be accessed by vehicle. The targeted searches compmrised foot searches of suitable habitat by personnel spaced approximately 20 m apart in meandering transects.

If a flora species was considered to potentially be a 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 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.

Following the survey, a likelihood of occurrence rating was assigned to each significant species, as follows:

- definite – species recorded within the Study Area by previous or current survey
- likely – Study Area within known range of species; suitable habitat within the Study Area and/or records within 5 km of Study Area

  - possible – Study Area within known range of species; optimal or potential habitat within the Study Area, no records within 5 km of Study Area
- unlikely – Study Area outside known range of species, no records within 5 km and/or no suitable habitat present in Study Area.

4.2.3 PEC assessment

Assessment of presence of any of the PECs identified in the desktop review was undertaken in the field based on general community descriptions.

4.2.4 Vegetation mapping

The vegetation descriptions from quadrats and transects 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 type (i.e. woodland, shrubland, etc.). To support delineation of vegetation types, cluster analyses were conducted based on species composition in each quadrat. As quadrats were sampled over two seasons and quadrats were scored by different survey personnel, the analyses were conducted for species presence-absence and annual and short-lived species were excluded from the dataset along with any taxon that could not be definitively identified to species level. Separate analyses were conducted for the 50 m x 50 m quadrats and the 3 m x 3 m quadrats scored for the transect surveys.

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 EPA (2016b).

The vegetation types thereby defined were then compared to relevé survey descriptions and the relevé assigned to the appropriate vegetation type.

The vegetation boundaries were mapped utilising high-quality colour aerial photography and from vegetation boundaries recorded on GPS during the field survey. Mapping of the boundary of chenopod (*Tecticornia*) shrublands with the areas of tidal mudflats devoid of the flora and vegetation that were the subject of this survey was achieved by flying along the boundary in a helicopter at low altitude and tracking the flight path on a hand held GPS unit.

Vegetation mapping was inferred in the extrapolated area (see section 1.3) from adjacent mapped vegetation types.

4.2.5 Condition mapping

The condition of vegetation was mapped across the Study Area based on the appropriate condition rating scale for the Eremaean Province where the Study Area is located (EPA 2016b). 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 4-1).

Table 4-1 Vegetation condition rating scale for Eremaean and Northern Botanical Provinces (EPA 2016b)

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.

4.2.6 Mapping of **Prosopis* spp. infestations

The cover values of **Prosopis* spp. recorded at quadrats in conjunction with the vegetation types delineated for the Study Area were used to map the intensity of **Prosopis* spp. infestation in the Study Area. The **Prosopis* spp. boundaries were mapped utilising high-quality colour aerial photography and from mapped vegetation type boundaries.

4.2.7 Targeted surveys for *Minuria tridens* (P1)

As the specimen of this species was identified post-field following the 2018 detailed survey, targeted searches were not conducted to determine the distribution or population size of the species at the time. Subsequently, aerial photography was used to map areas of vegetation with a similar appearance and texture to that in which the *Minuria tridens* was collected. These areas were visited during the targeted survey in 2019 to search for further individuals and populations of the species.

4.3 REVIEW OF SURVEY METHODS AGAINST EPA GUIDELINES

Comment on alignment of the survey with EPA technical guidance (EPA 2016b) is provided in Table 4-2.

Table 4-2 Alignment of survey with EPA guidelines

Key points	Compliant?
Preparation for survey (section 2.0) Survey led by botanist with at least five years experience in the bioregion Survey conducted under flora collection licences and landowner permission obtained	Yes, section 4.5
Desktop study (3.0) Relevant databases searched at appropriate search extent. Description of regional setting (e.g. vegetation, land systems and soils).	Yes, section 3, 4.1, 5.1
Survey (4.0)	
Reconnaissance survey (4.1) To verify the information obtained from the desktop study, characterise the flora and delineate the vegetation units present	Yes, section 4.2
Detailed survey (4.3) Survey effort – multiple sampling events	Yes, section 4.2
Sampling techniques appropriate (5.0) i.e. site type, quadrat size, vegetation condition rating	Yes, section 4.2
Survey design (6.0) Survey area extent appropriate (6.1) Survey effort (6.2) – adequate sampling of vegetation Site selection (6.3) Survey timing appropriate (6.4) Flora population census (6.5)	Yes, regarding survey area extent, site selection, survey timing (section 4.2) Mostly compliant regarding survey effort - number of sites per vegetation type variable due to highly variable extents in Study Area, at least three quadrats sampled in all vegetation types, except those with very limited extent in Study Area. Sites were selected from aerial imagery and from observations by helicopter and on the ground during the reconnaissance and detailed surveys. Surveys were conducted within the timeframes provided in the technical guidance (EPA 2016b) and included collection of *Tecticornia* specimens during all survey events including the summer reconnaissance survey. However seasonal conditions were not optimal. Significant flora searches not conducted over all suitable habitat due to very large size of Study Area and accessibility. Targeted searches also not conducted in the extrapolated area. Extent of significant flora was not recorded for all significant species (in particular *Tecticornia*) as these were identified after the field survey.
Flora (7.0) Collection and identification of specimens (7.1) Vouchering (7.2) New species (7.3)	Yes, section 4.2.1, 4.2.2, 4.4

Vegetation (8.0) Structural vegetation description (8.1) Floristic composition vegetation classification (8.2) Vegetation description (8.3) Defining TECs and PECs (8.4)	Yes, section 4.2.1, 4.2.3, 4.2.4
Mapping (9.0)	Yes
Reporting (10.0)	Yes

4.4 TAXONOMY AND NOMENCLATURE

Plant species were identified using local and regional flora keys, online flora keys (e.g. Spikey) and comparisons with named species held at the WA Herbarium. Nomenclature for flora and vegetation used in this report follows that used by FloraBase (DBCA 2019a) and the WA Herbarium.

All *Tecticornia* specimens were sent to Dr Kelly Shepherd (WA Herbarium) for identification, as is the requirement by the EPA for this genus. Michael Hislop (WA Herbarium) was consulted for identification of significant flora. Significant flora specimens have been vouchered with the WA Herbarium.

4.5 SURVEY PERSONNEL

The personnel involved in the survey are presented in Table 4-3.

Table 4-3 Project team

Name	Qualifications	Role/s
Alice Watt	BSc. (Cons. Bio. & Botany) (Hons) SL012089	Field survey, taxonomy, reporting
Frank Obbens	BSc. Hons. (Env. Biol.)	Taxonomy
Dr Grace Wells	PhD (Plant Cons.)	Survey design, GIS, data analysis, mapping
Dr Grant Wells	PhD (Botany) SL012222	Field survey, taxonomy, data analysis, reporting
Dr David Leach	PhD (Plant Biology)	GIS, map digitising
Ian Hay	B App Science (Surveying and mapping)	GIS
Anna Jacks	BSc. (Env. Sci.) (Hons)	Reporting, figure production
Martin Henson	BEnvSc. (Hons)	Field survey, taxonomy, reporting
Jarrad Clark	BSc. (Env. Mgt.)	Field survey
Karen Crews	BSc. (Env. Biol.) (Hons)	Report design, report review
Laurinda Timmins	BSc. (Env. Sci.) SL012075	Field survey

5 RESULTS

5.1 DESKTOP REVIEW

The database searches identified a high species diversity, with 414 flora taxa recorded within 40 km radius of the Study Area (Figure 5-1; Appendix 3). The list comprised species from 66 families and 187 genera.

5.1.1 Significant flora

The results of the combined database searches and review of flora reports identified records of 34 significant flora that may potentially occur within the Study Area (Table 5-1). A single Threatened Flora species listed under the EPBC Act was identified – *Eleocharis papillosa* (listed as P3 Priority flora in Western Australia), and a further 33 State listed Priority flora:

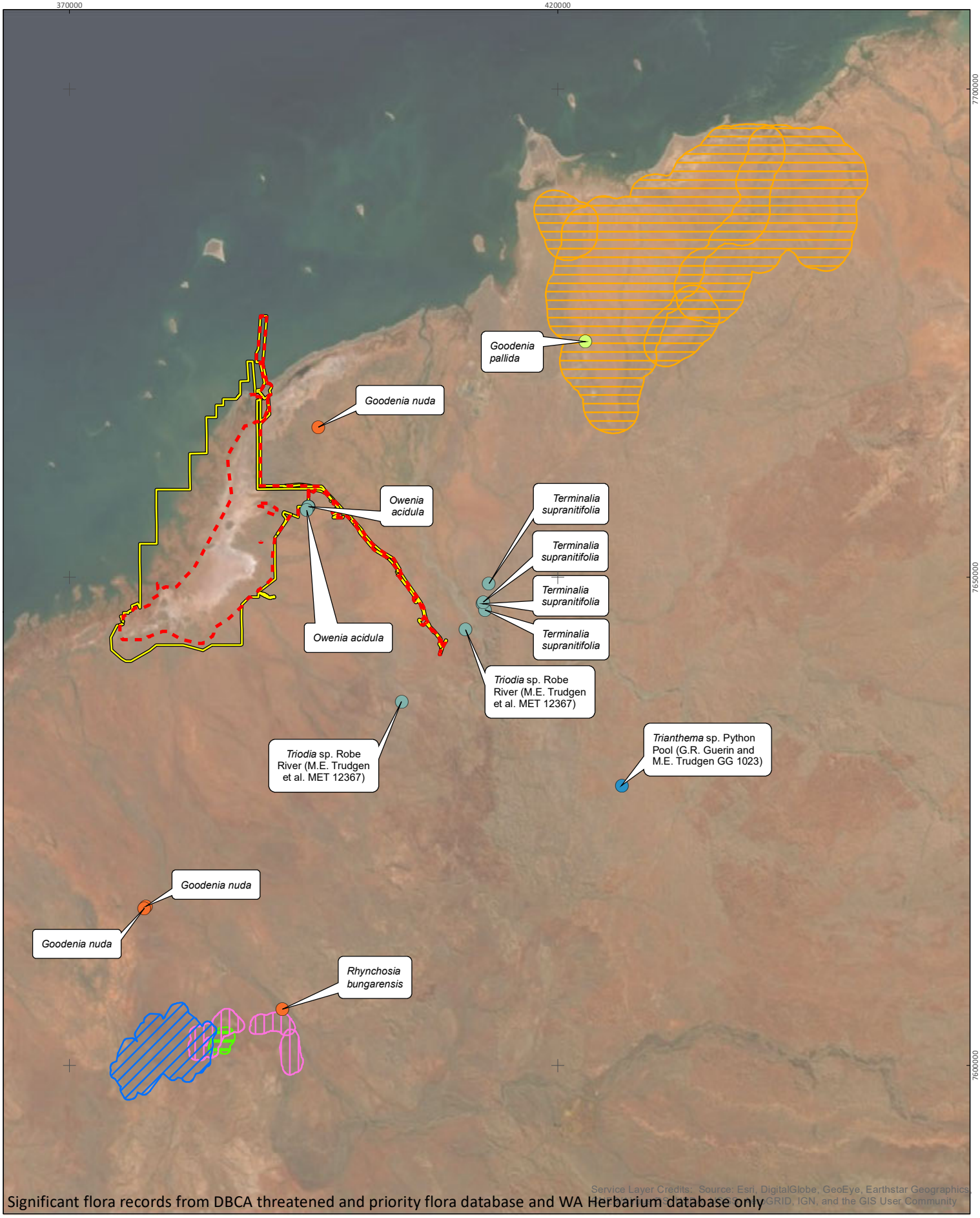
- eight Priority 1 species
- three Priority 2 species
- 20 Priority 3 species
- two Priority 4 species.

Table 5-1 Significant flora records from the area of the database searches

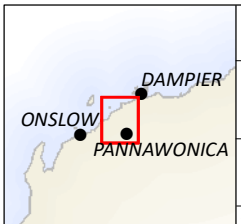
Species	Cons. status	Description and habitat
Abutilon sp. Onslow	P1	Semi-prostrate shrub to 2 m in diameter with yellow flowers, August to October. Red sand on sandplain, cracking clay loam on flat plain.
Atriplex flabelliformis	P3	Monoecious, erect, rounded perennial, herb, to 0.35 m high. Clay loam, loam, saline flats or marshes.
Bonamia brevifolia	P1	Prostrate herb, to 0.4 m wide, flowers purple and white recorded in December. Black cracking clay on plains.
Bothriochloa decipiens var. *cloncurrensis*	P1	Perennial, grass-like or herb, to 1.4 m high. Flowers green-yellow. Small, seasonally damp depression, on a stoney clay plain.
Carpobrotus sp. Thevenard Island (M. White 050)	P3	Prostrate, succulent perennial, herb, leaves sessile, triangular in cross-section; fruit turbinate. Flowers cream, August. Coarse white sand. Dune tops, disturbed areas.
Corchorus congener	P3	Spreading shrub, to 0.6 m high. Flowers yellow, April to June or August to November. Sand and red sandy loam with limestone in sand dunes or plains.
Cucumis sp. Barrow Island (D.W. Goodall 1264)	P2	Very sticky creeper. Stems and leaves hirsute. One leaf and flower at each node. Flower approximately 0.5 cm diameter. Gentle calcrete slope, red, sandy loam.
Eleocharis papillosa	Vu, P3	Annual, herb. Flower brown, November. Red clay over granite, open clay flats, claypans.
Eragrostis surreyana	P3	Annual, prostrate grass to 5 cm high. Soak areas with surface water, soil red-brown sandy clay, water holes.
Eremophila forrestii subsp. *viridis*	P3	Much-branched shrub, ca 1 m high. Flowers pink-cream, August. Generally occurs on the flats where a hardpan develops in between inland dunes.
Gomphrena pusilla	P2	Slender branching annual, herb, to 0.2 m high. Flowers white, March to April or June. Fine beach sand. Behind foredune, on limestone.

Species	Cons. status	Description and habitat
Goodenia nuda	P4	Erect to ascending herb, to 0.5 m high. Flowers yellow, April to August. Red-brown sandy loam on floodplains.
Goodenia pallida	P1	Erect herb, to 0.5 m high. Flowers purple, August. Red soils.
Goodenia sp. East Pilbara	P3	Open, erect annual or biennial, herb, to 0.2 m high. Flowers yellow. Red-brown clay soil, calcrete pebbles. Low undulating plain, swampy plains.
Gymnanthera cunninghamii	P3	Erect shrub, 1-2 m high. Flowers cream-yellow-green, January to December. Sandy soils.
Helichrysum oligochaetum	P1	Erect annual, herb, to ca 0.25 m high. Flowers yellow, August to November. Red clay on alluvial plains.
Indigofera sp. Bungaroo Creek	P3	Erect shrub, 1.5 m high and 1.0 m wide, dark pink flower with white centre. Drainage lines and creeks in red sandy loams.
Lepidobolus quadratus	P3	Rhizomatous, caespitose perennial, herb (sedge-like), 0.15-0.3 m high. Flowers brown/red, August to September. Lateritic gravel, grey/white sand.
Owenia acidula	P3	Tree, 3-8 m high. Flowers white-brown/cream. Drainage lines, floodplains and creeks, clay, sandy clay and silty loam soils.
Rhynchosia bungarensis	P4	Compact, prostrate shrub, to 0.5 m high. Flowers yellow. Pebbly, shingly coarse sand amongst boulders. Banks of flow line in the mouth of a gully in a valley wall.
Solanum albostellatum	P3	Annual or perennial herb up to 15 cm high with pale mauve flowers. Floodplains, crabhole, cracking clay soils.
Solanum cataphractum	P3	Erect or sprawling shrub. Flowers blue-purple, May to June. Sand, sandstone rock, undulating plateau, hummock grassland on sandstone clifftops.
Stackhousia clementii	P3	Dense broom-like perennial, herb, to 0.45 m high. Flowers green/yellow/brown. Skeletal soils, sandstone hills.
Stackhousia umbellata	P3	Spreading perennial, herb, to 0.7 m high. Flowers yellow, May to August. Sandy soils on limestone.
Stylidium weeliwolli	P3	Annual, herb, 0.1-0.25 m high, throat appendages 4, rod-shaped. Flowers pink and red, August to September. Gritty sand soil, sandy clay. Edge of watercourses.
Swainsona thompsoniana	P3	Annual or perennial prostrate herb up to 20 cm high with blue/purple flowers. Cracking clay floodplain, dark reddish brown silty cracking clay.
Tecticornia globulifera	P1	Low spreading shrub up to 50 cm tall, articles bright red. Lake bed with sandy clay loam soil, salt lake playa, floodplain with red sandy clay soils.
Tecticornia medusa	P3	Erect shrub to 0.8 m. Articles bright green. Flat floodplain, red clayey-sand, northern edge of large salt lake.
Tecticornia sp. Christmas Creek	P1	A low spreading shrub, 25 cm high, 50 cm across with articles varying in colour from a dull green to a purple red. Hill slopes in brown loam, saline flats, and flat floodplain in red clayey-sand.
Tephrosia rosea var. Port Hedland (A.S. George 1114)	P1	Erect, spreading shrub 120 cm tall x 120 cm wide with flowers deep pink in September. Coastal and near-coastal locations in sandy and sandy loam soils often tan, deep sands in coastal dunes.
Terminalia supranitifolia	P3	Spreading, tangled shrub or tree, 1.5-3 m high. Flowers green-yellow, May or July or December. Sand, among basalt rocks.

Species	Cons. status	Description and habitat
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	P2	Annual, prostrate and open herb: 0.02 m high and 0.20 m wide. Pink flower, March – May, July, September. Low undulating hills, plain in brown clayey-sand, rocky soil on flat plain.
Triodia sp. Robe River	P3	Perennial grass 0.3 m high x 0.2 m wide, white flowers, hill tops and plateau.
Triumfetta echinata	P3	Prostrate shrub, to 0.3 m high. Flowers August. Red sandy soils, sand dunes.



Significant flora records from DBCA threatened and priority flora database and WA Herbarium database only



BCI Minerals Ltd
Biological surveys for the Mardie Project

Project No	1189-1279
Date	05-Feb-20
Drawn by	AJ
Map author	GW

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Kilometres

1:500,000 (at A4) GDA 1994 MGA Zone 50

Development Envelope
Study Area

Conservation status of significant flora
- P1
- P2
- P3
- P4

TEC/PEC
- Horseflat Land System of the Roebourne Plains (P3)
- Sand Sheet vegetation (Robe Valley) (P1)
- Subterranean invertebrate communities of mesas in the Robe Valley region (EN)
- Subterranean invertebrate community of pisolitic hills in the Pilbara (P1)

Figure 5–1

Desktop records of significant flora and ecological communities

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5.1.2 Introduced flora

The desktop assessment identified records of 40 introduced species within the 40 km radius of the Study Area, of which four are a Declared Pest and WoNS (Table 5-2).

5.1.3 Vegetation associations

Regional scale vegetation mapping by Shepherd *et al.* (2002) mapped five vegetation associations in the Study Area (Table 5-3; Figure 5-2):

- Association 82: Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*
- Association 117: Hummock grasslands, grass steppe; soft spinifex
- Association 127: Bare areas; mud flats
- Association 600: Sedgeland; sedges with open low tree savannah; *Eucalyptus* sp. aff. *aspera* over various sedges
- Association 601: Mosaic: Sedgeland; various sedges with very sparse snakewood / Hummock grasslands, shrub-steppe; kanji over soft spinifex.

The Study Area is predominantly mapped as association 127 *Bare areas; mud flats*, occupying approximately 63.3% of the Study Area and association 601 *Mosaic sedgeland* at 33.8% (Table 5-3).

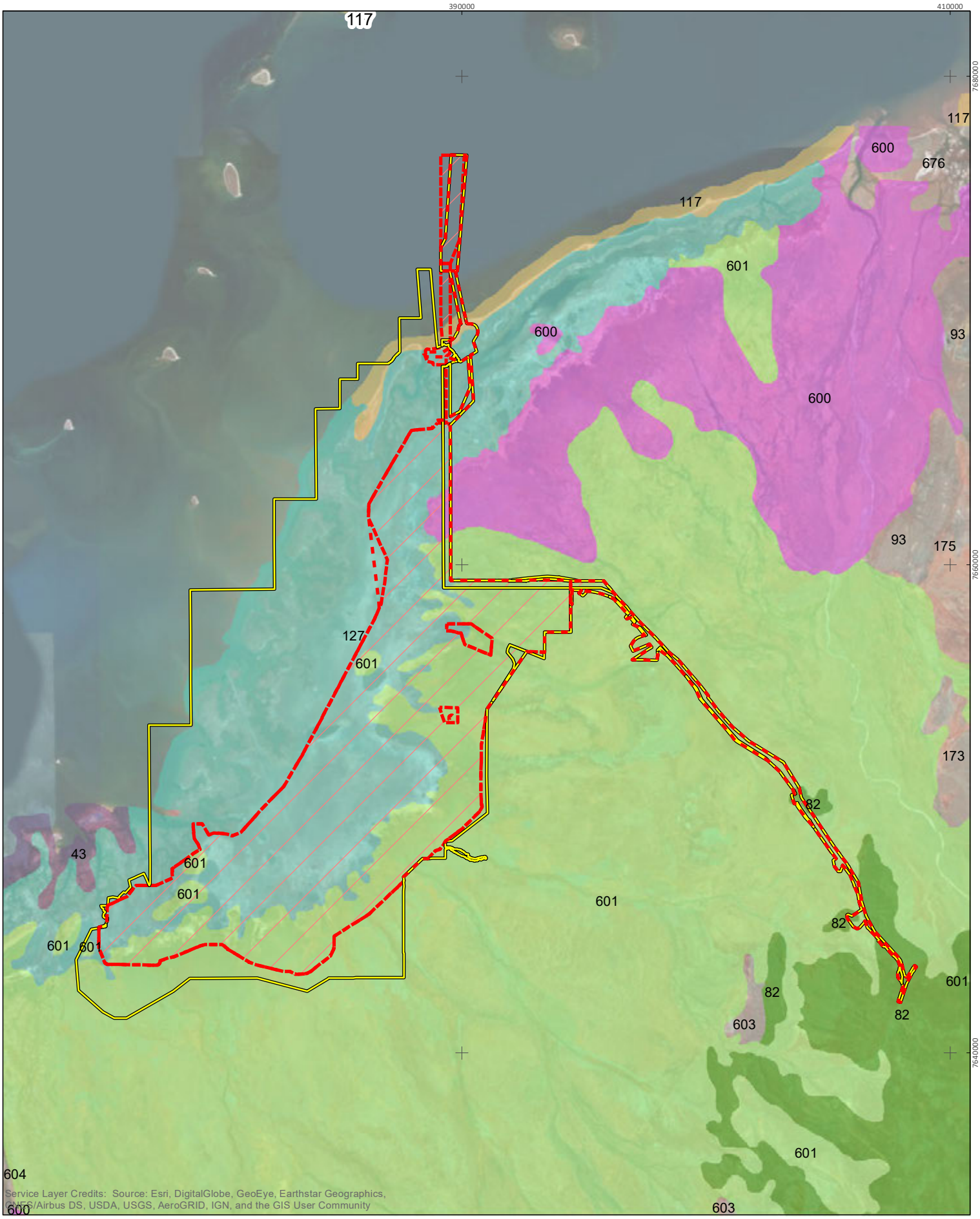
All vegetation associations are extensively represented in the Roebourne and Chichester subregions and have over 89% pre-European extent remaining and are therefore assigned the status of Least Concern (Table 5-3). Associations 82 and 117, the two hummock grasslands have the highest proportion in DBCA lands at 11.6% and 22.5% respectively, while the other associations have either below 3% or none of that association present in DBCA managed lands.

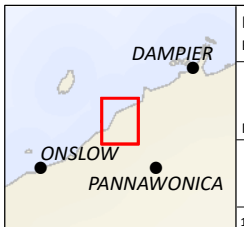
Table 5-2 Introduced flora records from the area of the database searches

Species name	Declared Pest	WoNS
**Aerva javanica*		
**Amaranthus viridis*		
**Arctotheca calendula*		
**Argemone ochroleuca* subsp. *ochroleuca*		
**Bidens bipinnata*		
**Casuarina equisetifolia*		
**Cenchrus ciliaris*		
**Cenchrus setaceus*		
**Cenchrus setiger*		
**Centaurium erythraea*		
**Chloris virgate*		
**Citrullus colocynthis*		
**Citrullus lanatus*		
**Conyza bonariensis*		
**Cucumis melo*		
**Cynodon dactylon*		
**Datura leichhardtii*		
**Eragrostis minor*		
**Flaveria trinervia*		
**Ipomoea cairica*		
**Malvastrum americanum*		
**Melochia pyramidata*		
**Papaver somniferum*		
**Parkinsonia aculeata*	s22(2) (C1, C3)	Y
**Passiflora foetida*		
**Passiflora foetida* var. *hispada*		
**Polycarpon tetraphyllum*		
**Portulaca oleracea*		
**Prosopis glandulosa* x *velutina*	s22(2) (C2, C3)	Y
**Prosopis pallida*	S12 (C2)	Y
**Senna occidentalis*		
**Setaria verticillata*		
**Solanum nigrum*		
**Sonchus oleraceus*		
**Stylosanthes hamata*		
**Tamarindus indica*		
**Tamarix aphylla*	s22(2) (C3)	Y
**Tribulus terrestris*		
**Vachellia farnesiana*		
**Washingtonia filifera*		

Table 5-3 Extent of Pre-European vegetation associations present in the Study Area (DBCA 2018a)

Vegetation association	Description	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Current extent in DBCA managed lands (%)	% of Study Area
82	Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*	2,563,583.23	2,550,898.98	99.51	11.59	0.8
117	Hummock grasslands, grass steppe; soft spinifex	82,705.78	78,096.64	94.43	22.54	1.4
127	Bare areas; mud flats	177,749.75	159,595.04	89.79	2.32	63.3
600	Sedgeland; sedges with open low tree savannah; *Eucalyptus* sp. aff. *aspera* over various sedges	67,036.26	66,954.63	99.88	0	0.7
601	Mosaic: Sedgeland; various sedges with very sparse snakewood / Hummock grasslands, shrub-steppe; kanji over soft spinifex	109,686.98	109,618.49	99.94	0	33.8
Un-mapped	Ocean and marine areas					5.6
Total						100





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Biological surveys for the Mardie Project

Project No	1279
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Drawn by	AJ
Map author	JC

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Development Envelope
Study Area

Vegetation association

- 43
- 82
- 117
- 127
- 600
- 601

Figure 5–2

Shepherd *et al.* (2002) vegetation associations of the Study Area

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5.1.4 Threatened and Priority Ecological Communities

One Endangered TEC listed under the EPBC Act or BC Act (Robe Valley Mesas – Subterranean invertebrate communities of mesas in the Robe Valley region) and three PECs were identified within 50 km of the Study Area (Table 5-4; Figure 5-1).

Table 5-4 Threatened and Priority Ecological Communities from desktop review

Community ID	Community name	Conservation status	Buffer (km)	Proximity to Study Area
Robe Valley Mesas	Subterranean invertebrate communities of mesas in the Robe Valley region	Endangered	0.5	41 km S of Study Area
Sand Sheet vegetation	Sand Sheet vegetation (Robe Valley)	Priority 1	0.5	43 km S of Study Area
Robe Valley Pisolitic Hills	Subterranean invertebrate communities of pisolitic hills in the Pilbara	Priority 1	0.5	40 km S of Study Area
Horseflat Land System	Horseflat Land System of the Roebourne Plains	Priority 3	2.0	32 km E of Study Area 8.8 km E of the Study Area (Phoenix 2017b)

5.2 FIELD SURVEY

A total of 238 flora taxa representing 41 families and 115 genera identified to species level were recorded in the Study Area during the field surveys (Appendix 4). Species richness ranged from 1 – 46 species between quadrats (Appendix 2). The assemblage included 230 native species and eight introduced species, including 169 perennial species, 66 annual or short-lived species and three unknown lifecycles. The most prominent families recorded were Fabaceae (48 species), Chenopodiaceae (29 species), Poaceae (28 species), Amaranthaceae (18 species) and Malvaceae (14 species).

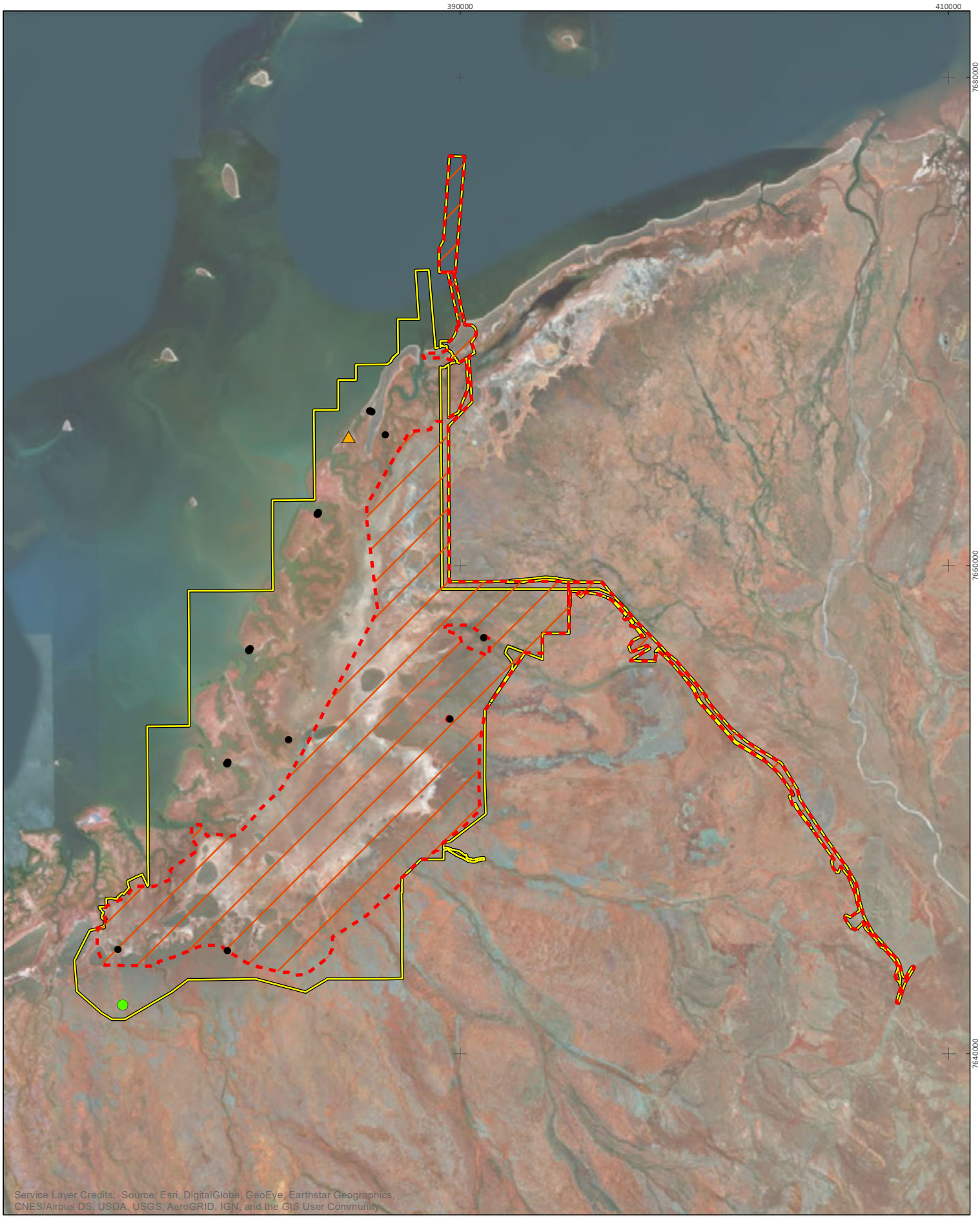
5.2.1 Significant flora records

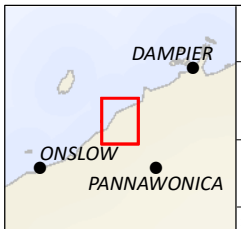
One Commonwealth listed Threatened flora, *Minuria tridens* (listed as P1 Priority flora in Western Australia; see section 5.2.1.1) and one other DBCA Priority flora *Goodenia nuda* (P4; section 5.2.1.2) were recorded in the Study Area during the survey (Figure 5-3). *Minuria tridens* was not identified through the desktop review as the only other previous record of this species in Western Australia was from near Cue, over 700 km south of the Study Area.

A record for the P3 species *Owenia acidula* occurred within the Study Area. A foot search was conducted for the species in the vicinity of the record following which a broader area was searched by helicopter flying at low altitude. No plants of the species were located.

The Study Area represents an approximate 80 km, north-east extension to the mapped distribution of *Cassytha aurea* var. *aurea* (DBCA 2019b) which subsequently is considered a significant species.

One samphire taxon identified as *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate (LOSA) was considered by taxonomic specialist, Dr Kelly Shepherd, to represent an undescribed species and is therefore considered a significant species; it was recorded at seven locations in the Study Area (Figure 5-3). Four other *Tecticornia* specimens could not be identified to species level and may also represent undescribed taxa. The species, *Tecticornia* sp. in early flower, *Tecticornia* sp. sterile 1, *Tecticornia* sp. sterile 4 and *Tecticornia* sp. sterile 6 are considered significant as they may represent new species.





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Biological surveys for the Mardie Salt Project

Project No	1279
Date	10-Feb-20
Drawn by	AJ
Map author	GW

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Kilometres

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Development Envelope

Study Area

Conservation status

- Vulnerable EPBC, P1 DBCA
- P4
- Other significant species

Abbreviations:
aff. = affinity to
EF = in early flower
LOSA = large ovate seed aggregate
var. = variety

Figure 5-3

Records of significant flora from field survey

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5.2.1.1 Minuria tridens

Status: VU (EPBC), P1 (DBCA)

Description: Dwarf virgate shrub, 0.25-0.35 m high (Figure 5-4). White-blue flowers September.

Figure 5-4 *Minuria tridens* (specimen from field survey)

Distribution and ecology: There is only one record of *Minuria tridens* in Western Australia, located on the roadside of the Great Northern Highway near Cue in the Eastern Murchison subregion; habitat is not described for this record. In the Northern Territory, it typically occurs on the south side of ranges and rises in low shrubland and is closely associated with high pH soils derived from dolomite, limestone and calcrete parent materials (Kerrigan & Albrecht 2006, in Nano & Pavey 2008). Associated species in the NT populations include *Acacia kempeana, Senna artemisioides* and *Indigofera leucotricha*; alkaline-tolerant hummock grasses (e.g. *Triodia longiceps* and *T. brizoides*) may be present in the wider-habitat area but are generally absent from the immediate population site (Kerrigan & Albrecht 2006, in Nano & Pavey 2008).

Records and distribution in Study Area: During the initial detailed survey a single plant was located on a coastal sand dune in *Triodia epactia* and *Cenchrus ciliaris* grassland (Figure 5-3), habitat that is not consistent with the NT records.

Subsequent targeted searches for the species identified a further four plants in close proximity to the initial record considered to be the species. The identity of these plants could not be definitively determined as plants were in a sterile and dessicated condition following an extended period of below average rainfall. Foot searches of suitable habitat for the species in the study area did not locate any other plants/specimens considered representative of the species.

5.2.1.2 Goodenia nuda

Status: P4

Description: Erect to ascending herb, to 0.5 m high (Figure 5-5). Yellow flowers April to August.

Figure 5-5 *Goodenia nuda* (Florabase pictures on left, specimen from field survey on right)

Distribution and ecology: Occurs in the Gascoyne, Little Sandy Desert and Pilbara bioregions (DBCA 2018b). This species is known from 117 records (ALA 2018), with habitat descriptions including:

- tussock grassland of *Eriachne benthamii*, low woodland of *Eucalyptus victrix* and *Acacia distans*. Mixed *Acacia* sparse mid shrubland (*Acacia tetragonophylla*, *A. synchronicia* and *A. sclerosperma* subsp. *sclerosperma*) in drainage line with red-brown sandy loam over ironstone
- low woodland of *Acacia aptaneura* and *Corymbia aspera* over open tussock grassland of *Aristida inaequilatera*, *Enneapogon polyphyllus* and *Aristida contorta* with low open shrubland of *Ptilotus obovatus*, *Mariana villosa* and *Eremophila lanceolata* on edge of drainage line in loam soil
- *Eucalyptus leucophloia*, *Corymbia hamersleyana* and *C. deserticola* low open woodland over *Hakea lorea* subsp. *lorea*, *Acacia elachantha* and *A. tumida* var. *pilbarensis* scattered tall shrubs over *A. atkinsiana*, *Senna glutinosa* open shrubland over *Isotropis atropurpurea* scattered low shrub over *Triodia* sp. Millstream and *T. wiseana* hummock grassland on floodplain with red-brown light clay
- low open woodland of *Acacia xiphophylla*, *A. victoriae*, *A. aneura* var. *aneura* over *A. tetragonophylla*, *Ptilotus obovatus*, *Senna* spp., and mixed species of *Maireana* and *Sclerolaena* in orange-brown alluvial sand over ironstone.

Population sizes provided in records for the species (DBCA 2018b) range from one to 200 plants.

Records and distribution in Study Area: Two individuals were located in a low *Eucalyptus victrix* woodland over tall open *Acacia coriacea* subsp. *pendens* shrubland over low *Eragrostis brownii*, *Eulalia aurea* and *Triodia wiseana* grassland (Figure 5-3).

5.2.2 Likelihood of occurrence assessment for significant flora

Assessment of the likelihood of occurrence of the remaining 33 significant flora identified from the desktop assessment determined one, *Owenia acidula* P3, was likely to be present in the Study Area, seven as possible and 25 unlikely (Table 5-1). Of those considered likely or possible, three were Priority 1, one was Priority 2 and four were Priority 3.

Table 5-5 Likelihood of occurrence for conservation significant flora in the Study Area

Species	Cons. status	Likelihood of occurrence
Abutilon sp. Onslow	P1	Unlikely Study Area outside of known range, no records within 5 km
Atriplex flabelliformis	P3	Unlikely Study Area outside of known range, no records within 5 km
Bonamia brevifolia	P1	Unlikely no suitable soil type in Study Area
Bothriochloa decipiens var. *cloncurrensis*	P1	Unlikely Study Area outside of known range, no records within 5 km
Carpobrotus sp. Thevenard Island (M. White 050)	P3	Unlikely Study Area outside of known range, no records within 5 km
Corchorus congener	P3	Possible suitable habitat in Study area but no records within 5 km
Cucumis sp. Barrow Island (D.W. Goodall 1264)	P2	Unlikely Study Area outside of known range, no records within 5 km
Eleocharis papillosa	Vu, P3	Unlikely Study Area outside of known range, no records within 5 km and no suitable habitat
Eragrostis surreyana	P3	Unlikely no records within 5 km and no suitable habitat
Eremophila forrestii subsp. *viridis*	P3	Unlikely Study Area outside of known range, no records within 5 km and no suitable habitat
Gomphrena pusilla	P2	Unlikely Study Area outside of known range, no records within 5 km
Goodenia nuda	P4	Definite, recorded in current survey
Goodenia pallida	P1	Possible suitable habitat in Study Area but no records within 5 km
Goodenia sp. East Pilbara	P3	Unlikely Study Area outside of known range, no records within 5 km and no suitable habitat
Gymnanthera cunninghamii	P3	Possible suitable habitat in Study Area but no records within 5 km
Helichrysum oligochaetum	P1	Possible suitable habitat in Study Area but no records within 5 km
Indigofera sp. Bungaroo Creek	P3	Unlikely Study Area outside of known range, no records within 5 km
Lepidobolus quadratus	P3	Unlikely Study Area outside of known range, no records within 5 km
Owenia acidula	P3	Likely, prior record of the species in the Study Area and large areas of suitable habitat
Rhynchosia bungarensis	P4	Unlikely, lack of suitable habitat and no record within 5 km
Solanum albostellatum	P3	Possible suitable habitat in Study Area but no records within 5 km
Solanum cataphractum	P3	Unlikely, lack of suitable habitat and no record within 5 km
Stackhousia clementii	P3	Unlikely, lack of suitable habitat and no record within 5 km
Stackhousia umbellata	P3	Unlikely Study Area outside of known range, no records within 5 km
Stylidium weeliwolli	P3	Unlikely Study Area outside of known range, no records within 5 km
Swainsona thompsoniana	P3	Unlikely Study Area outside of known range, no records within 5 km

Species	Cons. status	Likelihood of occurrence
Tecticornia globulifera	P1	Unlikely, lack of suitable habitat and no record within 5 km
Tecticornia medusa	P3	Unlikely, lack of suitable habitat and no record within 5 km
Tecticornia sp. Christmas Creek	P1	Unlikely, lack of suitable habitat and no record within 5 km
Tephrosia rosea var. Port Hedland (A.S. George 1114)	P1	Possible suitable habitat in Study Area but no records within 5 km
Terminalia supranitifolia	P3	Unlikely, lack of suitable habitat in Study Area
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	P2	Possible suitable habitat in Study Area but no records within 5 km
Triodia sp. Robe River	P3	Unlikely, lack of suitable habitat in Study Area
Triumfetta echinata	P3	Unlikely Study Area outside of known range, no records within 5 km

5.2.3 Introduced flora

A total of eight introduced flora species were recorded in the Study Area, including two WoNS and Declared Pests **Prosopis glandulosa x velutina* and **Prosopis pallida* (Table 5-6).

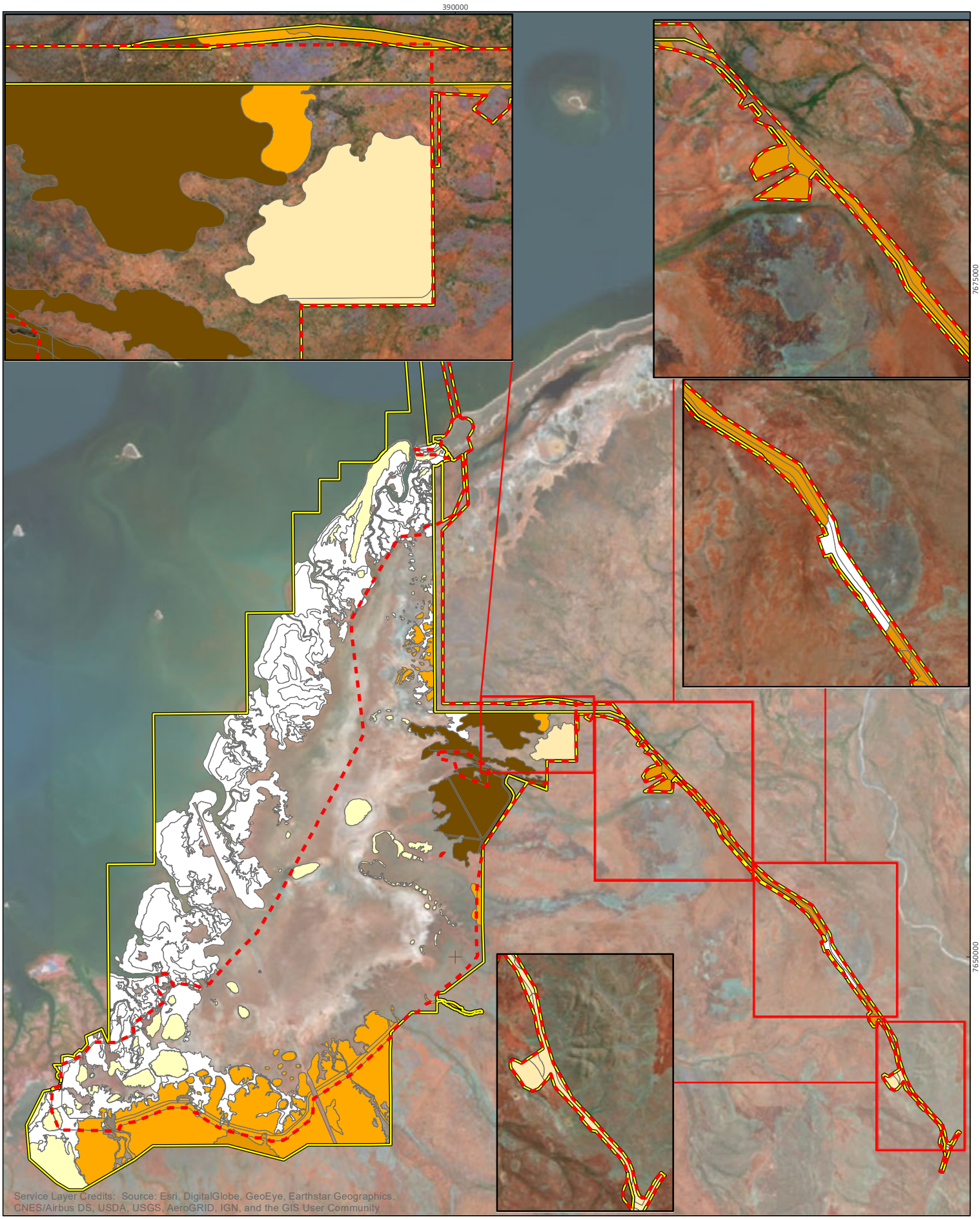
Table 5-6 Introduced flora species recorded during the field survey

Species	Status
**Aerva javanica*	
**Cenchrus ciliaris*	
**Cenchrus setiger*	
**Malvastrum americanum*	
**Phoenix dactylifera*	
**Prosopis glandulosa* x *velutina*	s22(2) (C3 for Mardie and Karratha Stations, C2 elsewhere) and WoNS
**Prosopis pallida*	S12 (C2) and WoNS
**Vachellia farnesiana*	

The Declared Pest **Prosopis* spp. was widespread across the study area (Figure 5-6) ranging from isolated shrubs to tall closed shrublands (Figure 5-7). With the exception of the tidal mudflats and tidal creeks, the species occurred in all habitats within the study area including flat/undulating sandy plains, coastal sand dunes, sandy islands on the tidal mudflats, sandy rises on the tidal mudflats, riparian vegetation of creeks and drainage lines and low lying clay plains. The majority of the plants sighted during the survey were in a sterile condition precluding the capacity to map the distribution of the two species recorded individually.

5.2.4 Unidentified flora

A total of 29 taxa recorded in the Study Area could not be identified to species level, in most instances due to insufficient taxonomic characters as plants were sterile (lacking reproductive structures; Table 5-7). A further five taxa were identified to species level but lacked sufficient taxonomic characters to determine the sub-species or variety (Appendix 4).



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Biological surveys for the Mardie Project

Project No	1189-1279
Date	05-Feb-20
Drawn by	AJ
Map author	GW

0 3.5 7
Kilometres

1:180,000 (at A4) GDA 1994 MGA Zone 50

Development Envelope
Study Area

% cover of *Prosopis* spp.

- 25-90%
- 10-35%
- <0.1-25%
- <0.1-15%
- <0.1-5%
- <0.1-2%
- <0.1-1%
- <0.1%

Figure 5–6

Location of *Prosopis* spp. (Mesquite) infestations in the Study Area

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Figure 5-7 ***Prosopis* spp. within the Study Area – (top) tall closed shrubland on flat plain, (bottom) isolated tall shrubs on coastal dune**

Table 5-7 Unidentified flora taxa recorded during the field survey

Unidentified taxon	Comments
Abutilon ?*fraseri*	sterile
Abutilon sp.	sterile
Aristida ?*holathera*	sterile
Atriplex ?*bunburyana*	sterile
Atriplex ?*codonocarpa*	sterile
Eragrostis sp.	sterile
Eriachne ?*helmsii*	incomplete inflorescence
Eucalyptus sp.	sterile seedling
Frankenia ?*ambita*	sterile
Frankenia ?*pauciflora*	sterile
Gomphrena ?*canescens*	old dry inflroescence
Goodenia ?*armitiana*	old dry fruit
Ipomoea sp.	sterile
Pterocaulon ?*sphacelatum*	dry dessicated specimen
Sida ?*arenicola*	sterile
Sida ?sp. Pilbara	sterile
Solanum ?*horridum*	sterile
Streptoglossa ?*adscendens*	sterile
Streptoglossa ?*bubakii*	sterile
Streptoglossa ?*odora*	sterile
Swainsona sp.	small seedling
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	sterile
Tecticornia sp. in early flower	insufficient taxonomic characters
Tecticornia sp. sterile 1	sterile
Tecticornia sp. sterile 2	
Tecticornia sp. sterile 3	
Tecticornia sp. sterile 4	sterile
Tecticornia sp. sterile 6	sterile
Whiteochloa ?*airoides*	sterile

5.2.5 Vegetation types

In total, 14 vegetation types were defined for the Study Area (Figure 5-8; Table 5-8) and include:

- one low open *Tecticornia* spp. shrublands complex on tidal mudflats and sandy rises on tidal mudflats
- a mangrove community on tidal mudflats and tidal creeks

- four spinifex (*Triodia* spp.) grasslands
- a *Spinifex longifolia* grassland
- a *Melaleuca argentea* and *Sesbania formosa* woodland
- a shrubland over *Triodia* spp. grassland
- two low open *Eucalyptus* and/or *Corymbia* spp. woodland over *Acacia* spp. shrubland over *Triodia* spp. hummock grassland
- a low mixed grassland, *Eragrostis* spp.
- a **Prosopis* spp. tall shrubland, and
- a low shrubland over *Sporobolus virginicus* grassland.

The vegetation types delineated by the statistical analysis are illustrated in dendrogram (Figure 5-9; Figure 5-10). Vegetation type AcAjTe (Soak) occurs in the extrapolated area and is yet to be described from a field survey. Based on the aerial photography used for the extrapolation, this area of vegetation looks completely different to any of the vegetation defined from field surveys.

The analysis of the 50 m x 50 m quadrats clearly delineated some of the vegetation types defined but sites from some vegetation types were interspersed within the dendrogram. This has occurred largely as a result of the similarity of the suite of species across a large number of sites, including the infestations of the weed species, **Prosopis* spp. and **Cenchrus ciliaris*. Sites that were not grouped within the dendrogram were allocated to a vegetation type where the vegetation was dominated by a particular species. For example, sites allocated to PgvExCt occurred in different groups within the dendrogram but were allocated to this vegetation type as the vegetation comprised predominantly an *Eragrostis xerophila* grassland. Similarly, one site MSP202 was allocated to the ChAbTw vegetation type despite not grouping with the other sites as the vegetation was dominated by *Triodia wiseana* hummock grassland.

The analysis of the 3 m x 3 m quadrats from the transect surveys of samphire shrublands on mudflats clearly defined different vegetation types with one exception, site MSP222Q4. This quadrat occurred within the *Triodia epactia* grassland on a sand island that bordered with a *Tecticornia* spp. shrubland on a mudflat. Despite being dominated by the *Triodia* spp. the site has aligned with the *Tecticornia* spp. shrubland as some species were common to both. The site was subsequently grouped with other quadrats that were dominated by the *Triodia* spp. grassland.

The *Tecticornia* spp. shrublands were mapped as a single complex (Tspp; Figure 5-8) as it was not possible to discern community type boundaries accurately from aerial imagery. Vegetation type codes are provided at the survey site location to indicate the spread of the different vegetation types defined.

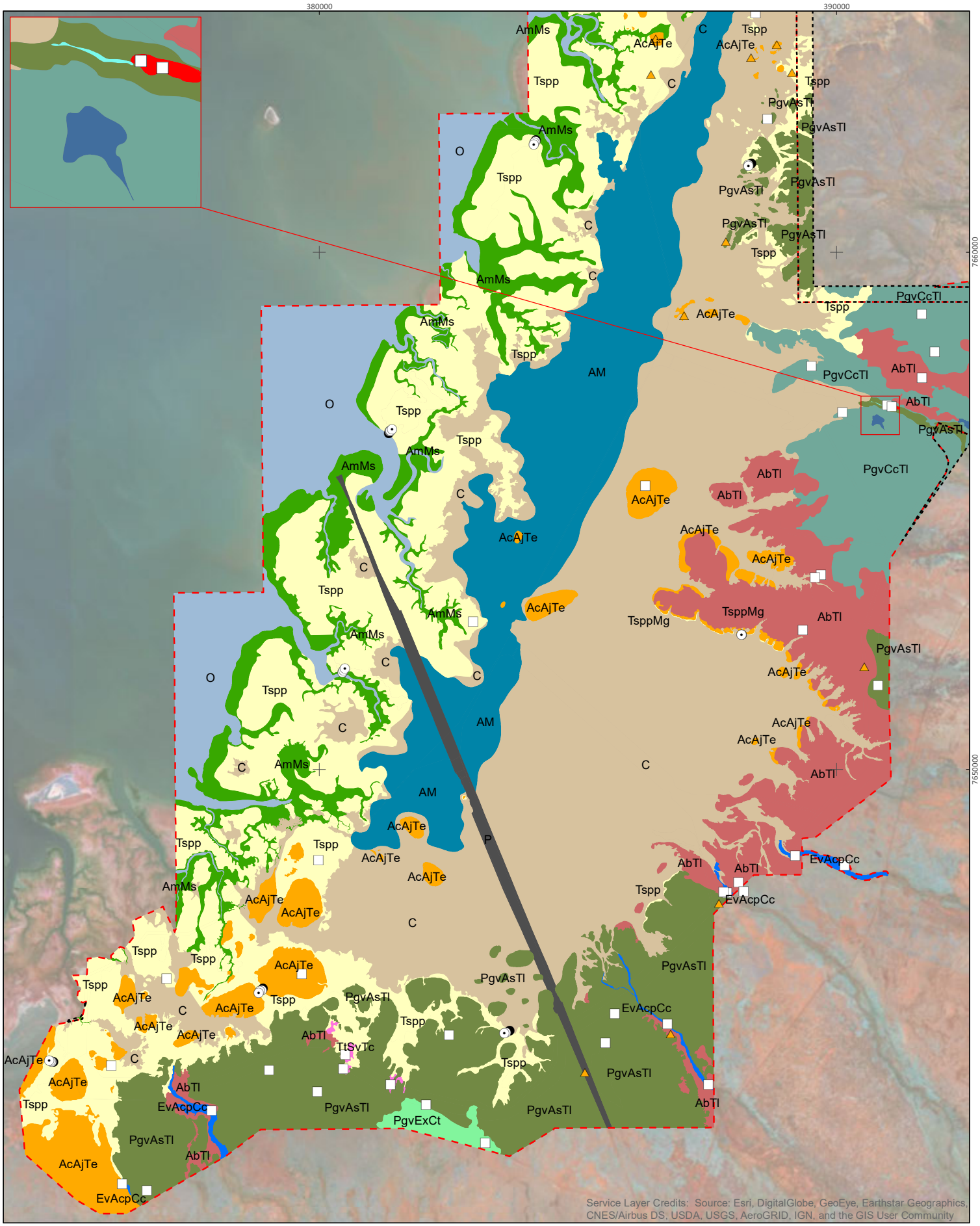
A large proportion of the Study Area (13,438.6ha, 46.3%) was devoid of the flora and vegetation that were the subject of the current survey. These areas comprised coastal beaches, tidal mudflats, tidal creeks, ocean and algal mat that were naturally devoid of vegetation (45.5%) and completely degraded/cleared areas including a gas pipeline corridor, pastoral tracks and infrastructure areas of Mardie station (0.8%) (Table 5-9).

Vegetation covered 15,581 .8ha of the Study Area. *Tecticornia* spp. shrublands were the most widespread accounting for 33.5% of vegetation, followed by PgvAsTl (20.3%, a mid isolated **Prosopis glandulosa* x *velutina* over isolated low shrubland over *Triodia* spp. grassland). A vegetation type dominated by a large infestation of the Declared Pest, **Prosopis glandulosa* x *velutina* (PgvCcTl) occupied 8.2% of the vegetation in the Study Area.

Seven vegetation types, AcAjTe(Soak), AjSlTe, AtAjTe, ChAbTw, EvAcpCc, MaPgvTd and TtSvTc combined comprised just 1.3% of the Study Area. Vegetation type PgvExCt considered representative of the Horseflat land system Priority 3 PEC (see section 5.1.4) covered 1.7% of the study area.

Other than the mangroves which occurred on the tidal mudflats and tidal creeks, three vegetation types are considered riparian vegetation as they are associated with either creeks or waterholes:

- MaPgvTd, associated with Mardie Pool, *Melaleuca argentea* and *Sesbania formosa* are recognised groundwater dependent species.
- EvAcpCc, riparian vegetation on creeklines, *Eucalyptus victrix* may be considered groundwater dependent but does also occur outside of riparian areas.
- AcAjTe(Soak), in the extrapolated area, appears to contain distinct and likely riparian vegetation type.



PANNAWONICA

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Biological surveys for the Mardie ject

Project No	1189-1279
Date	6/02/2020
Drawn by	AJ
Map author	GW

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Kilometres

1:95,000 (at A4) GDA 1994 MGA Zone 50

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- Quadrat
- Relevé
- Transcent
- Transect quadrat

Study Area
- Detailed survey
- Extrapolated area

Vegetation type
- AM

AbTl	AcAjTe	AcAjTe (Soak)
AjSlTe	AmMs	AtAjTe
Beach/dune	C	ChAbTw
Cleared	EvAcpCc	FW
MaPgvTd	O	P
PgvAsTl	PgvCcTl	PgvExCt
Tspp	TtSvTc	

Figure 5–8a

Vegetation types in the study area (south west)

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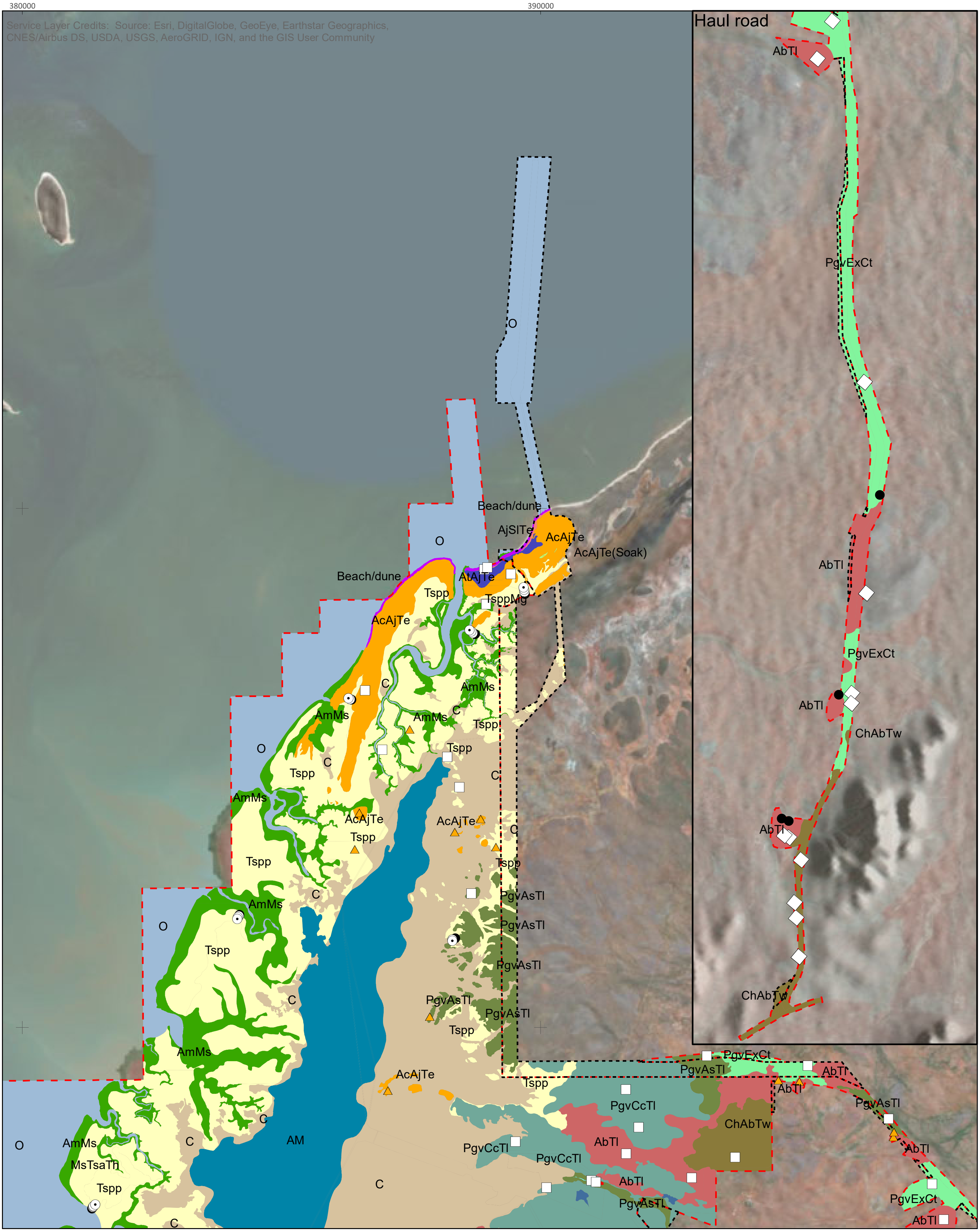

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Biological surveys for the Mardie Project	
Project No	1189-1279
Date	6/02/2020
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PANNAWONICA

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- Quadrat
- Relevé
- Transect
- Transect quadrat

Study Area

- Detailed survey
- Extrapolated area

Vegetation type

- AM
- AbTl
- AcAjTe
- AcAjTe(Soak)
- AjSlTe
- AmMs
- AtAjTe
- Beach/dune
- C
- ChAbTw
- Cleared
- EvAcpCc
- FW
- MaPgvTd
- O
- P
- PgvAsTl
- PgvCcTl
- PgvExCt
- Tspp
- TtSvTc

Figure 5–8b

Vegetation types in the study area (north and haul road)

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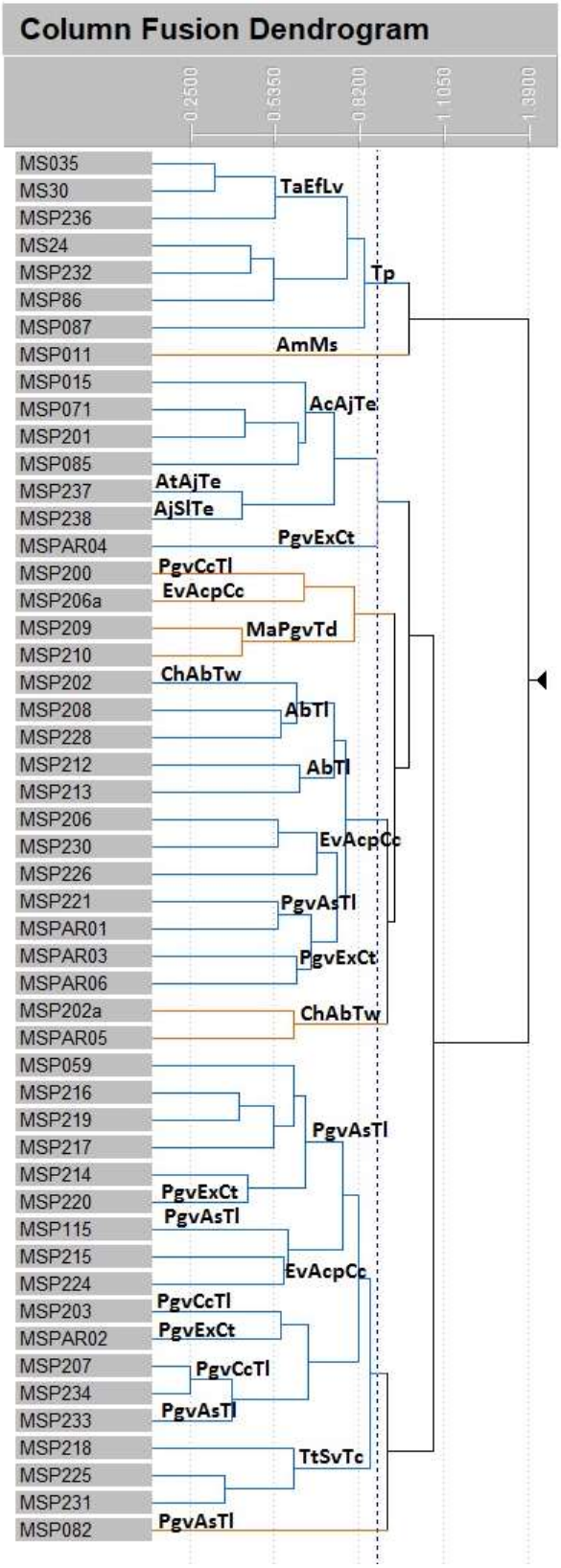


Figure 5-9 Vegetation types delineated from the dendrogram generated from the 50 m x 50 m quadrats

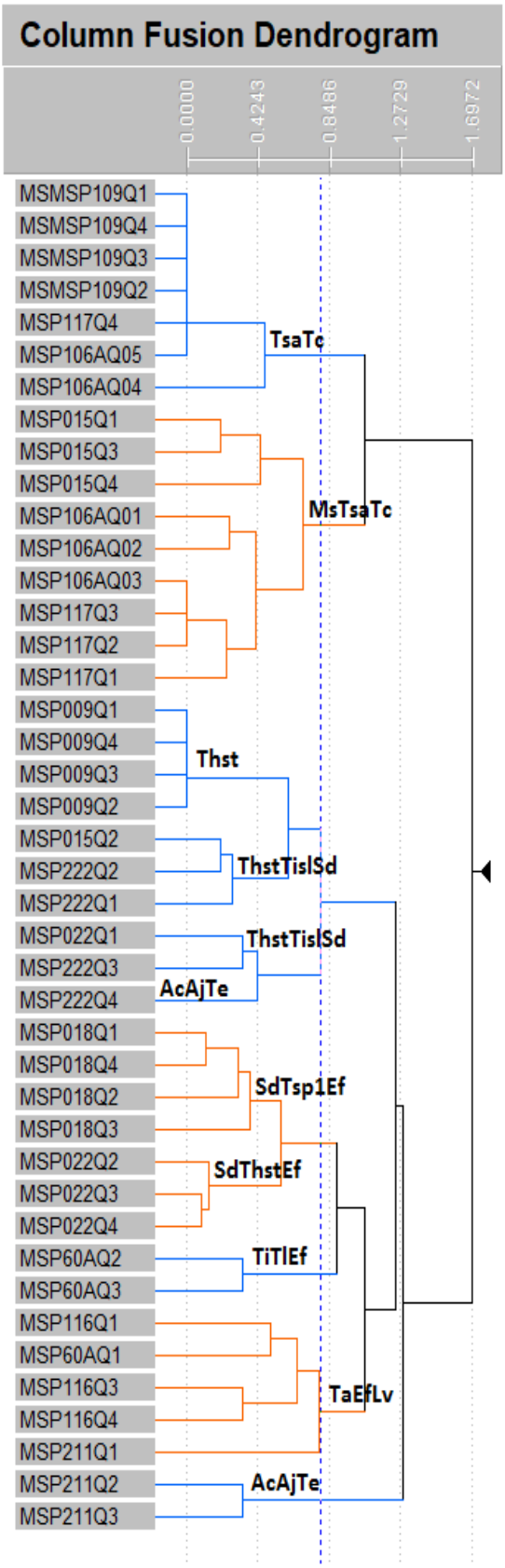


Figure 5-10 **Vegetation types delineated from the dendrogram generated from the 3 m x 3 m quadrats along transects**

Table 5-8 Vegetation types recorded in the Study Area

Vegetation type	Survey sites (quadrats, releves and vegetation descriptions)	Vegetation description	Photograph
AbTl	MS208, MS212, MS213, MSE007, MSE008, MSE009, MSE010, MSE011, MSE013, MSE014, MSE015, MSE016, MSE018a, MSE019, MSE021, MSE022, MSE023, MSE025, MSE029, MSP21a, MSP228, MSP230a, MSvd02	Mid to tall mixed *Acacia* shrubland, frequently *A. biveonsa* and infestations of **Prosopis glandulosa* x *velutina* over *Triodia* hummock grassland, *T. longiceps* with infestations of **Cenchrus ciliaris*	
AcAjTe	MS015, MS018Q1, MS054, MS071, MS085, MS201, MS211Q2, MS211Q3, MS222Q4, MS49, MSIS001, MSIS002, MSIS003, MSIS004, MSIS005, MSP45, MSP67	Isolated tall shrubs to open shrubland, frequently *Acacia coriacea*, **Prosopis glandulosa* x *velutina* and *Myoporum montanum* over isolated low shrubs to open shrubland of **Aerva javanica* over low closed *Triodia epactia* hummock grassland on sand dunes and sandy plains.	
AcAjTe(Soak)	Extrapolation – unconfirmed new vegetation type	Soak surrounded by Isolated tall shrubs to open shrubland, frequently *Acacia coriacea*, **Prosopis glandulosa* x *velutina* and *Myoporum montanum* over isolated low shrubs to	

Vegetation type	Survey sites (quadrats, releves and vegetation descriptions)	Vegetation description	Photograph
		open shrubland of **Aerva javanica* over low closed *Triodia epactia* hummock grassland on sand dunes and sandy plains.	
AjSlTe	MSP238	Isolated low **Aerva javanica*, *Atriplex bunburyana* and *Rhagodia preissii* subsp. *obovata* shrubs over tall *Spinifex longifolius* grassland over low *Triodia epactia*, **Cenchrus ciliaris* and *Whiteochloa airoides* grassland on beach foredune.	
AmMs[1]	MS011	Mid open *Avicennia marina* and *Rhizophora stylosa* shrubland over low closed *Muellerolimon salicorniaceum* shrubland surrounding tidal creek.	

Vegetation type	Survey sites (quadrats, releves and vegetation descriptions)	Vegetation description	Photograph
AtAjTe	MSP237	Isolated mid *Adriana tomentosa* var. *tomentosa*, *Trichodesma zeylanicum* var. *zeylanicum* and *Rhagodia preissii* subsp. *obovata* shrubs over isolated low **Aerva javanica*, *Corchorus walcottii* and *Indigofera linifolia* shrubs over mid closed *Triodia epactia* and *Whiteochloa airoides* hummock grassland on coastal sand dune.	
ChAbTw	MS202, MSE004, MSE005, MSE006, MSP202a	Isolated low *Corymbia hamersleyana* and *C. candida* trees over mid to tall shrubs to open shrubland of *Acacia* spp., frequently *A. ancistrocarpa*, *A. bivenosa* and *A .pyrifolia* var. *pyrifolia* over low to mid *Triodia wiseana* hummock grassland on flat and undulating plains.	

Vegetation type	Survey sites (quadrats, releves and vegetation descriptions)	Vegetation description	Photograph
EvAcpCc	MS206, MS215, MSE027, MSP206a, MSP224, MSP226, MSP230	Isolated low trees to low *open Eucalyptus victrix* woodland occasionally with *Corymbia candida* trees over mid to tall open shrubland with *Acacia* spp., frequently *Acacia coriacea* subsp. *pendens* and *A. pyrifolia* var. *pyrifolia*, *Ehretia saligna* and occasionally *Melaleuca lasiandra* over sparse low to open low **Cenchrus ciliaris*, *Triodia epactia* and *T. longiceps* grassland riparian vegetation of creeks.	
MaPgvTd	MS209, MS210	Mid *Melaleuca argentea*, **Phoenix dactylifera* and *Sesbania formosa* woodland over tall open **Prosopis glandulosa* x *velutina* woodland over isolated tall *Typha domingensis*, *Schoenoplectus subulatus* and *Cyperus vaginatus* sedges in creeks	

Vegetation type	Survey sites (quadrats, releves and vegetation descriptions)	Vegetation description	Photograph
PgvAsTl	MS059, MS082, MS115, MS214, MS216, MS217, MS219, MS221, MSar1, MSar3, MSE020, MSE024, MSE028, MSP233, MSP235	Isolated mid **Prosopis glandulosa* x *velutina* over isolated low shrubs frequently *Acacia synchronicia* and *Trianthema turgidifolia* over low to mid *Triodia longiceps* and *T. epactia* hummock grassland on plains.	
PgvCcTl	MS200, MS203, MS207, MSP234	Tall **Prosopis glandulosa* x *velutina* shrubland over mid **Cenchrus ciliaris, Triodia longiceps* and/or *T. angusta* hummock grassland.	

Vegetation type	Survey sites (quadrats, releves and vegetation descriptions)	Vegetation description	Photograph
PgvExCt	MS220, MSar2, MSar4, MSar6, MSE012, MSE017, MSE018b	Isolated mid shrubs, **Prosopis glandulosa* x *velutina*, *Acacia xiphophylla* and *A. inaequilatera* over low *Eragrostis xerophila* tussock grassland with occasional **Cenchrus ciliaris* and *Triodia* spp. grasses over isolated low *Corchorus tridens* and Asteraceae forbs on flat plain.	
Tspp	106AQ04, 106AQ05, 117Q4, MS009Q1, MS009Q2, MS009Q3, MS009Q4, MS015Q2, MS018Q2, MS018Q3, MS018Q4, MS025, MS035, MS057, MS109Q1, MS109Q2, MS109Q3, MS109Q4, MS116Q1, MS116Q3, MS116Q4, MS211, MS222Q1, MS222Q2, MS222Q3, MS22Q1, MS22Q2, MS22Q3, MS22Q4, MS24, MS30, MS50, MS60aQ1, MS60aQ3, 106AQ01, 106AQ02, 106AQ03, 117Q1, 117Q2, 117Q3, MS015Q1, MS015Q3, MS015Q4 MS86, MS87, MSP232, MSP236	Low mixed *Tecticornia* species sparse samphire shrubland to samphire shrubland on mudflats and low sandy rises	

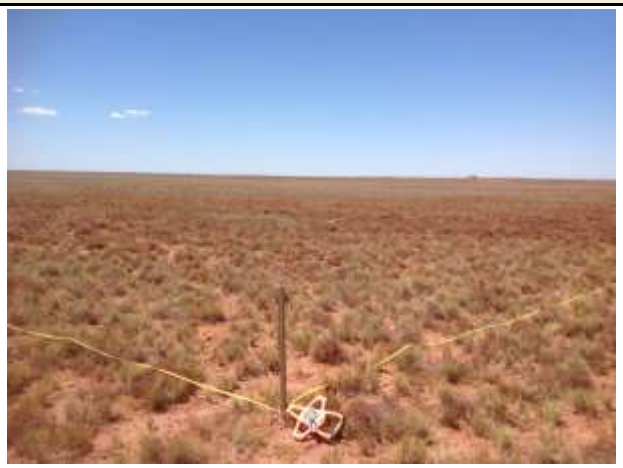
Vegetation type	Survey sites (quadrats, releves and vegetation descriptions)	Vegetation description	Photograph
TtSvTc	MS218, MSP225, MSP231	Low *Trianthema turgidifolium*, *Neobassia astrocarpa* and *Pluchea rubelliflora* shrubland over low *Sporobolus virginicus* grassland over isolated low *Trianthema cussackianum* forbs on low lying plains.	

Table 5-9 Extent of each vegetation type/feature

Vegetation type/feature	Extent in Study Area (ha)	% of Study Area	% of native vegetation extent in Study Area	Within DE (ha)	Within DE (%)
AbTl	2,100.7	7.2	13.5	1,912.4	11.9
AcAjTe	1,277.2	4.4	8.2	717.8	4.5
AcAjTe (Soak)	0.6	<0.1	<0.1	0.6	<0.1
AjSlTe	6.5	<0.1	<0.1	4.5	<0.1
AmMs	1,673.1	5.8	10.7	26.3	0.2
AtAjTe	25.1	0.1	0.2	13.1	0.1
ChAbTw	260.9	0.9	1.7	259.1	1.6
EvAcpCc	71.9	0.2	0.5	15.9	0.1
MaPgvTd	1.6	<0.1	<0.1	<0.1	<0.1
PgvAsTl	3,159.9	10.9	20.3	1,614.4	10.1
PgvCcTl	1,282.6	4.4	8.2	1,201.2	7.5
PgvExCt	483.0	1.7	3.1	373.2	2.3
Tspp	5,225.1	18.0	33.5	1,371.4	8.6
TtSvTc	13.7	<0.1	<0.1	12.5	0.1
AM (Algal mat)	2,559.5	8.8	-	929.3	5.8
O (Ocean or tidal creek)	2,780.7	9.6	-	356.2	2.2
FW (Permanent fresh water pool)	0.4	<0.1	-	-	-
Beach/dune	10.6	<0.1	-	1.6	<0.1
C (Mudflat or saltflat area)	7,845.8	27.0	-	7,085.3	44.2
P (Cleared for gas pipeline)	234.6	0.8	-	125.5	0.8
Cleared	7.0	<0.1	-	2.7	<0.1
Grand Total	**29,020.4**	**100.0**	**100.0**	**16,023.1**	**100.0**

5.2.6 Vegetation condition

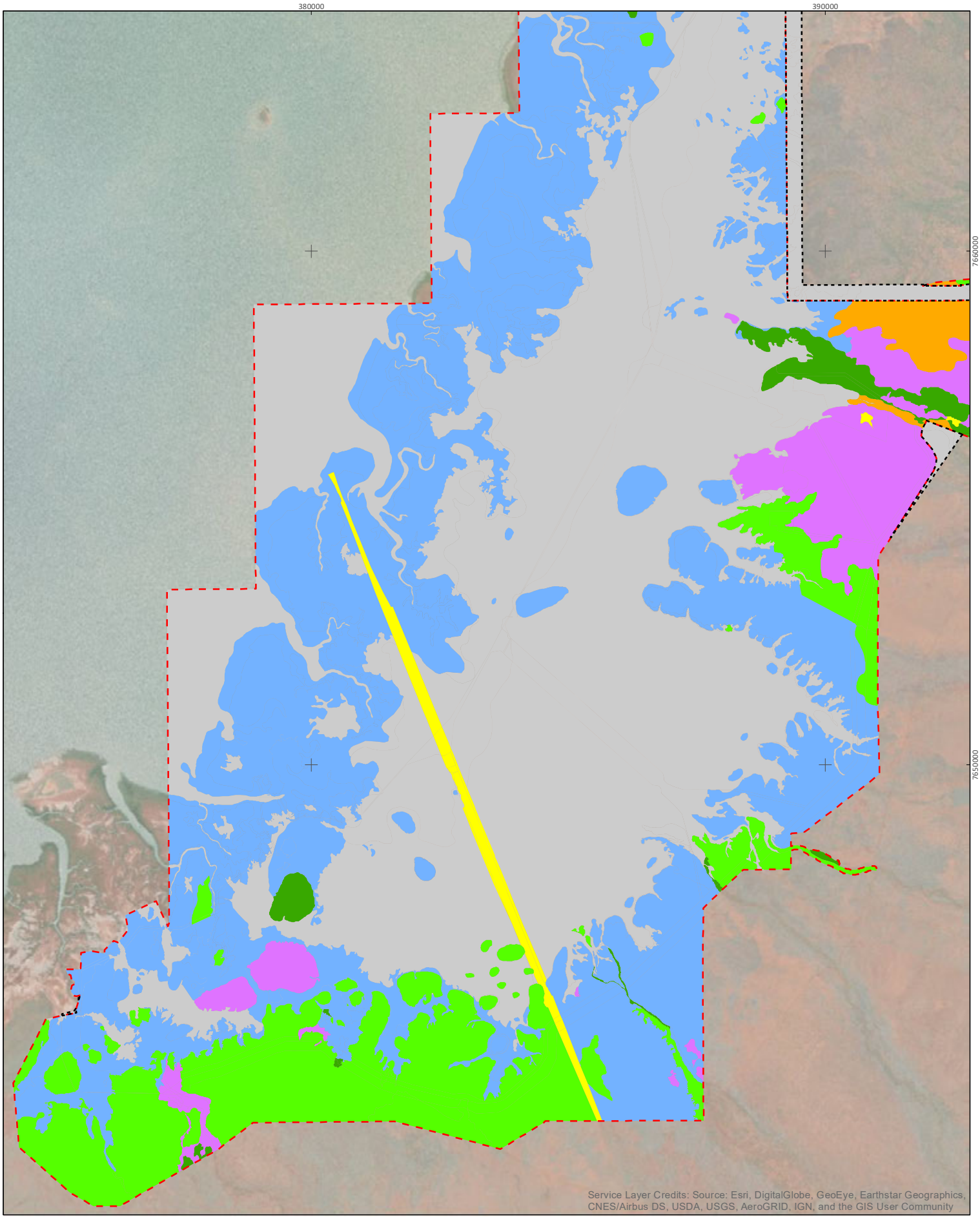
The condition of remnant vegetation in the Study Area ranged from Degraded to Excellent (Table 5-10, Figure 5-11). Areas naturally devoid of vegetation in the Study Area and vegetation mapped in the extrapolated area were assigned Not Applicable (N/A) condition rating (47.6%).

The majority of remnant vegetation in the detailed survey portion of Study Area (80.6%) was recorded to be in Very Good to Excellent condition, largely as a result of the *Tecticornia* spp. shrublands and mangroves on the tidal mudflats being subject to little or no disturbance. The remaining 19.4% of remnant vegetation in the detailed survey portion of the Study area was in Degraded to Good condition with disturbance primarily in the form of weed infestations, particularly **Prosopis* spp. and **Cenchrus ciliaris*, but also grazing damage from livestock and vehicle tracks.

A small proportion of the Study Area (0.8%) comprising cleared areas was rated as Completely Degraded.

Table 5-10 Extent of vegetation condition in the Study Area

Condition rating	Extent in Study Area (ha)	% of Study Area	% of remnant vegetation in Study Area
Excellent	9,198.3	31.7	61.5
Very Good	2,856.0	9.8	19.1
Good	925.4	3.2	6.2
Poor	1,693.2	5.8	11.3
Degraded	289.0	1.0	1.9
Completely Degraded (cleared)	241.6	0.8	-
N/A	13,817.0	47.6	-
Total	**29,020.4**	**100.0**	**100.0**



PANNAWONICA

BCI Minerals Ltd

Biological surveys for the Mardie Salt Project

Project No	1189-1279
Date	10-Mar-20
Drawn by	AJ
Map author	GW

0 2 4

Kilometres

1:95,000 (at A4) GDA 1994 MGA Zone 50

Study Area

- Detailed survey
- Extrapolated area

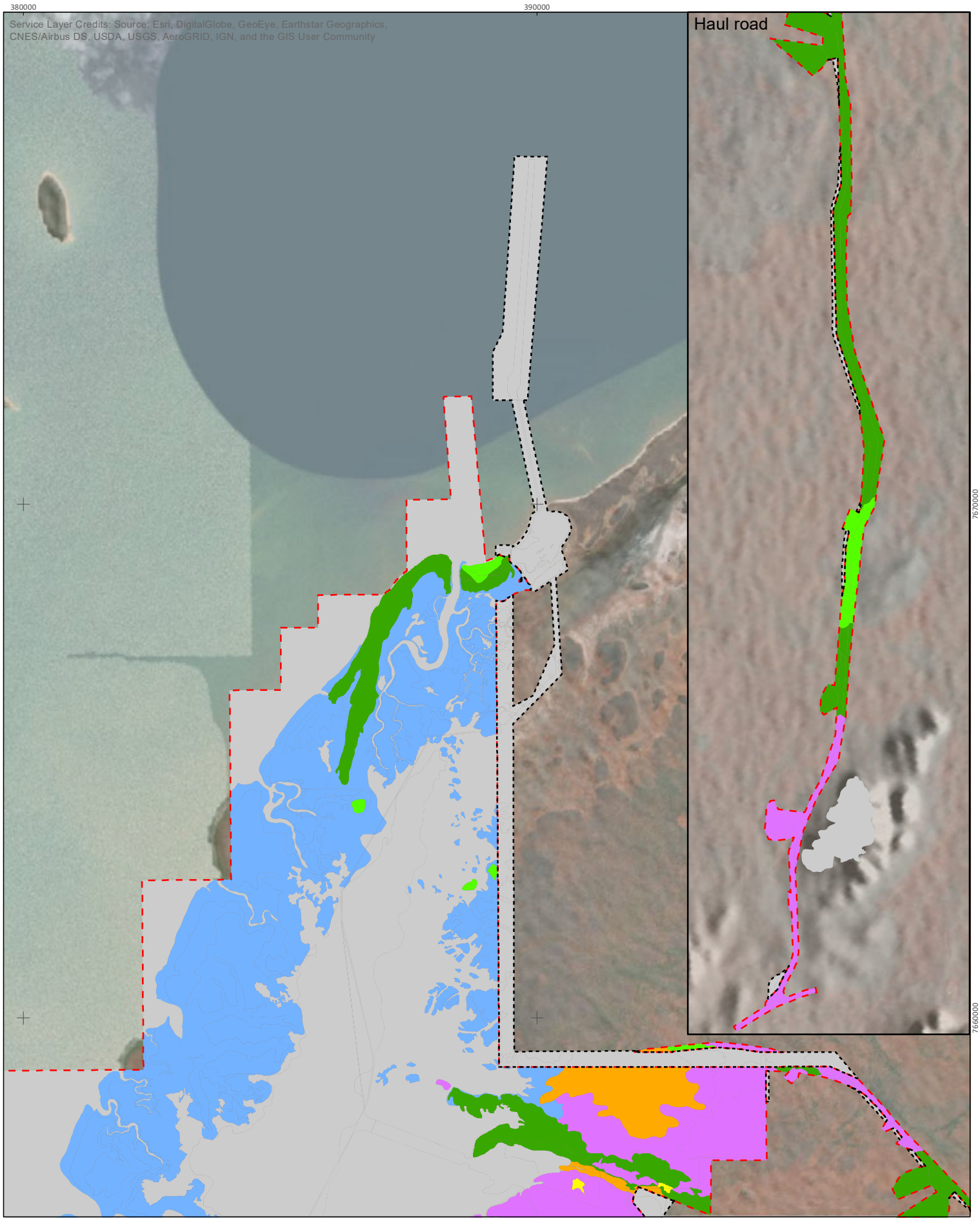
Vegetation condition

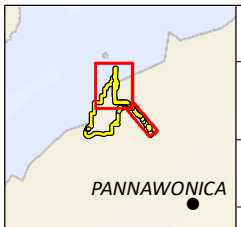
- Pristine
- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- N/A

Figure 5–11a

Vegetation condition in the study area (south west)

PHOENIX ENVIRONMENTAL SCIENCES





BCI Minerals Ltd
Biological surveys for the Mardie Salt Project

Project No	1189-1279
Date	10-Mar-20
Drawn by	AJ
Map author	GW

0 2 4
Kilometres

1:95,000 (at A4) GDA 1994 MGA Zone 50

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Study Area
- Detailed survey
- Extrapolated area

Vegetation condition
- Pristine
- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- N/A

Figure 5–11b

Vegetation condition in the study area (north and haul road)

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5.2.7 Threatened and Priority Ecological Communities

One vegetation type recorded for the Study Area, PgvExCt, was considered to be representative of the Priority 3 PEC, Horseflat Land System of the Roebourne Plains. The Low mixed *Eragrostis* spp. grassland that dominated this vegetation type resembles the description of the PEC and the occurrence of the vegetation type in the Study Area, for the most part, occurred on areas mapped as the Horseflat Land System (Figure 5-12). A total of 483 ha was mapped as the PEC.

Vegetation type AtAjTe which occurred on the landward side of a coastal dune (Figure 5-8) bore some resemblance to the Priority 3 PEC, Coastal dune native tussock grassland dominated by *Whiteochloa airoides,* due to the prominence of this grass species. However, the dominant grass species in this area was *Triodia epactia* and subsequently this vegetation type was not considered to be representative of the PEC.

5.2.8 Local and regional significance of vegetation

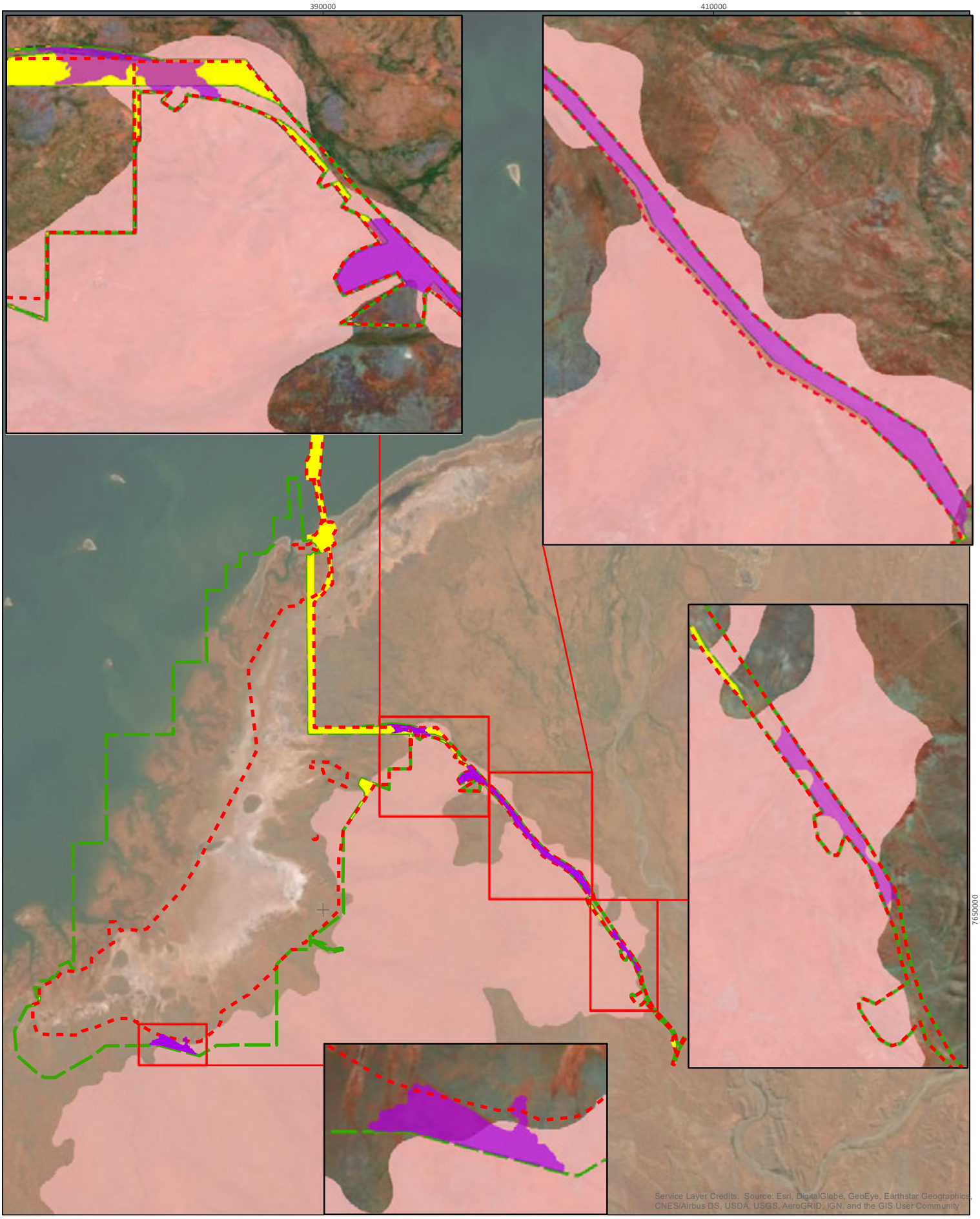
Vegetation type AcAjTe was habitat for the Commonwealth listed Vulnerable (State listed P1) species *Minuria tridens* and is considered significant vegetation as a refuge for significant plant taxa.

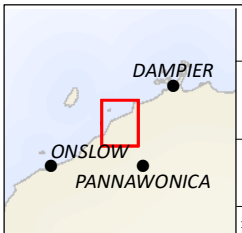
Vegetation type EvAcpCc was habitat for the P4 species *Goodenia nuda* and covered a small area (less than 1% of vegetation) in the Study Area and is subsequently considered significant vegetation due to restricted distribution and role as a refuge for significant plant taxa.

Vegetation type MaPgvTd occupied a very small area, was dominated by two species (*Melaleuca argentea* and *Sesbania formosa*) not recorded elsewhere in the Study Area, was at threat from weed invasion and impacts from grazing and represented habitat for the significant flora *Cassytha aurea* var. *aurea*. This vegetation type is considered significant vegetation due to restricted distribution and role as a refuge for riparian plant taxa not recorded elsewhere in the Study Area. Similarly, vegetation types AjSlTe, AtAjTe and TtSvTc occupied small areas and contained plant species not recorded elsewhere in the Study Area and are thereby considered significant as a result of restricted distribution and role as refuge for plant taxa not recorded elsewhere in the Study Area.

Vegetation type AcAjTe(Soak) requires confirmation and description from field surveys. Should this be confirmed as a unique vegetation type it would be considered locally significant due to restricted distribution.

The low open *Tecticornia* spp. chenopod shrublands over low open mixed grasslands as well as the low shrubland over *Sporobolus virginicus* grassland (TtSvTc) were habitat for one *Tecticornia* taxon considered representative of an undescribed species and/or the further four *Tecticornia* taxa that could not be described to species level and may potentially represent undescribed species. These shrublands are therefore considered significant as they represent habitat for potentially undescribed species.





BCI Minerals Ltd

Biological surveys for the Mardie Project

Project No	1189-1279
Date	05-Feb-20
Drawn by	AJ
Map author	GW

0 5 10

Kilometres

1:250,000 (at A4) GDA 1994 MGA Zone 50

Development Envelope

Study Area

Detailed survey

Extrapolated area

Horseflat Land System

PgvExCt, Low mixed *Eragrostis* spp. grassland, Horseflats PEC 3

Figure 5–12

Extent of vegetation type PgvExCt, representing Horseflat Land System of the Roebourne Plains PEC

PHOENIX ENVIRONMENTAL SCIENCES

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5.3 SURVEY LIMITATIONS

The limitations of the survey have been considered (Table 5-11) in accordance with EPA technical guidance (EPA 2016b).

Table 5-11 Survey limitations

Limitations	Limitation for this survey?	Comments
Availability of adequate contextual information at a regional and local scale	Yes	There was a limited number of reports available for review and several of those used occurred at some distance from the current Study Area. In addition, there is limited information pertaining to the P3 PEC, Horseflat land system of the Roebourne Plains, to facilitate rigorous statistical determination of whether vegetation types encountered are representative of this community.
Competency/experience of survey personnel, including taxonomy	No	The lead botanists for the survey Dr Grant Wells and Dr Grace Wells have conducted numerous surveys in the Pilbara bioregion over the last 14 years. Frank Obbens who undertook a large proportion of the taxonomy has over 20 years' experience. In addition, assistance from taxonomic specialists from the WA Herbarium, Dr Kelly Shepherd and Michael Hislop, was obtained where required. Dr Shepherd identified all *Tecticornia* specimens and Mike Hislop identified the Priority flora.
Proportion of flora recorded and/or collected, any identification issues	Yes	Several of the specimens collected could not be identified definitively to species level as a result of being sterile, possibly the result of below average rainfall in the first phase survey period.
Was the appropriate area fully surveyed (effort and extent)	Yes	The use of the helicopter did allow targeted searches for different vegetation types and subsequently it is considered that all broad floristic types were sampled. However, the Study Area was very large and subsequently searches for significant flora were not conducted over all suitable habitat. A small addition to the Study Area (1,110 ha) was made following completion of the surveys; vegetation mapping within this area was extrapolated from adjacent mapped polygons. Targeted searches have not been conducted in these areas.
Access restrictions	No	The use of a helicopter ensured all areas in the study area were accessible.
Timing, rainfall, season	Yes	Despite timing the detailed survey events to be undertaken six weeks following rainfall, below average falls resulted in notably dry conditions over a large proportion of the Study Area.
Disturbances which affected the results of the survey	No	The majority of the vegetation in the Study Area was in Very Good to Excellent condition and very little of the Study Area was recently burnt.

6 DISCUSSION

6.1 FLORA

The number of species recorded in the current survey was lower than for surveys conducted for Cape Preston approximately 20 km to the north west of the Study Area (Biota & Trudgen & Associates 2001; GHD 2013) (Table 6-1). The lower number of species (per unit area surveyed) likely reflects the large portion of the Study Area being naturally devoid of vegetation (e.g. tidal mudflats). The number of species recorded (per unit area surveyed) in the current survey in vegetated areas is equivalent to the number recorded in the Biota and Trudgen & Associates (2001) survey. Similarly, the number of vegetation types defined is also lower likely reflecting the large area that was naturally devoid of vegetation in the current Study Area.

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

Survey	Area (ha)	No. vegetation types	No. of identified species	No. of families	No. of genera	No. of weeds
(Maunsell AECOM 2008b)	-	17	500	64	196	18
AECOM (2009)	-	40	221	43	114	12
GHD (2013)	4502	9	120	28		4
Biota and Trudgen & Associates (2001)	20,880.6	64	426	64	190	12
This study	28,136.8	21	238	41	115	8

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 6-2 Dominant plant families recorded in the current survey and previous surveys

Family	Current survey	(Maunsell AECOM 2008b)	AECOM (2009)	GHD (2013)	Biota and Trudgen & Associates (2001)
Poaceae	28	77	36	19	65
Fabaceae	48	86	44	19	71
Malvaceae	14	64	18	10	53
Amaranthaceae	18	32	20	13	26
Chenopodiaceae	28	33	19	16	26
Asteraceae	10	16	11	3	16
Total number of species	238	500	221	120	476
% dominant families	61.3	61.6	67.0	75.0	54.0

6.2 SIGNIFICANT FLORA

Of the 34 significant flora identified from the desktop review as potentially occurring in the study area, only one species, *Goodenia nuda* P4, was recorded during the field survey. Notably, following identification of the habitats in the Study Area from the field surveys, assessment of the likelihood of occurrence of the significant flora determined only seven of the 33 species possibly being present and one species, *Owenia acidula,* likely to be present.

The population of *Goodenia nuda* recorded in the Study Area occurred within the DE and represents a small proportion (0.8%) of the records for the species (DBCA 2019a). The two plants recorded in the Study Area also represent a small proportion of the recorded number of plants for the species with populations of up to 200 plants previously recorded.

The *Minuria tridens* record in the Study Area represents only the second record for this species in WA with a further 20 populations restricted to the arid southern region of the NT (Nano & Pavey 2008). The species was recorded to be 'common' at the previous record in WA (DBCA 2019a) but subsequent attempts to relocate the population have been unsuccessful and its status is unknown (Nano & Pavey 2008). A solitary plant of confirmed identity was recorded in the Study Area with a further four plants considered to be the species recorded during subsequent targeted searches. All plants were located on a coastal sand dune in *Triodia epactia* and *Cenchrus ciliaris* grassland outside the DE. In the NT, *M. tridens* potentially has a negative association with hummock grasses and the national recovery plan for the species (Nano & Pavey 2008) suggests that habitat that remains free of *C. ciliaris* may be critical for the long term survival of *M. tridens*. It is not known if this association is applicable to WA populations.

The Study Area represented a range extension for *Cassytha aurea* var. *aurea*. The species was recorded in degraded riparian woodland; the DE has been modified to exclude the the habitat for this species.

A potentially new species, *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate, was recorded at six survey locations in the Study Area; two within the DE, and four outside of the DE. *Tecticornia* sp. sterile 1 and *Tecticornia* sp. sterile 6 were both recorded at two survey locations, one outside and one within the DE. The solitary location for *Tecticornia* sp. in early flower occurred outside of the DE. The DE has also been shifted to avoid the solitary record for *Tecticornia* sp. sterile 4.

The two *Abutilon* specimens not identified to species level were not considered representative of the P1 *Abutilon* sp. Onslow identified in the desktop assessment, as leaf margins were crenate rather than entire and leaf size was larger than that recorded (DBCA 2019a) for the Priority flora.

The *Aristida* specimen was not considered likely to represent a listed significant flora as no significant *Aristida* species have been recorded for either the Roebourne or Chichester subregions where the Study Area is located.

The *Atriplex* specimens did not resemble specimens of the Priority flora *Atriplex flabelliformis* identified in the desktop assessment and more closely resembled other *Atriplex* species. In addition, it was considered unlikely that the Priority species would be present in the Study Area as it lies outside of the recorded range of the species (DBCA 2019a).

The *Eucalyptus* specimen is unlikely to represent a significant flora as the two Priority *Eucalyptus* species known from the Pilbara bioregion occur several hundred kilometres from the Study Area.

The *Gomphrena* specimen was compared at the WA Herbarium to specimens of *Gomphrena pusilla* identified in the desktop assessment. The old dried flowers of the collected specimen were not commensurate with the inflorescence of the Priority species.

The *Goodenia* specimen was compared to specimens of *Goodenia pallida* identified in the desktop assessment but the leaves were not commensurate with those of the Priority flora.

The *Ipomoea* specimen was a robust perennial plant and not commensurate with the annual Priority species *Ipomoea racemigera* recorded for the Pilbara bioregion.

The *Pterocaulon* specimens was considered unlikely to represent the Priority 3 species *P. xenicum* recorded for the Pilbara bioregion as the closest record for this species occurs hundreds of kilometres from the Study Area.

There are two Priority flora *Sida* taxon recorded for the Pilbara bioregion both of which inhabit rocky hills and ridges and have distributions located hundreds of kilometres from the Study Area. Subsequently, the *Sida* specimen was considered unlikely to represent either of the Priority species due to the large distance and lack of suitable habitat.

The *Solanum* specimen had stems covered densely with spines which was not commensurate with the near-spineless stems of *Solanum albostellatum* and had a different leaf shape to *Solanum cataphractum* and subsequently was not considered to resemble either of the Priority flora identified in the desktop assessment.

The *Swainsona* seedling was not considered to represent the Priority flora *Swainsona thompsoniana* identified in the desktop assessment as stems were densely hairy rather than glabrous and the flower was a dark purple colour rather than mauve and therefore not commensurate with the Priority flora.

The remaining specimens that could not be identified to species level were all considered unlikely to represent any listed significant flora as no significant flora of the genera are recorded for the Pilbara bioregion (DBCA 2019a).

6.3 DECLARED PEST **PROSOPIS SPP.*

Both of the **Prosopis* species recorded in the Study Area are allocated to the category 2 (C2) - eradication category (organisms which should be eradicated from part or all of Western Australia) at the State wide scale; however, the *P. glandulosa* x *velutina* infestation on Mardie Station has special classification as C3 management category (organisms that should have some form of management applied that will alleviate the harmful impact of the organism, reduce the numbers or distribution of the organism or prevent or contain the spread of the organism). The requirements for land owners/occupiers with respect to C2 and C3 Declared Pests are described in Table 6-3.

Table 6-3 Requirements for C2 and C3 organisms in an area (DPIRD 2020)

Requirement	Recommendations
C2 organisms	
Introduction of the plant or its seeds into, or movement within this area is prohibited.	Mark the location of the pest in such a way that it can be found again.
Report the presence or suspected presence of this pest in this area (08 9368 3083)	C1 and C2 category pests are of high importance to WA and must be reported as a priority.
Supply or advertising supply of this pest into this area is prohibited	
If the Declared Pest is found in this area control measures must be taken to destroy, prevent or eradicate it.	Treat to destroy all plants, prevent seed set and prevent the spread of seed or plant parts within and from the area on or in livestock, fodder, grain, vehicles and/or machinery. Treat prior to seed set each year.
Ensure that any person conducting an activity on the land is aware that measures are required to be taken to control the Declared Pest	Erect a biosecurity sign for persons conducting an activity on the land.

Requirement	Recommendations
C3 organisms	
Introduction of the plant or its seeds into this area is prohibited.	-
Supply or advertising supply of this pest into this area is prohibited.	-
The infested area must be managed in such a way that alleviates the impact, reduces the number or distribution or prevents or contains the spread of the declared pest in this area.	Treat to destroy all plants, prevent seed set and prevent the spread of seed or plant parts within and from the area on or in livestock, fodder, grain, vehicles and/or machinery. Treat prior to seed set each year.
Ensure that any person conducting an activity on the land is aware that measures are required to be taken to control the declared pest.	Erect a biosecurity sign for persons conducting an activity on the land.

Accordingly, **Prosopis* spp. is likely to demand significant management during all phases of the Project. Discussions with the relevant authorities is recommended to ascertain the management expectations/requirements for these species. It should be noted in these discussions that the **Prosopis* infestation at Mardie station has a long history, dating back to the 1930's and is recognised as the largest single core infestation (150,000 ha) in Australia (NHT 2003). The Pilbara Mesquite Management Committee formed in 2000 has acknowledged that eradication of the species at Mardie is unachievable and the priority is to prevent the spread of the pest to neighbouring areas (NHT 2003).

6.4 VEGETATION

The vegetation types defined for the Study Area fit the broad description of vegetation units defined for the Roebourne subregion (Kendrick & Stanley 2001):

- the mangrove and chenopod (*Tecticornia* spp.) shrublands of the tidal mudflats and the low shrubland over *Sporobolus virginicus* grassland are representative of the samphire, *Sporobolus*, and mangal communities on marine alluvial flats and river deltas
- the *Triodia* spp. and *Eragrostis* spp. grasslands are representative of the grass savannah of mixed bunch and hummock grasses on colluvial coastal and sub-coastal plains
- the riparian vegetation of most creeks is representative of the *Eucalyptus victrix* woodlands of ephemeral drainage lines.

A large proportion of the Study Area was naturally devoid of vegetation representing association 127, bare areas and mud flats mapped by Shepherd *et al.* (2002). However, association 601 mapped for a substantial portion of the Study Area by Shepherd *et al.* (2002) was conspicuously absent.

The majority of the vegetation types recorded for the current Study Area align with vegetation types defined for Cape Preston by Biota and Trudgen & Associates (2001) indicating a broader distribution outside of the Study Area:

- The low open chenopod (*Tecticornia* spp.) shrublands (Tspp), and the low shrubland over *Sporobolus virginicus* grassland (TtSvTc) vegetation types align with the Ls1 and Ls2 vegetation types.
- The AmMs vegetation type aligns with the Am2 vegetation.
- The AjSlTe vegetation type aligns with Ld1 and occurred in a corresponding location, i.e. a narrow band of vegetation on the seaward margin of frontal dunes.

- The AcAjTe and AtAjTe vegetation types align with Ld3, all vegetation types were recorded on dunes and sandy areas.
- The ChAbTw vegetation type aligns with Roc1 and Nh2. This vegetation type was recorded on flat and undulating plains in the current Study Area but was recorded in minor flowlines in the Cape Preston survey
- The EvAcpCc vegetation type aligns with Pc3 and both vegetation types were recorded as riparian vegetation of creeklines
- The PgvExCt vegetation type aligns with Hpg1 with both vegetation types recorded on clay plains on the Horseflat land system.

The PgvAsTl, AbTl and PgvCcTl vegetation types of the current survey do not align as closely with vegetation types from the Biota and Trudgen & Associates (2001) Cape Preston surveys but are representative of the more generic description hummock grasslands of *Triodia* species on slopes and crests outlined in this survey and show some similarity to the Lp1, ROp1 and Pp2 vegetation types.

The MaPgvTd vegetation type of the current survey did not resemble vegetation types defined for any of the previous flora surveys reviewed in the desktop assessment. This indicates a highly restricted range for this vegetation type. The occurrence of suitable habitat for this vegetation type, banks surrounding semi-permanent water holes in a creek system, immediately adjacent this vegetation was occupied by a thicket of the Declared Pest **Prosopis glandulosa* x *velutina*. This suggests a relictual status for this vegetation type which was in Degraded to Poor condition due to the abundance of the Declared Pest and disturbance from livestock that utilise the water source. This vegetation was considered to be locally significant due to restricted distribution and presence of several species not recorded elsewhere in the Study Area. Vegetation type MaPgvTd falls partly within the DE.

The vegetation types AjSlTe, AtAjTe and TtSvTc were considered significant as they occupied small areas and contained plant species not recorded elsewhere. The limited distribution of AjSlTe and AtAjTe was noted during the field survey and subsequently the extent of these vegetation types outside of the DE was mapped. Some 68.5% of AjSlTe and 52.4% of AtAjTe occurred outside of the DE. Most (91.6%) of vegetation type TtSvTc occurs within the DE.

The AjSlTe vegetation type aligns with the Ld1 vegetation type of Biota and Trudgen & Associates (2001) that considered this vegetation type to have low conservation significance as it comprises common and widespread flora along the coast. The AtAjTe vegetation type aligns with the Ld3 vegetation type of Biota and Trudgen & Associates (2001) that considered this vegetation type to have a high conservation value due to small representation in the area (coastal dunes) despite a wide distribution and as it is susceptible to weed invasion and disturbance.

Vegetation types AcAjTe and EvAcpCc were considered significant as they represent habitat for significant flora *Minuria tridens* (P1) and *Goodenia nuda* (P4) respectively. AcAjTe was recorded both within and outside of the DE with the location of the significant flora population located outside. The AcAjTe vegetation type aligns with the Ld3 vegetation type of Biota and Trudgen & Associates (2001) that considered this vegetation type to have a high conservation value due to small representation in the area (coastal dunes) despite a wide distribution and as it is susceptible to weed invasion and disturbance. EvAcpCc also occurred both within and outside of the DE with the significant flora population occurring within. This vegetation type aligns with Pc3 of Biota and Trudgen & Associates (2001) that considered it to have high to moderate conservation value as this riparian vegetation have a high species richness and supports Priority flora in some areas.

Vegetation type AcAjTe(Soak) requires confirmation and description from field surveys. Should this be confirmed as a unique vegetation type it would be considered locally significant due to restricted distribution.

The chenopod (*Tecticornia* spp.) shrublands of the tidal mudflats and sandy rises on tidal mudflats were considered significant as they represent habitat for potentially undescribed species. These vegetation types align with the Ls1 and Ls2 vegetation types of Biota and Trudgen & Associates (2001) that considered them to have moderate conservation value as there is abundant suitable habitat along the coast but susceptible to physical disturbance such as vehicle traffic.

6.5 Horseflat land system of the Roebourne Plains PEC

The Horseflat land system of the Roebourne Plains is defined as a P3 (iii) community (DBCA 2017). It is described as:

"extensive, weakly gilgaied clay plains dominated by tussock grasslands on mostly alluvial non-gilgaied, red clay loams or heavy clay loams. Perennial tussock grasses include *Eragrostis xerophila* (Roebourne Plains grass) and other *Eragrostis* spp., *Eriachne* spp. and *Dicanthium* spp. The community also supports a suite of annual grasses including *Sorghum* spp. and rare *Astrebla* spp."

The description of the Horseflat land system of the Roebourne Plains is considerably broad with no obvious distinguishing features specified. Advice was sought from DBCA Species and Communities Branch concerning the characteristics and a determination of the mapped areas. Quadrat data, species lists, photos and maps were provided.

Jill Pryde confirmed via email on 23 January 2019 that the characteristics of the mapped areas within the study area align with the Horseflat land system of the Roebourne Plains (pers. comm. Jill Pryde, DBCA, 23 January 2019):

"I have reviewed Phoenix Environmental Sciences Mardie Quadrat Data and Figure 5-12 of the study area with an overlay of the Horseflat Land System and mapped vegetation type PgvExCt **Prosopis glandulosa* x *velutina* shrubs over low *Eragrostis xerophila, Dactyloctenium radulans* and *Triodia longiceps* grassland over isolated low *Rhodanthe humboldtiana, Streptoglassa liatroides* and *Angianthus acrohyalinus* forbs, considered representative of Priority 3 ecological community Horseflat land system of the Roebourne Plains. Reviewing the site descriptions and combination of data derived from Quadrats MSPAR02 , MSPAR04, MSPAR06, MSP220, recording the presence of perennial grass *Eragrostis xerophila* and other grasses, the condition of vegetation within quadrats, the red clay loam substrate and photographs, quadrats MSPAR04, MSPAR06, MSP220 described as vegetation type PgvExCt appear to align with the Horseflat Land System P3 ecological community."

6.6 SUMMARY

The Study Area does not contain any Commonwealth or State listed TEC or is likely to contain any Threatened flora. A total of 239.1 ha of the P3 Horseflat land system PEC occurred in the Study Area, the vast majority of which was located in the DE and proposed haul road.

The Study Area represents a large range extension for the State listed P1 flora *Minuria tridens* recorded outside of the DE. The habitat in which this species was recorded exists both within and outside of the DE. Targeted searches of this habitat did not locate any further populations of the species.

A population (two plants) of the State listed P4 flora *Goodenia nuda* was recorded within the DE with habitat for the species occurring both within and outside of the DE. *Cassytha aurea* var. *aurea* was considered a solitary record, and the DE has been modified to exclude this record.

Populations of a significant *Tecticornia* species considered to represent a new species to science was recorded within the DE but the majority of the records lie outside of the DE. Populations of four *Tecticornia* species that could not be identified to species level and may represent new species were

recorded; the population of two species are located outside the DE, records for the remaining two species occur both within and outside of the DE.

Mardie station is recognised as the largest infestation of the category 2 Declared Pest **Prosopis* spp. with a large infestation present in the DE. Management requirements for the category 2 Declared Pest require eradication of the species (DPIRD 2018); however, it has been acknowledged that this infestation cannot be eradicated (NHT 2003) and subsequently consultation with the relevant authorities is required to determine appropriate management strategies.

The majority of vegetation types defined for the Study Area align with vegetation types defined for other surveys in the region indicating a broader distribution outside of the Study Area and DE. Five vegetation types were considered significant as they had restricted distribution in the Study Area and/or represented habitat for species not recorded elsewhere in the Study Area. Vegetation type AcAjTe was considered significant as it represented habitat for the P1 species *Minuria tridens*; this vegetation was recorded both within and outside of the DE. Similarly, the *Tecticornia* spp. shrublands recorded both within and outside of the DE were considered significant as they represent habitat for a taxon considered new to science.

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Appendix 1 Survey site locations

Site	Site type	Latitude	Longitude
MS035	Quadrat	-21.1161	115.9258
MS24	Quadrat	-21.1095	115.9115
MS30	Quadrat	-21.1108	115.9235
MSE004	Quadrat	-21.3002	116.1062
MSE005	Quadrat	-21.2985	116.1043
MSE006	Quadrat	-21.2925	116.1005
MSE007	Quadrat	-21.291	116.0965
MSE008	Quadrat	-21.2912	116.0956
MSE012	Quadrat	-21.2668	116.089
MSE018a	Quadrat	-21.192	116.0153
MSE018b	Quadrat	-21.1858	116.0131
MSE023	Quadrat	-21.1844	115.9684
MSE025	Quadrat	-21.268	115.9215
MSE026	Quadrat	-21.2695	115.9224
MSE027	Quadrat	-21.2697	115.9193
MSE029	Quadrat	-21.2697	115.9187
MSP011	Quadrat	-21.0843	115.9309
MSP015	Quadrat	-21.0992	115.9083
MSP059	Quadrat	-21.1346	115.9279
MSP071	Quadrat	-21.1986	115.9046
MSP082	Quadrat	-21.2908	115.8983
MSP085	Quadrat	-21.2835	115.84
MSP087	Quadrat	-21.284	115.8148
MSP115	Quadrat	-21.2943	115.8674
MSP200	Quadrat	-21.1779	115.9357
MSP201	Quadrat	-21.079	115.9356
MSP202	Quadrat	-21.1808	115.9766
MSP202a	Quadrat	-21.3047	116.1108
MSP203	Quadrat	-21.1755	115.9587
MSP206	Quadrat	-21.2651	115.9413
MSP206a	Quadrat	-21.2634	115.9321
MSP207	Quadrat	-21.169	115.9563
MSP208	Quadrat	-21.1801	115.9563
MSP209	Quadrat	-21.1848	115.9498
MSP210	Quadrat	-21.185	115.9506
MSP212	Quadrat	-21.2239	115.9338
MSP213	Quadrat	-21.2143	115.9372
MSP214	Quadrat	-21.321	115.8108
MSP215	Quadrat	-21.3072	115.823

Site	Site type	Latitude	Longitude
MSP216	Quadrat	-21.3002	115.8337
MSP217	Quadrat	-21.304	115.8427
MSP218	Quadrat	-21.2976	115.848
MSP219	Quadrat	-21.3064	115.863
MSP220	Quadrat	-21.3132	115.874
MSP221	Quadrat	-21.2337	115.9477
MSP224	Quadrat	-21.3198	115.8062
MSP225	Quadrat	-21.3028	115.8564
MSP226	Quadrat	-21.3033	115.9156
MSP228	Quadrat	-21.2148	115.9361
MSP230	Quadrat	-21.2926	115.908
MSP231	Quadrat	-21.3	115.8476
MSP232	Quadrat	-21.222	115.8724
MSP233	Quadrat	-21.2959	115.8965
MSP234	Quadrat	-21.1859	115.9414
MSP236	Quadrat	-21.2992	115.8044
MSP237	Quadrat	-21.0782	115.9306
MSP238	Quadrat	-21.0778	115.9313
MSP86	Quadrat	-21.2635	115.8433
MSPAR01	Quadrat	-21.1632	115.9714
MSPAR02	Quadrat	-21.165	115.9901
MSPAR03	Quadrat	-21.1744	116.0051
MSPAR04	Quadrat	-21.2271	116.0567
MSPAR05	Quadrat	-21.2529	116.08
MSPAR06	Quadrat	-21.268	116.0901
MS025	Relevé	-21.106	115.9166
MS054	Relevé	-21.1205	115.9071
MS057	Relevé	-21.1268	115.9062
MS49	Relevé	-21.1217	115.9297
MS50	Relevé	-21.1265	115.9325
MSE009	Relevé	-21.2894	116.0935
MSE010	Relevé	-21.289	116.0947
MSE013	Relevé	-21.2683	116.0875
MSE017	Relevé	-21.2394	116.0711
MSE019	Relevé	-21.1775	116.006
MSE020	Relevé	-21.1767	116.0061
MSE021	Relevé	-21.1678	115.9886
MSE022	Relevé	-21.1675	115.9847
MSE028	Relevé	-21.2716	115.9178
MSP230a	Relevé	-21.2944	115.9086

Site	Site type	Latitude	Longitude
MSP235	Relevé	-21.156	115.92
MSP45	Relevé	-21.1239	115.9248
MSP67	Relevé	-21.1689	115.9121
MSPVD01	Relevé	-21.3009	115.8926
MSPVD02	Relevé	-21.2304	115.9452
MSMSP109Q1	Transect	-21.138	115.8847
MSP009Q1	Transect	-21.0825	115.9382
MSP015Q1	Transect	-21.0895	115.9289
MSP018Q2	Transect	-21.1007	115.9058
MSP022Q1	Transect	-21.2858	115.8327
MSP106AQ01	Transect	-21.189	115.857
MSP116Q1	Transect	-21.2936	115.8787
MSP117Q1	Transect	-21.2308	115.848
MSP211	Transect	-21.2247	115.9225
MSP222Q1	Transect	-21.2985	115.7936
MSP60AQ1	Transect	-21.1424	115.9248
MSMSP109Q2	Transect Quadrat	-21.1383	115.8846
MSMSP109Q3	Transect Quadrat	-21.1385	115.8844
MSMSP109Q4	Transect Quadrat	-21.1388	115.8843
MSP009Q2	Transect Quadrat	-21.0822	115.9381
MSP009Q3	Transect Quadrat	-21.0818	115.938
MSP009Q4	Transect Quadrat	-21.0814	115.9379
MSP015Q2	Transect Quadrat	-21.0893	115.9285
MSP015Q3	Transect Quadrat	-21.089	115.9282
MSP015Q4	Transect Quadrat	-21.0888	115.9278
MSP018Q3	Transect Quadrat	-21.1006	115.9056
MSP018Q4	Transect Quadrat	-21.1005	115.9053
MSP022Q2	Transect Quadrat	-21.2862	115.8325
MSP022Q3	Transect Quadrat	-21.2864	115.8322
MSP022Q4	Transect Quadrat	-21.2866	115.8319
MSP106AQ02	Transect Quadrat	-21.1888	115.8571
MSP106AQ03	Transect Quadrat	-21.1887	115.8572
MSP106AQ04	Transect Quadrat	-21.1886	115.8572
MSP106AQ05	Transect Quadrat	-21.1884	115.8576
MSP116Q3	Transect Quadrat	-21.2939	115.878
MSP116Q4	Transect Quadrat	-21.294	115.8776
MSP117Q2	Transect Quadrat	-21.2308	115.848
MSP117Q3	Transect Quadrat	-21.2305	115.8482
MSP117Q4	Transect Quadrat	-21.2302	115.8484
MSP211Q2	Transect Quadrat	-21.2247	115.9224

Site	Site type	Latitude	Longitude
MSP211Q3	Transect Quadrat	-21.2246	115.9224
MSP222Q2	Transect Quadrat	-21.2984	115.7933
MSP222Q3	Transect Quadrat	-21.2983	115.7931
MSP222Q4	Transect Quadrat	-21.2982	115.7928
MSP60AQ2	Transect Quadrat	-21.1426	115.9243
MSP60AQ3	Transect Quadrat	-21.1429	115.9242

Appendix 2 Flora survey site descriptions

Site details			
Site:	MS035	**Type:**	Quadrat (50 m x 50 m)
Date(s):	21 August 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.11614, 115.925751 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	10	**Topography:**	sandy rise on mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	5	**Soil:**	sand, sandy loam,
Grass cover (%):	6	**Rock type:**	ironstone
Herb cover (%):	0.1	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Isolated low *Tecticornia indica* subsp *leiostachya*, *Frankenia ambita* and *Trianthema turgidifolium* shrubs over isolated low *Triodia epactia* and *Eragrostis falcata* grasses over isolated clumps of *Lawrencia viridigrisea* forbs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia indica subsp. *leiostachya*	03.0	00.30		
Triodia epactia	03.0	00.25		
Eragrostis falcata	03.0	00.15		
Frankenia ambita	02.0	00.10		
Trianthema turgidifolium	01.0	00.15		
Tecticornia halocnemoides subsp. *longispicata*	00.1	00.20		
Sclerolaena costata	00.1	00.15		
Lawrencia viridigrisea	00.1	00.10		

Site details			
Site:	MS24	**Type:**	Quadrat (50 m x 50 m)
Date(s):	22 August 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.109498, 115.911476 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	70	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	70	**Soil:**	clay,
Grass cover (%):	0.1	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low closed *Muellerolimon salicorniaceum*, *Tecticornia pterygosperma* subsp. *denticultata* and *T.* sp. affinity to *T. halocnemoides* large ovate seed aggregate shrubland over low isolated clumps of *Eragrostis falcata* grasses.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Muellerolimon salicorniaceum	35.0	00.20		
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	30.0	00.40		
Tecticornia pterygosperma subsp. *denticulata*	07.0	00.30		
Surreya diandra	05.0	00.20		
Tecticornia indica subsp. *leiostachya*	05.0	00.15		
Eragrostis falcata	00.1	00.20		
Frankenia ?*pauciflora*	00.1	00.10		

Site details			
Site:	MS30	**Type:**	Quadrat (50 m x 50 m)
Date(s):	22 August 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.11082, 115.923533 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	10	**Topography:**	sandy rise on mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	10	**Soil:**	sand, sandy loam,
Grass cover (%):	0.1	**Rock type:**	none
Herb cover (%):	0.1	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Sparse open *Tecticornia auriculata*, *T. halocnemoides* subsp. *longispicata* and *T. indica* subsp. *leiostachya* shrubland over isolated clumps of low *Eragrostis* ? *falcata* grasses and isolated clumps of low *Lawrencia viridigrisea* forbs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia auriculata	05.0	00.30		
Tecticornia halocnemoides subsp. *longispicata*	04.0	00.20		
Tecticornia indica subsp. *leiostachya*	01.0	00.15		
Eragrostis falcata	00.1	00.25		
Lawrencia viridigrisea	00.1	00.15		
Frankenia ?*ambita*	00.1	00.10		
Muellerolimon salicorniaceum	00.1	00.10		

Site details			
Site:	MSE004	**Type:**	Quadrat (50 m x 50 m)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Alice Watt	**Position:**	-21.300194, 116.106219 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	75	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	40	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	70	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Tall *Acacia ancistrocarpa*, *A. bivenosa* and *Grevillea pyramidalis* shrubland over *Triodia wiseana* hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	70.0	02.50		
Acacia ancistrocarpa	30.0	04.00		
Acacia bivenosa	05.0	03.00		
Grevillea pyramidalis	02.0	04.00		
Grevillea wickhamii	02.0	04.00		
Acacia inaequilatera	01.0	01.00		
Acacia atkinsiana	00.1	00.80		
Cucumis variabilis	00.1	00.50		

Site details			
Site:	MSE005	**Type:**	Quadrat (50 m x 50 m)
Date(s):	10 September 2019	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-21.298468, 116.104342 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	75	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	5	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	75	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid *Acacia ancistrocarpa*, *A. synchronicia* and *A. bivenosa* over low *Triodia wiseana* hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	75.0	00.40		
Acacia synchronicia	02.0	04.00		
Acacia ancistrocarpa	02.0	03.00		
Acacia bivenosa	01.0	02.50		
Acacia inaequilatera	01.0	01.00		
Indigofera monophylla	00.1	01.50		
Corchorus lasiocarpus	00.1	00.50		
Trichodesma zeylanicum var. *grandiflorum*	00.1	00.40		
Cucumis variabilis	00.1	00.30		

Site details			
Site:	MSE006	**Type:**	Quadrat (50 m x 50 m)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Martin Henson	**Position:**	-21.292516, 116.100528 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	70	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	10	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	70	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	1 – 5 years
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Isolated low *Corymbia hamersleyana* trees over mid isolated *Acacia ancistrocarpa*, *A.bivenosa* and *A. inaequilatera* shrubs over low *Triodia wiseana* hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	70	00.40		
Acacia ancistrocarpa	02.0	03.00		
Acacia bivenosa	02.0	03.00		
Acacia inaequilatera	02.0	03.00		
Corymbia hamersleyana	01.0	05.00		

Site details			
Site:	MSE007	**Type:**	Quadrat (50 m x 50 m)
Date(s):	10 September 2019	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-21.290991, 116.096516 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	plain
Tree/shrub cover >2 m (%):	40	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	60	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	grazing – medium, none,
Land system:			
Vegetation description and type:	Tall *Acacia xiphophylla* shrubland over low *Triodia wiseana* hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	60.0	00.50		
Acacia xiphophylla	30.0	04.00		

Site details			
Site:	MSE008	**Type:**	Quadrat (50 m x 50 m)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Martin Henson	**Position:**	-21.291224, 116.095648 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	70	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	20	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	70	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Tall open *Acacia ancistrocarpa*, *A. synchronicia* and *A. inaequilatera* shrubland over low *Triodia wiseana* hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	70.0	00.50		
Acacia ancistrocarpa	04.0	04.00		
Acacia inaequilatera	01.0	03.00		
Acacia synchronicia	01.0	03.00		
Acacia bivenosa	01.0	02.50		
Senna artemisioides subsp. *oligophylla*	00.1	01.20		

Site details			
Site:	MSE009	**Type:**	Relevé (unbounded)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Martin Henson	**Position:**	-21.289425, 116.093479 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	2	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	60	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Isolated tall *Acacia ancistrocarpa*, *A. bivenosa* and *A. ancistrocarpa* shrubs over low *Triodia wiseana* hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	60.0	00.40		
Acacia bivenosa	02.0	03.00		
Acacia ancistrocarpa	01.0	04.00		
Grevillea pyramidalis	01.0	03.00		
Hakea chordophylla	01.0	02.50		
Acacia inaequilatera	00.2	03.00		

Site details			
Site:	MSE010	**Type:**	Relevé (unbounded)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Martin Henson	**Position:**	-21.288957, 116.09469 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	plain
Tree/shrub cover >2 m (%):	30	**Soil colour:**	red-brown
Shrub cover <2 m (%):	0	**Soil:**	sandy clay, sandy loam
Grass cover (%):	20	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	grazing – low
Land system:			
Vegetation description and type:	Tall open *Acacia xiphophylla* and *A. synchronicia* shrubland over *Triodia wiseana* open hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	20.0	00.30		
Acacia xiphophylla	15.0	03.00		
Acacia synchronicia	05.0	02.00		

Site details			
Site:	MSE012	**Type:**	Quadrat (50 m x 50 m)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Martin Henson	**Position:**	-21.266762, 116.089047 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	30	**Topography:**	plain
Tree/shrub cover >2 m (%):	20	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	10	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	1 – 5 years
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	vehicle tracks,
Land system:			
Vegetation description and type:	Tall open *Acacia bivenosa*, *A. inaequilatera* and *A. xiphophylla* shrubs over open *Triodia wiseana* grassland and *Eragrostis xerophila* tussock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Acacia bivenosa	08.0	04.00		
Acacia inaequilatera	05.0	03.00		
Triodia wiseana	04.0	00.30		
Acacia xiphophylla	00.5	04.00		
Hakea chordophylla	00.2	04.00		
Prosopis glandulosa x *velutina*	00.1	01.50	*	
Solanum lasiophyllum	00.1	00.30		
Eragrostis xerophila	00.1	00.10		

Site details			
Site:	MSE013	**Type:**	Relevé (unbounded)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Alice Watt	**Position:**	-21.268263, 116.087489 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	30	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	40	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	>5 years
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none
Land system:			
Vegetation description and type:	Tall open *Acacia bivenosa*, *A. ancistrocarpa* and *A. inaequilatera* shrubland over *Triodia wiseana* hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	40.0	00.80		
Acacia bivenosa	30.0	02.00		
Acacia ancistrocarpa	00.1	03.00		
Acacia inaequilatera	00.1	02.00		

Site details			
Site:	MSE017	**Type:**	Relevé (unbounded)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Martin Henson	**Position:**	-21.239394, 116.07107 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	plain
Tree/shrub cover >2 m (%):	25	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	30	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none
Land system:			
Vegetation description and type:	Tall open *Acacia xiphophylla* and *A. inaequilatera* shrubland over *Triodia wiseana* and *Eragrostis xerophila* grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	40.0	00.60		
Acacia xiphophylla	10.0	02.50		
Acacia inaequilatera	02.0	04.00		
Prosopis glandulosa x *velutina*	01.0	01.50	*	
Hakea chordophylla	00.1	03.00		
Myoporum montanum	00.1	01.60		
Acacia synchronicia	00.1	00.50		
Eragrostis xerophila	00.1	00.10		

Site details			
Site:	MSE018a	**Type:**	Quadrat (50 m x 50 m)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Alice Watt	**Position:**	-21.19196, 116.015255 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	40	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	60	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	>5 years
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid *Acacia bivenosa* shrubland over low *Triodia wiseana* hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	60.0	00.40		
Acacia bivenosa	40.0	02.00		

Site details			
Site:	MSE018b	**Type:**	Quadrat (50 m x 50 m)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Martin Henson	**Position:**	-21.185762, 116.013117 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	30	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	20	**Soil:**	sandy clay,
Grass cover (%):	10	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none
Land system:			
Vegetation description and type:	Mid open *Acacia xiphophylla*, *A. synchronicia* and **Prosopis glandulosa* x *veluntia* shrubland over open *Triodia wiseana* hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	20.0	00.50		
Acacia xiphophylla	10.0	01.50		
Prosopis glandulosa x *velutina*	00.1	01.50	*	
Acacia synchronicia	00.1	00.30		

Site details			
Site:	MSE019	**Type:**	Relevé (unbounded)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Martin Henson	**Position:**	-21.177464, 116.005996 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	1	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	1	**Soil:**	sandy clay,
Grass cover (%):	0	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Isolated *Acacia xiphophylla* and *Hakea chordophylla* shrubs over isolated *Triodia longiceps* grasses		

Species	Cover (%)	Height (m)	Weed	Conservation status
Acacia xiphophylla	01.0	03.00		
Hakea chordophylla	00.1	01.50		
Triodia longiceps	00.1	00.30		

Site details			
Site:	MSE020	**Type:**	Relevé (unbounded)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Martin Henson	**Position:**	-21.176652, 116.006097 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	plain
Tree/shrub cover >2 m (%):	45	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	5	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Degraded, EPA (2016)	**Disturbance**	none
Land system:			
Vegetation description and type:	Tall **Prosopis glandulosa* x *veluntia* and *Hakea chordophylla* shrubland over *Eragrostis xerophila* grasses		

Species	Cover (%)	Height (m)	Weed	Conservation status
Prosopis glandulosa x *velutina*	40.0	05.00	*	
Eragrostis xerophila	05.0	00.25		
Hakea chordophylla	00.1	04.00		
Acacia xiphophylla	00.1	01.00		

Site details			
Site:	MSE021	**Type:**	Relevé (unbounded)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Alice Watt	**Position:**	-21.167756, 115.988581 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	50	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	none
Land system:			
Vegetation description and type:	Mid isolated **Prosopis glandulosa* x *veluntia* shrubs over *Triodia longiceps* hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	50.0	00.30		
Prosopis glandulosa x *velutina*	00.1	02.00	*	

Site details			
Site:	MSE022	**Type:**	Relevé (unbounded)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Alice Watt	**Position:**	-21.167505, 115.984687 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	30	**Topography:**	plain
Tree/shrub cover >2 m (%):	30	**Soil colour:**	brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	0	**Rock type:**	granite rocks; quartz;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Degraded, EPA (2016)	**Disturbance**	grazing – medium, livestock tracks,
Land system:			
Vegetation description and type:	Tall open **Prosopis glandulosa* x *veluntia*, *Acacia synchronicia* and *A. inaequilatera* shrubland over low isolated *Eragrostis xerophila* grasses		

Species	Cover (%)	Height (m)	Weed	Conservation status
Prosopis glandulosa x *velutina*	25.0	05.00	*	
Acacia synchronicia	04.0	05.00		
Acacia inaequilatera	01.0	03.00		
Hakea chordophylla	01.0	03.00		
Eragrostis xerophila	00.5	00.10		

Site details			
Site:	MSE023	**Type:**	Quadrat (50 m x 50 m)
Date(s):	10 September 2019	**Permanent:**	No
Observer(s):	Alice Watt	**Position:**	-21.184415, 115.96844 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	70	**Topography:**	plain
Tree/shrub cover >2 m (%):	70	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Degraded, EPA (2016)	**Disturbance**	weed infestation,
Land system:			
Vegetation description and type:	Tall closed **Prosopis glandulosa* x *velutina*, *Acacia sclerosperma* subsp. *sclerosperma* and *Hakea chordophylla* shrubland over isolated *Eragrostis xerophila* grasses		

Species	Cover (%)	Height (m)	Weed	Conservation status
Prosopis glandulosa x *velutina*	35.0	08.00	*	
Acacia sclerosperma subsp. *sclerosperma*	35.0	04.00		
Hakea chordophylla	00.1	03.00		
Vachellia farnesiana	00.1	02.00	*	
Acacia inaequilatera	00.1	01.00		
Eragrostis xerophila	00.1	00.10		
Acacia coriacea subsp. *pendens*	00.1			

Site details			
Site:	MSE025	**Type:**	Quadrat (50 m x 50 m)
Date(s):	12 September 2019	**Permanent:**	Yes
Observer(s):	Martin Henson	**Position:**	-21.267961, 115.921466 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	75	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none
Land system:			
Vegetation description and type:	Closed *Triodia longiceps* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	75.0	00.40		

Site details			
Site:	MSE026	**Type:**	Quadrat (50 m x 50 m)
Date(s):	12 September 2019	**Permanent:**	No
Observer(s):	Martin Henson	**Position:**	-21.269494, 115.922413 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	70	**Topography:**	plain
Tree/shrub cover >2 m (%):	10	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	65	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Isolated *Acacia sclerosperma* subsp. *sclerosperma* and **Prosopis glandulosa* x *velutina* over low *Triodia longiceps* hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	65.0	00.40		
Acacia sclerosperma subsp. *sclerosperma*	10.0	02.50		
Prosopis glandulosa x *velutina*	01.0	02.50	*	
Acacia bivenosa	00.1	01.50		
Scaevola spinescens	00.1	01.00		

Site details			
Site:	MSE027	**Type:**	Quadrat (50 m x 50 m)
Date(s):	12 September 2019	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-21.269706, 115.919328 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	25	**Topography:**	drainage line
Tree/shrub cover >2 m (%):	25	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	gravel / alluvial,
Grass cover (%):	0	**Rock type:**	ironstone
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none
Land system:			
Vegetation description and type:	Tall open *Acacia ampliceps*, *A. inaequilatera* and *A. trachycarpa* shrubs over isolated *Triodia longiceps* hummock grasses		

Species	Cover (%)	Height (m)	Weed	Conservation status
Acacia ampliceps	20.0	04.00		
Acacia trachycarpa	00.5	04.00		
Melaleuca globifera	00.5	04.00		
Petalostylis labicheoides	00.5	04.00		
Acacia inaequilatera	00.5	02.00		
Triodia longiceps	00.1	00.40		
Sporobolus australasicus	00.1	00.10		

Site details			
Site:	MSE028	**Type:**	Relevé (unbounded)
Date(s):	12 September 2019	**Permanent:**	Yes
Observer(s):	Martin Henson	**Position:**	-21.271626, 115.917835 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	60	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none
Land system:			
Vegetation description and type:	*Triodia longiceps* hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	60.0	00.30		

Site details			
Site:	MSE029	**Type:**	Quadrat (50 m x 50 m)
Date(s):	12 September 2019	**Permanent:**	No
Observer(s):	Martin Henson	**Position:**	-21.269672, 115.918677 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	65	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	65	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Triodia longiceps hummock grassland		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	65.0	00.30		

Site details			
Site:	MSMSP109Q1	**Type:**	Transect (3 m x 3 m)
Date(s):	21 August 2018	**Permanent:**	No
Observer(s):	Alice Watt	**Position:**	-21.138033, 115.884743 (North-west)

Vegetation		Physical features	
Total vegetation cover (%):	60	**Topography:**	tidal creek
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	60	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low *Suaeda arbusculoides* and *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate shrubland.		

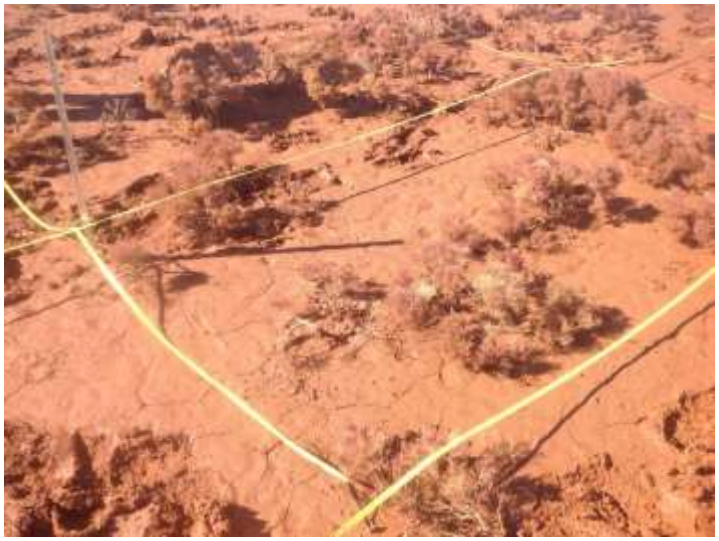
Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	55.0	0.25		
Suaeda arbusculoides	05.0	00.50		

Site details			
Site:	MSMSP109Q2	**Type:**	Transect (3 m x 3 m)
Date(s):	21 August 2018	**Permanent:**	No
Observer(s):	Alice Watt	**Position:**	-21.138264, 115.884649 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	40	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	40.0	00.30		

Site details			
Site:	MSMSP109Q3	**Type:**	Transect (3 m x 3 m)
Date(s):	21 August 2018	**Permanent:**	No
Observer(s):	Alice Watt	**Position:**	-21.138532, 115.884421 (North-west)

Vegetation		Physical features	
Total vegetation cover (%):	50	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	50	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate shrubland.		



Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	50.0	00.30		

Site details			
Site:	MSMSP109Q4	**Type:**	Transect (3 m x 3 m)
Date(s):	21 August 2018	**Permanent:**	No
Observer(s):	Alice Watt	**Position:**	-21.138824, 115.884329 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	30	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	30	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low open *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	30.0	00.30		

Site details			
Site:	MSP011	**Type:**	Quadrat (50 m x 50 m)
Date(s):	15 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.084284, 115.930921 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	85	**Topography:**	tidal creek
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	85	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid open *Avicennia marina* and *Rhizophora stylosa* shrubland over low closed *Muellerolimon salicorniaceum* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Muellerolimon salicorniaceum	80.0	00.20		
Rhizophora stylosa	07.0	01.50		
Avicennia marina	03.0	01.80		

Site details			
Site:	MSP015	**Type:**	Quadrat (50 m x 50 m)
Date(s):	15 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.099161, 115.908342 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	90	**Topography:**	sand dune
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	15	**Soil:**	sandy loam,
Grass cover (%):	90	**Rock type:**	none
Herb cover (%):	20	**Fire age:**	not evident
Vegetation condition:	Good, EPA (2016)	**Disturbance**	weed infestation,
Land system:			
Vegetation description and type:	Sparse mid *Alectryon oleifolius* subsp. *oleifolius*, *Eremophila longifolia* and *Myoporum montanum* shrubland over low open **Aerva javanica*, *Scaevola spinescens* and *S. acacioides* shrubland over low closed *Triodia epactia* hummock grassland.		

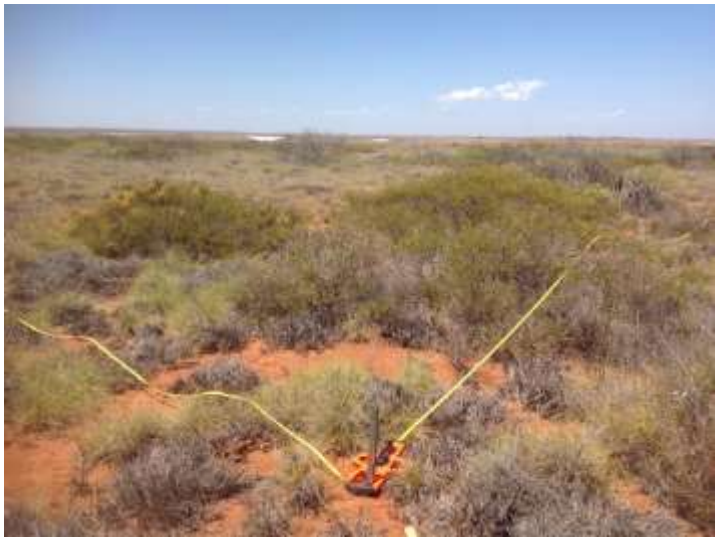
Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia epactia	90.0	00.40		
Cassytha capillaris	20.0	00.40		
Aerva javanica	10.0	00.70	*	
Alectryon oleifolius subsp. *oleifolius*	04.0	01.60		
Eremophila longifolia	03.0	01.50		
Scaevola spinescens	02.0	00.60		
Myoporum montanum	01.0	01.70		
Trichodesma zeylanicum var. *grandiflorum*	00.1	01.80		
Senna glutinosa subsp. ?*glutinosa*	00.1	01.60		
Rhagodia eremaea	00.1	01.20		
Frankenia ambita	00.1	00.50		
Ptilotus divaricatus	00.1	00.50		
Scaevola cunninghamii	00.1	00.50		
Solanum cleistogamum	00.1	00.50		
Scaevola acacioides	00.1	00.40		

Euphorbia tannensis subsp. *eremophila*	00.1	00.30
Indigofera trita	00.1	00.30
Sida fibulifera	00.1	00.20
Crotalaria medicaginea var. *neglecta*	00.1	00.15
Rhynchosia minima	00.1	00.15
Surreya diandra		

Site details			
Site:	MSP059	**Type:**	Quadrat (50 m x 50 m)
Date(s):	16 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.134618, 115.927854 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	85	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-orange
Shrub cover <2 m (%):	1	**Soil:**	sandy clay, sandy loam
Grass cover (%):	85	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	>5 years
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	weed infestation,
Land system:			
Vegetation description and type:	Isolated mid **Prosopis glandolusa* x *velutina* shrubs over isolated clumps of low *Solanum lasiophyllum*, *Pterocaulon sphacelatum* and *Indigofera trita* shrubs over low *Triodia epactia* and *T. longiceps* hummock grassland.		

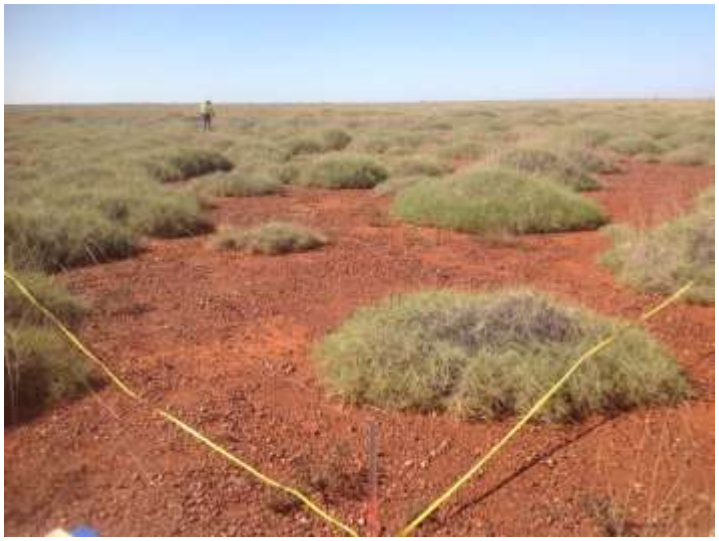
Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia epactia	50.0	00.40		
Triodia longiceps	35.0	00.45		
Prosopis glandulosa x *velutina*	01.0	01.70	*	
Cenchrus ciliaris	01.0	00.30	*	
Trianthema turgidifolium	00.5	00.20		
Evolvulus alsinoides var. *villosicalyx*	00.5	00.15		
Indigofera trita	00.1	00.35		
Pterocaulon sphacelatum	00.1	00.30		
Solanum lasiophyllum	00.1	00.30		
Lawrencia viridigrisea	00.1	00.25		
Eragrostis eriopoda	00.1	00.20		
Heliotropium cunninghamii	00.1	00.15		
Rhynchosia minima	00.1	00.15		
Sclerolaena diacantha	00.1	00.15		

Site details			
Site:	MSP071	**Type:**	Quadrat (50 m x 50 m)
Date(s):	16 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.198601, 115.904626 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	80	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	20	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	5	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid open *Acacia ligulata* and *A. stellaticeps* shrubland over low closed *Triodia epactia* hummock grassland.		



Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia epactia	75.0	00.40		
Acacia ligulata	10.0	01.80		
Acacia stellaticeps	10.0	01.20		
Cassytha capillaris	05.0	00.40		
Scaevola spinescens	01.0	00.50		
Sida fibulifera	00.5	00.30		
Acacia coriacea	00.1	01.40		
Prosopis glandulosa x *velutina*	00.1	01.30	*	
Goodenia ?armitiana	00.1	00.50		
Whiteochloa ?airoides	00.1	00.50		
Cenchrus ciliaris	00.1	00.40	*	
Heliotropium chrysocarpum	00.1	00.40		
Indigofera monophylla	00.1	00.40		
Rhynchosia minima	00.1	00.20		
Solanum lasiophyllum	00.1	00.20		
Euphorbia tannensis subsp. *eremophila*	00.1	0.2		

Site details			
Site:	MSP082	**Type:**	Quadrat (50 m x 50 m)
Date(s):	16 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.290757, 115.89825 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	75	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	75	**Rock type:**	ferrous – ironstone
Herb cover (%):	0	**Fire age:**	>5 years
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid closed *Triodia longiceps* hummock grassland over isolated clumps of low *Sclerolaena costata*, *S. densiflora* and *Pterocaulon sphacelatum* forbs.		



Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	75.0	01.00		
Pterocaulon sphacelatum	00.1	00.30		
Sclerolaena densiflora	00.1	00.20		
Sclerolaena costata	00.1	00.15		

Site details			
Site:	MSP085	**Type:**	Quadrat (50 m x 50 m)
Date(s):	16 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.283466, 115.840004 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	80	**Topography:**	plain
Tree/shrub cover >2 m (%):	3	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	5	**Soil:**	sandy loam,
Grass cover (%):	80	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Poor, EPA (2016)	**Disturbance**	evidence of feral animals, grazing – medium, livestock tracks, weed infestation,

Land system:

Vegetation description and type: Isolated tall *Acacia ampliceps* shrubs over isolated low *Acacia bivenosa*, *Myoporum montanum* and *Acacia coriacea* ?subsp. *coriacea* shrubs over low closed *Triodia epactia* and **Cenchrus ciliaris* grassland.

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia epactia	50.0	00.35		
Cenchrus ciliaris	30.0	00.40	*	
Acacia bivenosa	04.0	01.00		
Acacia ampliceps	02.0	03.00		
Acacia ampliceps x *bivenosa*	01.0	01.50		
Cassytha capillaris	01.0	00.40		
Prosopis pallida	00.1	03.00	*	
Acacia coriacea ?subsp. *coriacea*	00.1	01.00		
Myoporum montanum	00.1	00.80		
Hakea lorea subsp. *lorea*	00.1	00.50		
Acacia synchronicia	00.1	00.40		
Goodenia ?*armitiana*	00.1	00.40		
Indigofera trita	00.1	00.40		
Pterocaulon sphacelatum	00.1	00.40		

Aristida ?holathera	00.1	00.30
Rhagodia eremaea	00.1	00.30
Pluchea rubelliflora	00.1	00.15
Sida fibulifera	00.1	00.15
Goodenia forrestii	00.1	00.10
Rhynchosia minima	00.1	00.10
Senna glutinosa subsp. *pruinosa*	00.1	00.10
Haloragis gossei	00.1	00.05

Site details			
Site:	MSP087	**Type:**	Quadrat (50 m x 50 m)
Date(s):	19 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.283994, 115.814814 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	6	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	6	**Soil:**	sandy clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low sparse *Tecticornia halocnemoides* subsp. *longispicata* and *T. halocnemoides* subsp. *tenuis* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia halocnemoides subsp. *longispicata*	06.0	00.30		
Tecticornia halocnemoides subsp. *tenuis*	00.1	00.15		

Site details			
Site:	MSP106AQ01	**Type:**	Transect (3 m x 3 m)
Date(s):	20 August 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.189006, 115.856953 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	tidal creek
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	40	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Isolated mid *Avicennia marina* and *Rhizophora stylosa* shrubs over low *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate, *Muellerolimin salicaorniaceum* and *Surreya diandra* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	25.0	00.45		
Muellerolimon salicorniaceum	13.0	00.35		
Surreya diandra	01.0	00.30		
Avicennia marina	00.1	01.80		
Rhizophora stylosa	00.1	01.50		

Site details			
Site:	MSP106AQ02	**Type:**	Transect (3 m x 3 m)
Date(s):	20 August 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.188796, 115.857094 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	98	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	98	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate, *Muellerolimin salicaorniaceum* and *Surreya diandra* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Muellerolimon salicorniaceum	75.0	00.30		
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	20.0	00.40		
Surreya diandra	02.0	00.30		

Site details			
Site:	MSP106AQ03	**Type:**	Transect (3 m x 3 m)
Date(s):	20 August 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.188698, 115.85723 (North-west)

Vegetation		Physical features	
Total vegetation cover (%):	75	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	75	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate and *Muellerolimon salicorniaceum* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Muellerolimon salicorniaceum	70.0	00.25		
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	05.0	00.40		

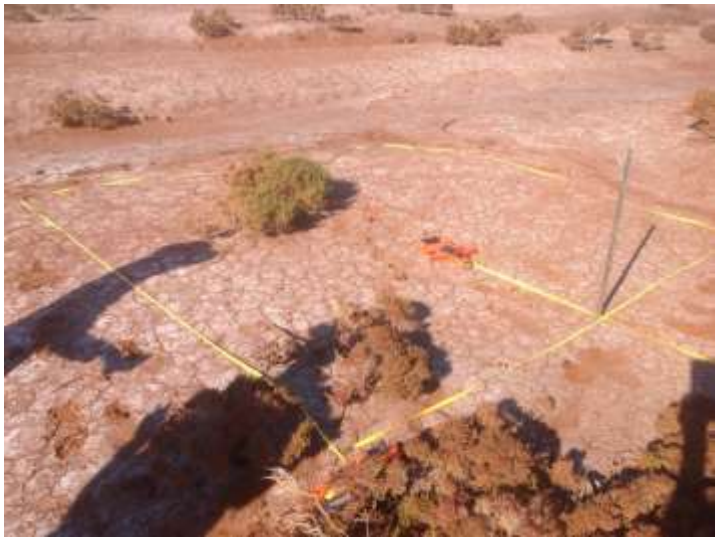
Site details			
Site:	MSP106AQ04	**Type:**	Transect (3 m x 3 m)
Date(s):	20 August 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.188637, 115.85723 (North-west)

Vegetation		Physical features	
Total vegetation cover (%):	25	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	25	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low open *Rhizophora stylosa* and *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	20.0	00.40		
Rhizophora stylosa	10.0	00.70		

Site details			
Site:	MSP106AQ05	**Type:**	Transect (3 m x 3 m)
Date(s):	20 August 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.188351, 115.857581 (North-west)

Vegetation		Physical features	
Total vegetation cover (%):	15	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	15	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate chenopod shrubland.		



Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	15.0	00.30		

Site details			
Site:	MSP115	**Type:**	Quadrat (50 m x 50 m)
Date(s):	16 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.294315, 115.867381 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	30	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	1	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	30	**Rock type:**	ferrous – ironstone
Herb cover (%):	1	**Fire age:**	<1 year
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	evidence of feral animals, livestock tracks,
Land system:			
Vegetation description and type:	Isolated low *Acacia synchronicia*, *Trianthema turgidifolia* and *Corchorus tridens* shrubs over low *Triodia* sp. grassland over isolated low *Pluchea rubelliflora* and *Streptoglossa adscendens* forbs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	30.0	00.15		
Trianthema turgidifolium	02.0	00.15		
Dactyloctenium radulans	02.0	00.05		
Eulalia aurea	01.0	00.40		
Pluchea rubelliflora	01.0	00.25		
Indigofera trita	01.0	00.15		
Alysicarpus muelleri	00.5	00.10		
Cenchrus ciliaris	00.5	00.10	*	
Indigofera linifolia	00.5	00.05		
Trianthema triquetrum	00.5	00.03		
Streptoglossa adscendens	00.1	00.40		
Acacia synchronicia	00.1	00.30		
Pterocaulon sphacelatum	00.1	00.30		
Sida sp. Pilbara	00.1	00.15		
Abutilon sp.	00.1	00.10		

Goodenia forrestii	00.1	00.10
Corchorus tridens	00.1	00.05

Site details			
Site:	MSP117Q1	**Type:**	Transect (3 m x 3 m)
Date(s):	21 August 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-21.230814, 115.848026 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	95	**Topography:**	tidal creek
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	95	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low closed *Muellerolimon salicorniaceum*, *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate and *T.* sp. In early flower shrubland over low isolated clumps of *Sporobolus virginicus* grasses.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Muellerolimon salicorniaceum	80.0	00.40		
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	15.0	00.30		
Tecticornia sp. In early flower	00.1	00.30		
Sporobolus virginicus	00.1	00.20		

Site details			
Site:	MSP117Q2	**Type:**	Transect (3 m x 3 m)
Date(s):	21 August 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-21.230776, 115.848015 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	85	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	85	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low closed *Muellerolimon salicorniaceum*, *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Muellerolimon salicorniaceum	85.0	00.20		
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	01.0	00.30		

Site details			
Site:	MSP117Q3	**Type:**	Transect (3 m x 3 m)
Date(s):	21 August 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-21.230476, 115.848183 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	55	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	55	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low *Muellerolimon salicorniaceum*, *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Muellerolimon salicorniaceum	35.0	00.20		
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	20.0	00.30		

Site details			
Site:	MSP117Q4	**Type:**	Transect (3 m x 3 m)
Date(s):	21 August 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-21.23015, 115.84843 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	15	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	15	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low open *Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	15.0	00.30		

Site details			
Site:	MSP200	**Type:**	Quadrat (50 m x 50 m)
Date(s):	16 March 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.177904, 115.935745 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	90	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	2	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	50	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Degraded, EPA (2016)	**Disturbance**	evidence of feral animals, grazing – medium, livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Mid **Prosopis pallida* shrubland over isolated low *Acacia bivenosa* shrubs over low closed *Triodia longiceps* and **Cenchrus ciliaris* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Prosopis pallida	50.0	01.80	*	
Triodia longiceps	45.0	00.40		
Cenchrus ciliaris	30.0	00.25	*	
Acacia bivenosa	00.1	00.50		
Eragrostis setifolia				

Site details			
Site:	MSP201	**Type:**	Quadrat (50 m x 50 m)
Date(s):	15 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.079004, 115.935603 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	85	**Topography:**	sand dune
Tree/shrub cover >2 m (%):	1	**Soil colour:**	brown,
Shrub cover <2 m (%):	10	**Soil:**	sandy loam,
Grass cover (%):	80	**Rock type:**	none
Herb cover (%):	20	**Fire age:**	not evident
Vegetation condition:	Good, EPA (2016)	**Disturbance**	weed infestation,
Land system:			
Vegetation description and type:	Isolated tall **Prosopis glandulosa* x *velutina* and *Acacia coriacea* subsp. *pendens* shrubs over low open *Indigofera trita*, **Aerva javanica* and *Maireana planifolia* shrubland over low closed *Triodia epactia* and **Cenchrus ciliaris* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia epactia	55.0	00.40		
Cassytha capillaris	25.0	00.40		
Cenchrus ciliaris	25.0	00.40	*	
Aerva javanica	05.0	00.60	*	
Indigofera trita	05.0	00.40		
Prosopis glandulosa x *velutina*	01.0	04.00	*	
Maireana planifolia	01.0	00.40		
Sida fibulifera	01.0	00.25		
Solanum lasiophyllum	00.5	00.70		
Pterocaulon sphacelatum	00.5	00.50		
Acacia coriacea subsp. *pendens*	00.1	04.00		
Acacia sericophylla	00.1	01.00		
Scaevola spinescens	00.1	00.80		
Rhagodia eremaea	00.1	00.60		
Corchorus walcottii	00.1	00.30		
Euphorbia tannensis subsp. *eremophila*	00.1	00.25		

Rhynchosia minima	00.1	00.10

Site details			
Site:	MSP202	**Type:**	Quadrat (50 m x 50 m)
Date(s):	17 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.180844, 115.976567 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	plain
Tree/shrub cover >2 m (%):	20	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	2	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	50	**Rock type:**	ferrous – ironstone
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Poor, EPA (2016)	**Disturbance**	grazing – low, livestock tracks, vehicle tracks, weed infestation,

Land system:

Vegetation description and type: Isolated low *Corymbia hamersleyana* and *C. candida* subsp. *dipsodes* trees over tall open *Acacia bivenosa*, *A. pyrifolia* var. *pyrifolia* and *Prosopis glandulosa* x *velutina* shrubland over low *Triodia wiseana* and **Cenchrus ciliaris* grassland.

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	45.0	00.40		
Acacia bivenosa	12.0	04.00		
Cenchrus ciliaris	05.0	00.30	*	
Prosopis glandulosa x *velutina*	02.0	04.00	*	
Corymbia hamersleyana	01.0	05.00		
Acacia pyrifolia var. *pyrifolia*	01.0	03.00		
Senna glutinosa subsp. *glutinosa*	01.0	01.00		
Solanum ?*horridum*	00.5	00.30		
Corymbia candida subsp. *dipsodes*	00.1	08.00		
Vachellia farnesiana	00.1	01.20	*	
Acacia inaequilatera	.1			
Acacia sclerosperma	.1			
Bonamia media	.1			
Dichrostachys spicata	.1			
Trichodesma zeylanicum var. *grandiflorum*	.1			

Ptilotus obovatus

Site details			
Site:	MSP202a	**Type:**	Quadrat (50 m x 50 m)
Date(s):	15 August 2018	**Permanent:**	Yes
Observer(s):	Laurinda Timmins	**Position:**	-21.304698, 116.110814 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	70	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	12	**Soil:**	rocks,
Grass cover (%):	60	**Rock type:**	basalt;
Herb cover (%):	0.1	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Isolated mid *Acacia ancistrocarpa*, *A. synchronicia* and *A. pyrifolia* var. *pyrifolia* shrubs over isolated low *Corchorus laniflorus*, *Indigofera monphylla* and *Senna ferraria* shrubs over mid *Triodia wiseana* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	60.0	00.60		
Acacia ancistrocarpa	02.0	01.50		
Corchorus laniflorus	02.0	00.50		
Indigofera monophylla	02.0	00.50		
Acacia pyrifolia var. *pyrifolia*	01.0	01.30		
Acacia synchronicia	01.0	01.30		
Senna ferraria	01.0	00.50		
Senna glutinosa subsp. *pruinosa*	01.0	00.50		
Acacia bivenosa	00.5	01.30		
Senna glutinosa subsp. *glutinosa*	00.5	00.60		
Tephrosia clementii	00.5	00.50		
Triumfetta clementii	00.5	00.20		
Pterocaulon ?sphacelatum	00.2	00.01		
Hibiscus coatesii	00.1	00.30		
Crotalaria medicaginea var. *neglecta*	00.1	00.25		
Bonamia pilbarensis	00.1	00.10		

Gomphrena cunninghamii	00.1	00.10

Site details			
Site:	MSP203	**Type:**	Quadrat (50 m x 50 m)
Date(s):	17 March 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.175523, 115.958665 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	90	**Topography:**	plain
Tree/shrub cover >2 m (%):	85	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	10	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Degraded, EPA (2016)	**Disturbance**	grazing – low, livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Tall closed *Prosopis glandulosa* x *velutina* shrubland over isolated low *Solanum lasiophyllum* shrubs over mid open *Triodia angusta* and **Cenchrus ciliaris* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Prosopis glandulosa x *velutina*	90.0	02.20	*	
Triodia angusta	06.0	00.60		
Cenchrus ciliaris	05.0	00.40	*	
Eucalyptus sp.	00.1	04.00		
Ptilotus exaltatus	00.1	00.30		
Solanum lasiophyllum	00.1	00.30		

Site details			
Site:	MSP206	**Type:**	Quadrat (50 m x 50 m)
Date(s):	16 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.265117, 115.941254 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	creek
Tree/shrub cover >2 m (%):	22	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	20	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	27	**Rock type:**	none
Herb cover (%):	0.1	**Fire age:**	not evident
Vegetation condition:	Good, EPA (2016)	**Disturbance**	evidence of feral animals, grazing – low, livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Isolated low *Eucalyptus victrix* trees over tall open *Melaleuca lasiandra*, *Acacia coriacea* subsp. *coriacea* and *A. pyrifolia* var. *pyrifolia* shrubland over low open *Triodia epactia*, *T.longiceps* and **Cenchrus ciliaris* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Cenchrus ciliaris	15.0	00.20	*	
Melaleuca lasiandra	10.0	02.50		
Triodia longiceps	10.0	00.40		
Eucalyptus victrix	05.0	08.00		
Acacia bivenosa	05.0	02.00		
Acacia trachycarpa	05.0	01.50		
Acacia ligulata	03.0	01.80		
Acacia coriacea subsp. *coriacea*	02.0	04.00		
Acacia synchronicia	02.0	01.00		
Triodia epactia	02.0	00.40		
Acacia pyrifolia var. *pyrifolia*	00.1	02.50		
Acacia atkinsiana	00.1	01.50		
Petalostylis labicheoides	00.1	01.50		
Prosopis glandulosa x *velutina*	00.1	01.00	*	
Senna notabilis	00.1	00.30		

Solanum diversiflorum	00.1	00.25
Cleome viscosa	00.1	00.20
Solanum lasiophyllum	00.1	00.20
Goodenia muelleriana	00.1	00.15
Sida fibulifera	00.1	00.15
Goodenia forrestii	00.1	00.10
Hybanthus aurantiacus	00.1	00.10
Bonamia media	00.1	00.05
Ipomoea muelleri	00.1	00.05
Euphorbia australis	00.1	00.01

Site details			
Site:	MSP206a	**Type:**	Quadrat (50 m x 50 m)
Date(s):	18 August 2018	**Permanent:**	Yes
Observer(s):	Laurinda Timmins	**Position:**	-21.263371, 115.93208 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	30	**Topography:**	creek
Tree/shrub cover >2 m (%):	2	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	35	**Soil:**	gravel / alluvial, sandy clay, clay loam,
Grass cover (%):	2	**Rock type:**	ferrous – ironstone;
Herb cover (%):	0	**Fire age:**	>5 years
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	livestock tracks,
Land system:			
Vegetation description and type:	Mid *Acacia ampliceps* and *A. bivenosa* shrubland over isolated clumps of low *Frankenia ambita* shrubs over isolated clumps of low **Cenchrus ciliaris* and *Eriachne mucronata* grasses.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Acacia ampliceps	30.0	02.50		
Acacia bivenosa	05.0	01.80		
Eriachne mucronata	00.1	00.40		
Cenchrus ciliaris	00.1	00.30	*	
Frankenia ambita	00.1	00.30		
Melaleuca glomerata				

Site details			
Site:	MSP207	**Type:**	Quadrat (50 m x 50 m)
Date(s):	17 March 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.168955, 115.956321 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	80	**Topography:**	plain
Tree/shrub cover >2 m (%):	80	**Soil colour:**	red-brown
Shrub cover <2 m (%):	0	**Soil:**	sandy clay, sandy loam
Grass cover (%):	20	**Rock type:**	ferrous - ironstone
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Degraded, EPA (2016)	**Disturbance**	grazing – medium, livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Tall closed *Prosopis glandulosa* x *velutina* and **Vachellia farnesiana* shrubland over isolated mid *Acacia coriacea* subsp. ?*pendens* shrubs over low open **Cenchrus ciliaris* and *Triodia longiceps* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Prosopis glandulosa x *velutina*	75.0	03.50	*	
Cenchrus ciliaris	20.0	00.40	*	
Vachellia farnesiana	05.0	02.50	*	
Acacia coriacea subsp. ?*pendens*	01.0	01.50		
Triodia longiceps	01.0	00.40		

Site details			
Site:	MSP208	**Type:**	Quadrat (50 m x 50 m)
Date(s):	17 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.1801, 115.956279 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	45	**Topography:**	plain
Tree/shrub cover >2 m (%):	30	**Soil colour:**	brown,
Shrub cover <2 m (%):	10	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	15	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Poor, EPA (2016)	**Disturbance**	grazing – high, livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Tall *Acacia slcerosperma*, *A. bivenosa* and **Prosopis glandulosa* x *velutina* shrubland over mid open *Stylobasium spathulatum*, *Carissa lanceolata* and *Senna glutinosa* subsp. *pruinosa* shrubland over low open **Cenchrus ciliaris* and *Triodia angusta* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Acacia sclerosperma	20.0	05.00		
Stylobasium spathulatum	10.0	01.50		
Cenchrus ciliaris	10.0	00.30	*	
Acacia bivenosa	05.0	04.00		
Prosopis glandulosa x *velutina*	05.0	03.00	*	
Triodia angusta	05.0	00.40		
Acacia coriacea subsp. *coriacea*	01.0	02.00		
Carissa lanceolata	01.0	01.20		
Acacia pyrifolia ?var. *pyrifolia*	00.5	02.00		
Hakea lorea subsp. *lorea*	00.1	04.00		
Acacia glaucocaesia	00.1	03.50		P3 (DBCA list)
Acacia ligulata	00.1	02.50		
Vachellia farnesiana	00.1	02.50	*	
Senna glutinosa subsp. *pruinosa*	00.1	01.20		

Senna notabilis	00.1	00.60
Solanum lasiophyllum	00.1	00.25
Senna glutinosa subsp. *glutinosa*	00.1	00.20
Senna artemisioides subsp. *oligophylla*	00.1	00.15
Acacia sericophylla		

Site details			
Site:	MSP209	**Type:**	Quadrat (50 m x 50 m)
Date(s):	17 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.184751, 115.949797 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	15	**Topography:**	creek
Tree/shrub cover >2 m (%):	13	**Soil colour:**	brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy loam,
Grass cover (%):	2	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Degraded, EPA (2016)	**Disturbance**	erosion channels, evidence of feral animals, grazing – high, historic clearing, livestock tracks, vehicle tracks, weed infestation,
Land system:			
Vegetation description and type:	Mid *Melaleuca argentea* and *Phoenix dactylifera* woodland over isolated mid *Acacia coriacea* and *A. ampliceps* shrubs over isolated tall *Typha domingensis*, *Schoenoplectus subulatus* and *Cyperus vaginatus* sedges.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Phoenix dactylifera	09.0	20.00	*	
Melaleuca argentea	06.0	20.00		
Typha domingensis	01.0	01.50		
Acacia coriacea	01.0	01.40		
Schoenoplectus subulatus	01.0	01.20		
Acacia ampliceps	01.0	01.00		
Acacia bivenosa	01.0	00.80		
Cyperus vaginatus	00.5	01.00		
Prosopis glandulosa x *velutina*	00.1	00.80	*	
Cassytha aurea var. *aurea*	00.1	00.50		
Acacia synchronicia	00.1	00.40		
Stylobasium spathulatum	00.1	00.40		
Cenchrus ciliaris	00.1	00.10	*	

Site details			
Site:	MSP210	**Type:**	Quadrat (50 m x 50 m)
Date(s):	17 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.184999, 115.950619 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	65	**Topography:**	creek
Tree/shrub cover >2 m (%):	65	**Soil colour:**	brown,
Shrub cover <2 m (%):	1	**Soil:**	sandy loam,
Grass cover (%):	2	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Poor, EPA (2016)	**Disturbance**	erosion channels, evidence of feral animals, grazing – high, livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Mid *Melaleuca argentea* and *Sesbania formosa* woodland over tall open *Prosopis glandulosa* x *velutina* shrubland over isolated mid *Cyperus vaginatus* sedges.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Melaleuca argentea	45.0	20.00		
Prosopis glandulosa x *velutina*	35.0	04.00	*	
Sesbania formosa	20.0	20.00		
Cyperus vaginatus	02.0	01.20		
Acacia bivenosa	02.0	00.60		
Eucalyptus victrix	00.5	08.00		
Acacia ampliceps	00.1	02.20		
Acacia synchronicia	00.1	00.50		

Site details			
Site:	MSP211	**Type:**	Transect (3 m x 3 m)
Date(s):	17 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.22473, 115.922457 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	10	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	10	**Soil:**	sand,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	weed infestation,
Land system:			
Vegetation description and type:	Low open *Lawrencia viridigrisea*, *Sclerolaena costata* and *Tecticornia indica* subsp. *bidens* shrubland over isolated low **Cenchrus ciliaris* grasses.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia indica subsp. *bidens*	05.0	00.30		
Lawrencia viridigrisea	04.0	00.40		
Sclerolaena costata	01.0	00.15		
Cenchrus ciliaris	00.5	25.00	*	

Site details			
Site:	MSP212	**Type:**	Quadrat (50 m x 50 m)
Date(s):	17 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.223949, 115.933803 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	90	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	35	**Soil:**	sandy loam,
Grass cover (%):	90	**Rock type:**	ferrous – ironstone
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid *Acacia bivenosa*, *A. synchronicia* and *Myoporum montanum* shrubland over isolated low *Indigofera trita*, *Acacia ligulata* and *Solanum lasiophyllum* shrubs over mid closed *Triodia longiceps* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	90.0	00.70		
Acacia bivenosa	30.0	01.80		
Indigofera trita	02.0	00.50		
Acacia synchronicia	01.0	01.20		
Myoporum montanum	01.0	01.20		
Ehretia saligna	00.5	02.50		
Senna glutinosa subsp. *glutinosa*	00.1	01.60		
Acacia ligulata	00.1	01.00		
Senna artemisioides subsp. *oligophylla*	00.1	01.00		
Solanum lasiophyllum	00.1	00.45		
Sida fibulifera	00.1	00.30		
Rhynchosia minima	00.1	00.20		
Stemodia kingii	00.1	00.15		

Site details			
Site:	MSP213	**Type:**	Quadrat (50 m x 50 m)
Date(s):	17 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.214296, 115.937241 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	90	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	30	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	90	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	>5 years
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	weed infestation,
Land system:			
Vegetation description and type:	Mid *Acacia bivenosa*, *Myoporum montanum* and *Prosopis glandulosa* x *velutina* shrubland over isolated low *Eremophila forrestii* subsp. *forrestii*, *Euphorbia tannensis* and *Carissa lanceolata* shrubs over mid closed *Triodia longiceps* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	90.0	00.60		
Acacia bivenosa	28.0	01.60		
Myoporum montanum	02.0	01.30		
Eremophila forrestii subsp. *forrestii*	00.5	00.50		
Euphorbia tannensis subsp. *eremophila*	00.5	00.40		
Prosopis glandulosa x *velutina*	00.1	02.20	*	
Capparis lasiantha	00.1	01.20		
Carissa lanceolata	00.1	01.00		
Indigofera trita	00.1	00.50		
Solanum lasiophyllum	00.1	00.40		

Site details			
Site:	MSP214	**Type:**	Quadrat (50 m x 50 m)
Date(s):	18 March 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.321015, 115.810802 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	1	**Soil:**	sandy clay,
Grass cover (%):	50	**Rock type:**	ferrous – ironstone
Herb cover (%):	0	**Fire age:**	>5 years
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Isolated clumps of mid **Prosopis glandulosa* x *velutina* shrubs over isolated low *Atriplex* ?*codonocarpa*, *Sclerolaena bicornis* and *Sesbania cannabina* shrubs over mid *Triodia longiceps* and *T. epactia* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	50.0	00.90		
Prosopis glandulosa x *velutina*	00.5	01.50	*	
Sclerolaena bicornis	00.5	00.40		
Eragrostis xerophila	00.5	00.10		
Atriplex ?*codonocarpa*	00.5	00.05		
Cenchrus ciliaris	00.1	00.50	*	
Commelina ensifolia	00.1	00.40		
Enchylaena tomentosa	00.1	00.15		
Sesbania cannabina	00.1	00.15		
Dactyloctenium radulans	00.1	00.10		
Triodia epactia	00.1	00.10		
Ptilotus murrayi	00.1	00.02		

Site details			
Site:	MSP215	**Type:**	Quadrat (50 m x 50 m)
Date(s):	18 March 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.307191, 115.823007 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	creek
Tree/shrub cover >2 m (%):	50	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	2	**Soil:**	sand,
Grass cover (%):	15	**Rock type:**	ferrous – ironstone
Herb cover (%):	1	**Fire age:**	not evident
Vegetation condition:	Poor, EPA (2016)	**Disturbance**	grazing – medium, livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Low *Eucalyptus victrix* woodland over tall *Acacia ampliceps*, *Acacia coriacea* subsp. *pendens* and **Prosopis glandulosa* x *velutina* shrubland over low open **Cenchrus ciliaris*, *Triodia longiceps* and *T. wiseana* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus victrix	15.0	06.00		
Prosopis glandulosa x *velutina*	15.0	04.00	*	
Cenchrus ciliaris	13.0	00.30	*	
Acacia ampliceps	10.0	04.00		
Acacia coriacea subsp. *pendens*	05.0	05.00		
Triodia wiseana	03.0	00.40		
Sesbania cannabina	01.0	01.20		
Triodia longiceps	01.0	01.20		
Stemodia grossa	01.0	00.40		
Trianthema turgidifolium	00.5	00.30		
Acacia ampliceps x *bivenosa*	00.1	02.00		
Acacia synchronicia	00.1	02.00		
Acacia coriacea subsp. ?*pendens*	00.1	01.20		

Eragrostis tenellula	00.1	00.60
Pluchea rubelliflora	00.1	00.25
Enchylaena tomentosa	00.1	00.15
Eragrostis leptocarpa	00.1	00.15
Trianthema cusackianum	00.1	00.15
Goodenia forrestii	00.1	00.10
Indigofera linifolia	00.1	00.10
Ipomoea muelleri	00.1	00.10
Phyllanthus maderaspatensis	00.1	00.10
Trianthema triquetrum	00.1	00.10
Striga curviflora	00.1	00.08
Lotus australis	00.1	00.05
Portulaca oleracea	00.1	00.05
Corchorus tridens	00.1	00.03
Ipomoea coptica	00.1	00.02

Site details			
Site:	MSP216	**Type:**	Quadrat (50 m x 50 m)
Date(s):	18 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.300177, 115.833721 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	2	**Soil:**	sandy clay,
Grass cover (%):	40	**Rock type:**	ferrous – ironstone
Herb cover (%):	0	**Fire age:**	1 – 5 years
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Isolated clumps of mid **Prosopis glandulosa* x *velutina* shrubs over isolated low *Trianthema turgidifolia*, *Acacia synchronicia* and *Atriplex vesicaria* shrubs over low *Triodia longiceps* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	40.0	00.40		
Acacia synchronicia	01.0	00.40		
Trianthema turgidifolium	01.0	00.30		
Angianthus acrohyalinus	00.5	00.10		
Prosopis glandulosa x *velutina*	00.1	01.40	*	
Atriplex vesicaria	00.1	00.40		
Atriplex codonocarpa	00.1	00.30		
Enchylaena tomentosa	00.1	00.30		
Maireana tomentosa	00.1	00.25		
Pluchea rubelliflora	00.1	00.20		
Sclerolaena diacantha	00.1	00.20		
Cenchrus ciliaris	00.1	00.15	*	
Dactyloctenium radulans	00.1	00.10		
Gomphrena ?canescens	00.1	00.10		
Sporobolus australasicus	00.1	00.10		
Swainsona kingii	00.1	00.10		

Dysphania rhadinostachya subsp. *rhadinostachya*	00.1	00.05
Neptunia dimorphantha	00.1	00.05
Ptilotus murrayi	00.1	00.05
Streptoglossa ?*bubakii*	00.1	00.05
Streptoglossa liatroides	00.1	00.05
Swainsona sp.	00.1	00.05
Trianthema triquetrum	00.1	00.05
Ptilotus aervoides	00.1	00.02

Site details			
Site:	MSP217	**Type:**	Quadrat (50 m x 50 m)
Date(s):	18 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.303961, 115.842695 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	plain
Tree/shrub cover >2 m (%):	5	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	2	**Soil:**	sandy clay,
Grass cover (%):	50	**Rock type:**	ferrous – ironstone
Herb cover (%):	0	**Fire age:**	>5 years
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	weed infestation,
Land system:			
Vegetation description and type:	Isolated tall *Acacia synchronicia* and **Prosopis glandulosa* x *velutina* shrubs over isolated mid *Acacia ampliceps* and *A. ligulata* shrubs over mid *Triodia longiceps* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	50.0	00.80		
Acacia synchronicia	04.0	03.00		
Prosopis glandulosa x *velutina*	01.0	02.50	*	
Acacia ampliceps	01.0	01.50		
Atriplex codonocarpa	01.0	00.30		
Sclerolaena densiflora	01.0	00.20		
Chrysopogon fallax	00.5	01.00		
Sclerolaena diacantha	00.5	00.15		
Acacia ligulata	00.1	02.00		
Pterocaulon ?sphacelatum	00.1	00.50		
Maireana tomentosa	00.1	00.25		
Commelina ensifolia	00.1	00.15		
Dactyloctenium radulans	00.1	00.05		
Ptilotus murrayi	00.1	00.05		
Sporobolus australasicus				

Site details			
Site:	MSP218	**Type:**	Quadrat (50 m x 50 m)
Date(s):	18 March 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.297586, 115.847971 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	35	**Soil:**	clay loam,
Grass cover (%):	25	**Rock type:**	ferrous – ironstone
Herb cover (%):	1	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	grazing – low, livestock tracks,
Land system:			
Vegetation description and type:	Low *Tecticornia halocnemoides* subsp. *tenuis*, *T. halocnemoides* 'ovate seed aggregate' and *Trianthema turgidifolium* shrubland over low open *Sporobolus virginicus* grassland over isolated clumps of low *Streptoglossa* ?*adscendens* and *S. bubakii* forbs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia halocnemoides subsp. *tenuis*	35.0	00.20		
Sporobolus virginicus	25.0	00.15		
Pterocaulon sphacelatum	00.1	00.40		
Streptoglossa ?*adscendens*	00.1	00.30		
Vachellia farnesiana	00.1	00.30	*	
Neobassia astrocarpa	00.1	00.20		
Pluchea rubelliflora	00.1	00.20		
Trianthema cusackianum	00.1	00.20		
Trianthema turgidifolium	00.1	00.20		
Frankenia ambita	00.1	00.15		
Muellerolimon salicorniaceum	00.1	00.15		
Streptoglossa bubakii	00.1	00.15		
Tecticornia halocnemoides 'ovate seed aggregate'	00.1	00.15		
Surreya diandra	00.1	00.10		

Site details			
Site:	MSP219	**Type:**	Quadrat (50 m x 50 m)
Date(s):	18 March 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.306361, 115.862956 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	20	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	1	**Soil:**	clay loam,
Grass cover (%):	19	**Rock type:**	ferrous – ironstone
Herb cover (%):	0	**Fire age:**	1 – 5 years
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	grazing – low, livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Isolated mid *_Prosopis glandulos_ x _velutina_ shrubs over isolated low _Acacia synchronica_, _Trianthema turgidifolia_ and _Senna notabilis_ shrubs over low open _Triodia longiceps_ hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	19.0	00.25		
Prosopis glandulosa x *velutina*	01.0	01.50	*	
Trianthema turgidifolium	01.0	00.25		
Xerochloa laniflora	01.0	00.05		
Ptilotus exaltatus	00.5	00.15		
Dactyloctenium radulans	00.5	00.05		
Dichanthium sericeum subsp. *humilius*	00.5	00.05		
Ptilotus aervoides	00.5	00.05		
Sporobolus australasicus	00.5	00.05		
Acacia synchronicia	00.1	00.50		
Pterocaulon sphacelatum	00.1	00.30		
Cenchrus ciliaris	00.1	00.15	*	
Senna notabilis	00.1	00.15		
Streptoglossa odora	00.1	00.08		
Angianthus acrohyalinus	00.1	00.05		

Atriplex ?*codonocarpa*	00.1	00.05
Dysphania rhadinostachya subsp. *rhadinostachya*	00.1	00.05
Neptunia dimorphantha	00.1	00.05
Rhagodia eremaea		

Site details			
Site:	MSP220	**Type:**	Quadrat (50 m x 50 m)
Date(s):	18 March 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.313189, 115.873977 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	0	**Soil:**	clay loam,
Grass cover (%):	60	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	grazing – medium, livestock tracks, vehicle tracks, weed infestation,

Land system:

Vegetation description and type: Isolated mid **Prosopis glandulosa* x *velutina* shrubs over low *Eragrostis xerophila*, *Dactyloctenium radulans* and *Triodia longiceps* grassland over isolated low *Rhodanthe humboldtiana*, *Streptoglossa liatroides* and *Angianthus acrohyalinus* forbs.

Species	Cover (%)	Height (m)	Weed	Conservation status
Eragrostis xerophila	60.0	00.25		
Prosopis glandulosa x *velutina*	01.0	01.50	*	
Triodia longiceps	01.0	00.30		
Rhodanthe humboldtiana	00.5	00.10		
Acacia synchronicia	00.1	00.20		
Eriachne ?helmsii	00.1	00.15		
Indigofera linifolia	00.0	00.15		
Sclerolaena bicornis	00.0	00.15		
Angianthus acrohyalinus	00.0	00.10		
Heliotropium inexplicitum	00.0	00.10		
Ptilotus gomphrenoides	00.0	00.10		
Streptoglossa ?odora	00.0	00.10		
Dactyloctenium radulans	00.0	00.05		
Streptoglossa liatroides	00.0	00.05		

Site details			
Site:	MSP221	**Type:**	Quadrat (50 m x 50 m)
Date(s):	18 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.23371, 115.947714 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	90	**Topography:**	plain
Tree/shrub cover >2 m (%):	15	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	1	**Soil:**	clay loam,
Grass cover (%):	90	**Rock type:**	ferrous – ironstone
Herb cover (%):	0	**Fire age:**	>5 years
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	weed infestation,
Land system:			
Vegetation description and type:	Tall open *Acacia bivenosa* , *A. xiphophylla* and *Prosopis glandulosa* x *velutina*shrubland over isolated low *Indigofera trita*, *Scaevola spinescens* and *Eremophila forrestii* subsp. *forresti* shrubs over mid closed *Triodia longiceps* and *T. epactia* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	80.0	00.60		
Acacia bivenosa	13.0	02.20		
Triodia epactia	10.0	00.60		
Acacia xiphophylla	02.0	02.50		
Prosopis glandulosa x *velutina*	01.0	01.30	*	
Eremophila forrestii subsp. *forrestii*	01.0	00.60		
Indigofera trita	01.0	00.50		
Scaevola spinescens	01.0	00.50		
Solanum lasiophyllum	00.5	00.40		
Vachellia farnesiana	00.1	01.50	*	
Eremophila forrestii subsp. *forrestii*	00.1	00.60		
Senna glutinosa subsp. ?x *lueissenii*	00.1	00.60		
Cucumis variabilis	00.1	00.30		
Goodenia forrestii	00.1	00.30		
Hibiscus sturtii	00.1	00.30		

Solanum cleistogamum	00.1	00.30
Rhynchosia minima	00.1	00.20
Sclerolaena costata	00.1	00.10
Bonamia pilbarensis	00.0	00.05

Site details			
Site:	MSP224	**Type:**	Quadrat (50 m x 50 m)
Date(s):	16 August 2018	**Permanent:**	Yes
Observer(s):	Laurinda Timmins	**Position:**	-21.319796, 115.80624 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	creek
Tree/shrub cover >2 m (%):	10	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	10	**Soil:**	clay loam,
Grass cover (%):	40	**Rock type:**	ferrous – ironstone;
Herb cover (%):	5	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	grazing – high, historic operations, livestock tracks, weed infestation,

Land system:

Vegetation description and type: Low *Eucalyptus victrix* woodland over tall open *Acacia coriacea* subsp. *pendens* shrubland over low *Eragrostis brownii*, *Eulalia aurea* and *Triodia wiseana* grassland.

Species	Cover (%)	Height (m)	Weed	Conservation status
Eragrostis brownii	40.0	00.40		
Eucalyptus victrix	10.0	06.00		
Acacia coriacea subsp. *pendens*	10.0	04.00		
Triodia wiseana	05.0	00.80		
Eulalia aurea	05.0	00.50		
Prosopis glandulosa x *velutina*	03.0	00.80	*	
Trianthema turgidifolium	02.0	00.15		
Marsilea hirsuta	02.0	00.05		
Diplachne fusca subsp. *fusca*	01.0	00.60		
Cenchrus ciliaris	01.0	00.30	*	
Pluchea rubelliflora	01.0	00.10		
Acacia tetragonophylla	00.1	02.50		
Acacia synchronicia	00.1	01.50		
Acacia bivenosa	00.1	00.40		
Maireana tomentosa subsp. *tomentosa*	00.1	00.40		

Sida ?*arenicola*	00.1	00.40	
Solanum cleistogamum	00.1	00.40	
Solanum lasiophyllum	00.1	00.40	
Alternanthera nodiflora	00.1	00.15	
Goodenia nuda	00.1	00.15	P4 (DBCA list)
Hybanthus aurantiacus	00.1	00.10	
Centipeda minima subsp. *macrocephala*	00.1	00.05	
Eragrostis tenellula	00.1	00.05	
Evolvulus alsinoides var. *villosicalyx*	00.1	00.05	
Pterocaulon ?*sphacelatum*	00.1	00.05	
Ptilotus murrayi	00.1	00.03	
Commelina ensifolia			

Site details			
Site:	MSP225	**Type:**	Quadrat (50 m x 50 m)
Date(s):	16 August 2018	**Permanent:**	Yes
Observer(s):	Laurinda Timmins	**Position:**	-21.302819, 115.856384 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	plain
Tree/shrub cover >2 m (%):	1	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	40	**Soil:**	clay,
Grass cover (%):	3	**Rock type:**	none
Herb cover (%):	1	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	grazing – medium, weed infestation,
Land system:			
Vegetation description and type:	Isolated mid *Acacia ampliceps* and *Prosopis glandulosa* x *velutina* shrubs over low *Trianthema turgidifloium*, *Frankenia ambita* and *Neobassia astrocarpa* shrubland over isolated low *Sprobolus virginicus* and *Triodia longiceps* grasses.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Trianthema turgidifolium	15.0	00.20		
Neobassia astrocarpa	10.0	00.15		
Trianthema cusackianum	05.0	00.15		
Frankenia ambita	03.0	00.20		
Atriplex ?bunburyana	02.0	00.40		
Dissocarpus paradoxus	02.0	00.15		
Sporobolus virginicus	02.0	00.15		
Prosopis glandulosa x *velutina*	01.0	01.50	*	
Acacia ampliceps	01.0	01.20		
Triodia longiceps	01.0	00.50		
Pluchea rubelliflora	00.5	00.15		

Site details			
Site:	MSP226	**Type:**	Quadrat (50 m x 50 m)
Date(s):	17 August 2018	**Permanent:**	Yes
Observer(s):	Laurinda Timmins	**Position:**	-21.30326, 115.915629 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	creek
Tree/shrub cover >2 m (%):	20	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	10	**Soil:**	gravel / alluvial, clay loam, clay,
Grass cover (%):	15	**Rock type:**	ferrous – ironstone;
Herb cover (%):	2	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	grazing – low, weed infestation
Land system:			
Vegetation description and type:	Tall open *Acacia citrinoviridis*, *A. coriacea* subsp. *pendens* and *Erythrina vespertilio* shrubland over sparse mid *Acacia xiphophylla* shrubland over low open **Cenchrus ciliaris*, *Triodia epactia* and *Eulalia aurea* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Acacia coriacea subsp. *pendens*	15.0	04.50		
Triodia epactia	15.0	00.80		
Acacia citrinoviridis	10.0	06.00		
Acacia xiphophylla	05.0	01.80		
Cenchrus ciliaris	05.0	00.40	*	
Eulalia aurea	03.0	00.50		
Scaevola spinescens	03.0	00.50		
Erythrina vespertilio	02.0	04.00		
Acacia sclerosperma	02.0	03.00		
Acacia tumida var. *pilbarensis*	01.0	01.80		
Acacia tetragonophylla	01.0	01.50		
Eriachne ?*helmsii*	01.0	00.30		
Senna glutinosa subsp. *glutinosa*	00.5	00.80		
Corymbia candida	00.1	01.50		
Ehretia saligna	00.1	01.50		
Acacia pyrifolia var. *pyrifolia*	00.1	01.20		

Senna notabilis	00.1	01.20	
Sesbania cannabina	00.1	00.80	
Trichodesma zeylanicum var. *grandiflorum*	00.1	00.60	
Abutilon lepidum	00.1	00.50	
Eremophila forrestii subsp. *forrestii*	00.1	00.50	
Solanum diversiflorum	00.1	00.50	
Triumfetta appendiculata	00.1	00.50	
Phyllanthus maderaspatensis	00.1	00.40	
Pterocaulon sphacelatum	00.1	00.40	
Streptoglossa ?bubakii	00.1	00.40	
Waltheria indica	00.1	00.40	
Duperreya commixta	00.1	00.30	
Solanum horridum	00.1	00.30	
Bonamia erecta	00.1	00.25	
Cucumis melo	00.1	00.20	
Malvastrum americanum	00.1	00.20	*
Rhynchosia minima	00.1	00.20	
Solanum lasiophyllum	00.1	00.20	
Alternanthera nana	00.1	00.15	
Euphorbia biconvexa	00.1	00.15	
Ipomoea muelleri	00.1	00.15	
Gomphrena canescens	00.1	00.10	
Goodenia muelleriana	00.1	00.10	
Operculina aequisepala	00.1	00.10	
Sporobolus virginicus	00.1	00.10	
Synaptantha tillaeacea var. *tillaeacea*	00.1	00.10	
Bonamia pilbarensis	00.1	00.05	
Dysphania rhadinostachya subsp. *rhadinostachya*	00.1	00.05	
Striga squamigera	00.0	00.15	
Indigofera boviperda subsp. *boviperda*			

Site details			
Site:	MSP228	**Type:**	Quadrat (50 m x 50 m)
Date(s):	18 August 2018	**Permanent:**	Yes
Observer(s):	Laurinda Timmins	**Position:**	-21.214807, 115.936144 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	drainage line
Tree/shrub cover >2 m (%):	1	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	40	**Soil:**	gravel / alluvial, clay loam, clay,
Grass cover (%):	10	**Rock type:**	quartz;
Herb cover (%):	1	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	grazing – low, livestock tracks,
Land system:			
Vegetation description and type:	Tall *Acacia sclerosperma* shrubland over mid open *Acacia bivenosa*, *A. ligulata* and *Senna glutinosa* subsp. *glutinosa* shrubland over low open **Cenchrus ciliaris*, *Sporobolus virginicus* and *Triodia longiceps* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Acacia sclerosperma	35.0	02.00		
Acacia bivenosa	10.0	01.20		
Sporobolus virginicus	10.0	00.15		
Triodia longiceps	03.0	00.60		
Scaevola spinescens	03.0	00.50		
Acacia ligulata	01.0	01.30		
Tecticornia sp. sterile 4	01.0	00.30		
Senna glutinosa subsp. *glutinosa*	00.5	01.20		
Frankenia ambita	00.5	00.30		
Tecticornia halocnemoides subsp. *tenuis*	00.5	00.30		
Tecticornia sp. sterile 6	00.5	00.30		
Cenchrus ciliaris	00.5	00.15	*	
Prosopis glandulosa x *velutina*	00.1	02.50	*	
Myoporum montanum	00.1	01.30		
Capparis spinosa	00.1	00.80		
Vachellia farnesiana	00.1	00.80	*	

Tecticornia indica subsp. *leiostachya*	00.1	00.50
Solanum lasiophyllum	00.1	00.40
Ptilotus exaltatus	00.1	00.15

Site details			
Site:	MSP230	**Type:**	Quadrat (50 m x 50 m)
Date(s):	18 August 2018	**Permanent:**	Yes
Observer(s):	Laurinda Timmins	**Position:**	-21.292601, 115.908046 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	drainage line
Tree/shrub cover >2 m (%):	10	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	20	**Soil:**	gravel / alluvial, sandy clay, loam, clay loam, clay,
Grass cover (%):	20	**Rock type:**	ferrous – ironstone;
Herb cover (%):	1	**Fire age:**	>5 years
Vegetation condition:	Good, EPA (2016)	**Disturbance**	grazing – low, livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Low open *Eucalyptus victrix* woodland over mid open *Acacia coriacea* subsp. *pendens*, *A bivenosa* and *Ehretia saligna* over sparse low *Triodia epactia* and **Cenchrus ciliaris* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus victrix	08.0	05.00		
Acacia bivenosa	05.0	01.00		
Triodia epactia	05.0	00.80		
Cenchrus ciliaris	03.0	00.40	*	
Acacia coriacea subsp. *pendens*	02.0	02.50		
Acacia ampliceps	02.0	01.80		
Ehretia saligna	02.0	01.80		
Acacia ampliceps x *bivenosa*	01.0	01.80		
Phyllanthus maderaspatensis	00.5	00.30		
Acacia pyrifolia var. *pyrifolia*	00.1	01.50		
Trichodesma zeylanicum var. *grandiflorum*	00.1	01.50		
Sesbania cannabina	00.1	01.30		
Prosopis glandulosa x *velutina*	00.1	00.80	*	
Scaevola spinescens	00.1	00.60		

Isotropis atropurpurea	00.1	00.50
Solanum lasiophyllum	00.1	00.50
Abutilon sp.	00.1	00.40
Hybanthus aurantiacus	00.1	00.40
Pterocaulon sphacelatum	00.1	00.40
Senna notabilis	00.1	00.40
Indigofera boviperda subsp. *boviperda*	00.1	00.30
Indigofera trita	00.1	00.30
Stemodia grossa	00.1	00.30
Alternanthera nodiflora	00.1	00.15
Eragrostis tenellula	00.1	00.15
Centipeda minima subsp. *macrocephala*	00.0	00.05

Site details			
Site:	MSP231	**Type:**	Quadrat (50 m x 50 m)
Date(s):	19 August 2018	**Permanent:**	Yes
Observer(s):	Laurinda Timmins	**Position:**	-21.300042, 115.8476 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	10	**Soil:**	clay loam, clay,
Grass cover (%):	50	**Rock type:**	none
Herb cover (%):	1	**Fire age:**	not evident
Vegetation condition:	Good, EPA (2016)	**Disturbance**	grazing – medium, livestock tracks, weed infestation,

Land system:

Vegetation description and type: Low sparse *Trianthema turgidifolia*, *Tecticornia* sp. sterile 1 and and *Tecticornia indica* subsp. *leiostachya* shrubland over low *Sporobolus virginicus*, **Cenchrus ciliaris* and *Dactyloctenium radulans* grassland over isolated low *Trianthema cusackianum* forbs.

Species	Cover (%)	Height (m)	Weed	Conservation status
Sporobolus virginicus	50.0	00.20		
Trianthema turgidifolium	05.0	00.30		
Tecticornia sp. sterile 1	03.0	00.30		
Trianthema cusackianum	02.0	00.15		
Triodia longiceps	00.5	00.50		
Tecticornia indica subsp. *leiostachya*	00.5	00.40		
Neobassia astrocarpa	00.1	00.15		
Pluchea rubelliflora	00.1	00.15		
Cenchrus ciliaris	00.1	00.05	*	
Dactyloctenium radulans	00.1	00.05		
Prosopis glandulosa x *velutina*	00.1		*	

Site details			
Site:	MSP232	**Type:**	Quadrat (50 m x 50 m)
Date(s):	21 August 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.222039, 115.872355 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	40	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low *Tecticornia auriculata*, *T. halocnemoides* subsp. *longispicata* and *T.* sp. sterile 6 chenopod shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia auriculata	20.0	00.60		
Tecticornia halocnemoides subsp. *longispicata*	10.0	00.25		
Tecticornia sp. sterile 6	10.0	00.25		
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	01.0	00.40		
Muellerolimon salicorniaceum	00.1	00.15		
Tecticornia indica subsp. *leiostachya*				

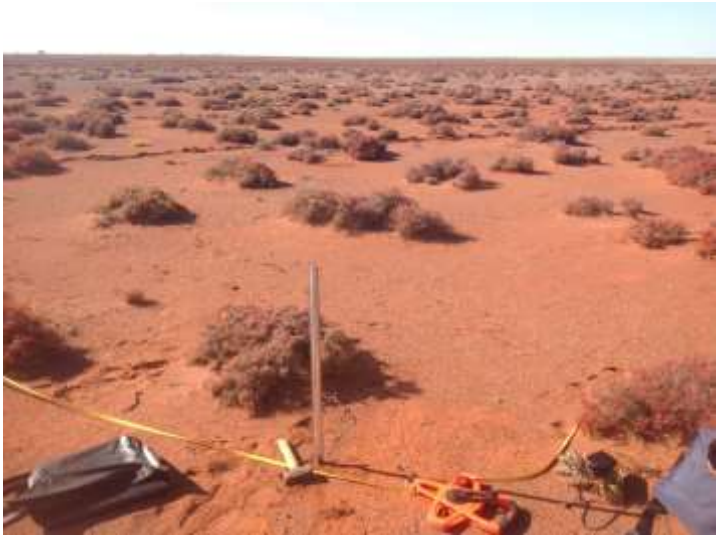
Site details			
Site:	MSP233	**Type:**	Quadrat (50 m x 50 m)
Date(s):	21 August 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-21.295897, 115.89651 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	plain
Tree/shrub cover >2 m (%):	2	**Soil colour:**	brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	60	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Tall isolated *Vachellia farnesiana* and *Prosopis glandulosa* x *velutina* shrubs over mid *Triodia longiceps* hummock grassland over isolated clumps of low *Schenkia coementii* forbs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	50.0	01.00		
Eriachne ?*helmsii*	10.0	00.30		
Vachellia farnesiana	01.0	02.00	*	
Prosopis glandulosa x *velutina*	01.0	01.80	*	
Eulalia aurea	01.0	00.50		
Schenkia clementii	00.1	00.05		

Site details			
Site:	MSP234	**Type:**	Quadrat (50 m x 50 m)
Date(s):	21 August 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-21.185946, 115.941446 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	plain
Tree/shrub cover >2 m (%):	25	**Soil colour:**	brown,
Shrub cover <2 m (%):	0	**Soil:**	sandy clay,
Grass cover (%):	55	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Good, EPA (2016)	**Disturbance**	grazing – medium, livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Tall open *Prosopis glandulosa* x *velutina* shrubland over mid *Triodia longiceps* grassland over low open **Cenchrus ciliaris* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia longiceps	45.0	00.70		
Prosopis glandulosa x *velutina*	25.0	02.00	*	
Cenchrus ciliaris	10.0	00.10	*	

Site details			
Site:	MSP236	**Type:**	Quadrat (50 m x 50 m)
Date(s):	22 August 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.299173, 115.804367 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	25	**Topography:**	sandy rise on mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	25	**Soil:**	sandy clay, clay loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	livestock tracks,
Land system:			
Vegetation description and type:	Low open *Tecticornia auriculata*, *T. halocnemoides* subsp. *tenuis* and *T.* sp. affinity to *T. halocnemoides* large ovate seed aggregate shrubland over isolated clumps of low *Eragrostis falcata* grasses over isolated clumps of low *Trianthema cussackianaum* forbs.		



Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia halocnemoides subsp. *tenuis*	10.0	00.30		
Tecticornia sp. affinity to *T. halocnemoides* large ovate seed aggregate	10.0	00.30		
Tecticornia auriculata	05.0	00.30		
Eragrostis falcata	00.5	00.40		
Frankenia ?*ambita*	00.5	00.20		
Trianthema turgidifolium	00.5	00.20		
Gomphrena canescens	00.1	00.20		
Sclerolaena costata	00.1	00.10		
Trianthema cusackianum	00.1	00.02		

Site details			
Site:	MSP237	**Type:**	Quadrat (50 m x 50 m)
Date(s):	23 August 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.07824, 115.93062 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	75	**Topography:**	sand dune
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	2	**Soil:**	sand,
Grass cover (%):	75	**Rock type:**	none
Herb cover (%):	1	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	litter, weed infestation,
Land system:			
Vegetation description and type:	Isolated mid *Adriana tomentosa* var. *tomentosa*, *Trichodesma zeylanicum* var. *zeylanicum* and *Rhagodia preissii* subsp. *obovata* shrubs over isolated low **Aerva javanica*, *Chorchorus walcottii* and *Indigofera linifolia* shrubs over mid closed *Triodia epactia* and *Whiteochloa airoides* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia epactia	45.0	00.60		
Whiteochloa airoides	30.0	00.70		
Adriana tomentosa var. *tomentosa*	01.0	01.50		
Aerva javanica	01.0	00.60	*	
Rhynchosia minima	00.5	00.50		
Euphorbia coghlanii	00.5	00.40		
Euphorbia drummondii	00.5	00.20		
Rhagodia preissii subsp. *obovata*	00.1	01.20		
Trichodesma zeylanicum var. zeylanicum	00.1	01.20		
Cassytha capillaris	00.1	00.50		
Corchorus walcottii	00.1	00.40		
Pterocaulon sphacelatum	00.1	00.40		
Cenchrus ciliaris	00.1	00.30	*	
Nicotiana occidentalis subsp. *occidentalis*	00.1	00.25		
Cleome viscosa	00.1	00.20		

Euphorbia tannensis subsp. *eremophila*	00.1	00.15
Indigofera linifolia	00.1	00.10
Swainsona kingii	00.1	00.10
Ptilotus villosiflorus	00.1	00.08
Dysphania plantaginella	00.1	00.06

Site details			
Site:	MSP238	**Type:**	Quadrat (unbounded)
Date(s):	23 August 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.077843, 115.931262 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	55	**Topography:**	sand dune
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown, whitish,
Shrub cover <2 m (%):	40	**Soil:**	sand,
Grass cover (%):	30	**Rock type:**	none
Herb cover (%):	1	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	litter, weed infestation,
Land system:			
Vegetation description and type:	Isolated low **Aerva javanica*, *Atriplex bunburyana* and *Rhagodia preissii* subsp. *obovata* shrubs over tall *Spinifex longifolius* grassland over low *Triodia epactia*, **Cenchrus ciliaris* and *Whiteochloa airoides* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Spinifex longifolius	40.0	01.20		
Triodia epactia	20.0	00.40		
Cenchrus ciliaris	10.0	00.30	*	
Whiteochloa airoides	01.0	00.50		
Euphorbia coghlanii	00.5	00.40		
Euphorbia drummondii	00.5	00.20		
Rhagodia preissii subsp. *obovata*	00.1	00.80		
Aerva javanica	00.1	00.50	*	
Rhynchosia minima	00.1	00.50		
Ipomoea sp.	00.1	00.40		
Threlkeldia diffusa	00.1	00.30		
Atriplex bunburyana	00.1	00.25		
Salsola australis	00.1	00.10		
Euphorbia australis	00.1	00.03		

Site details			
Site:	MSP86	**Type:**	Quadrat (50 m x 50 m)
Date(s):	19 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.263538, 115.84325 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	6	**Topography:**	tidal mudflat
Tree/shrub cover >2 m (%):	0	**Soil colour:**	brown,
Shrub cover <2 m (%):	6	**Soil:**	clay loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low sparse *Tecticornia halocnemoides* subsp. *longispicata*, *T. pterygosperma* subsp. *denticulata* and *T. indica* subsp. *leiostachya* chenopod shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia halocnemoides subsp. *longispicata*	05.0	00.20		
Tecticornia pterygosperma subsp. *denticulata*	01.0	00.10		
Tecticornia indica subsp. *leiostachya*	00.1	00.15		

Site details			
Site:	MSPAR01	**Type:**	Quadrat (50 m x 50 m)
Date(s):	19 March 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.16318, 115.971425 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	85	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	10	**Soil colour:**	red-orange
Shrub cover <2 m (%):	5	**Soil:**	clay loam
Grass cover (%):	80	**Rock type:**	ferrous - ironstone
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	livestock tracks, weed infestation,
Land system:			
Vegetation description and type:	Tall open *Grevillea pyramidalis*, *Hakea lorea* and *Prosopis glandulosa* x *velutina* shrubland over isolated mid *Acacia inaequilatera* and *Senna glutinosa* subsp. *glutinosa* shrubs over low closed *Triodia epactia* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia epactia	80.0	00.40		
Prosopis glandulosa x *velutina*	14.0	02.50	*	
Grevillea pyramidalis	05.0	03.50		
Hakea lorea subsp. *lorea*	01.0	02.60		
Acacia inaequilatera	01.0	01.20		
Cenchrus ciliaris	01.0	00.30	*	
Ptilotus helipteroides	01.0	00.10		
Bonamia pilbarensis	00.5	00.05		
Euphorbia tannensis subsp. *eremophila*	00.5	00.05		
Solanum lasiophyllum	00.2	00.50		
Vachellia farnesiana	00.1	01.60	*	
Acacia coriacea ?subsp. *coriacea*	00.1	01.50		
Senna glutinosa subsp. *glutinosa*	00.1	01.40		
Trichodesma zeylanicum var. *grandiflorum*	00.1	01.20		
Cucumis variabilis	00.1	00.50		
Acacia bivenosa	00.1	00.40		

Euphorbia boophthona	00.1	00.40
Indigofera trita	00.1	00.40
Triumfetta clementii	00.1	00.20
Sclerolaena costata	00.1	00.15

Site details			
Site:	MSPAR02	**Type:**	Quadrat (50 m x 50 m)
Date(s):	19 March 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-21.165022, 115.990125 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	85	**Topography:**	plain
Tree/shrub cover >2 m (%):	30	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	2	**Soil:**	clay loam,
Grass cover (%):	80	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Poor, EPA (2016)	**Disturbance**	grazing – low, historic clearing, livestock tracks, weed infestation,

Land system:

Vegetation description and type: Low open *Eucalyptus victrix* woodland over tall open *Acacia synchronicia* and *Prosopis glandulosa* x *velutina* shrubland over low closed *Eragrostis xerophila* tand **Cenchrus ciliaris* tussock grassland.

Species	Cover (%)	Height (m)	Weed	Conservation status
Eragrostis xerophila	60.0	00.35		
Cenchrus ciliaris	20.0	00.40	*	
Prosopis glandulosa x *velutina*	10.0	02.00	*	
Eucalyptus victrix	08.0	08.00		
Acacia synchronicia	02.0	04.00		

Site details			
Site:	MSPAR03	**Type:**	Quadrat (50 m x 50 m)
Date(s):	20 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.174371, 116.005114 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	25	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	20	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	5	**Soil:**	clay loam,
Grass cover (%):	2	**Rock type:**	alluvial
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Degraded, EPA (2016)	**Disturbance**	grazing – medium, livestock tracks, vehicle tracks, weed infestation,
Land system:			
Vegetation description and type:	Tall open *Prosopis glandulosa* x *velutina* and *Acacia xiphophylla* shrubland over isolated mid *Acacia glaucocaesia* shrubs over isolated low *Eragrostis xerophila*, **Cenchrus ciliaris* and *Triodia epactia* grasses.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Prosopis glandulosa x *velutina*	25.0	04.00	*	
Eragrostis xerophila	02.0	00.10		
Acacia xiphophylla	01.0	02.20		
Acacia glaucocaesia	01.0	01.80		P3 (DBCA list)
Acacia pyrifolia var. *pyrifolia*	01.0	00.50		
Triodia epactia	01.0	00.40		
Cenchrus ciliaris	01.0	00.25	*	
Sclerolaena costata	01.0	00.10		
Aristida contorta	01.0	00.05		
Scaevola spinescens	00.1	00.40		
Hakea lorea subsp. *lorea*	00.1	00.30		
Myoporum montanum	00.1	00.20		
Abutilon ?fraseri	00.1	00.15		
Senna artemisioides subsp. *oligophylla*	00.1	00.15		
Senna notabilis	00.1	00.15		

Ptilotus helipteroides	00.1	00.10
Ptilotus aervoides	00.1	00.03
Dactyloctenium radulans	00.1	00.02
Polymeria ambigua	00.1	00.02
Solanum lasiophyllum		

Site details			
Site:	MSPAR04	**Type:**	Quadrat (50 m x 50 m)
Date(s):	20 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.227094, 116.056743 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	85	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	clay loam,
Grass cover (%):	85	**Rock type:**	ferrous – ironstone
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Good, EPA (2016)	**Disturbance**	grazing – high, livestock tracks, weed infestation,

Land system:

Vegetation description and type: Low closed *Eragrostis xerophila* , **Cenchrus ciliaris* and *Enneapogon caerulescens* grassland over isolated low *Corchorus tridens*, *Rhynchosia minima* and *Euphorbia drummondii* forbs.

Species	Cover (%)	Height (m)	Weed	Conservation status
Eragrostis xerophila	80.0	00.30		
Cenchrus ciliaris	05.0	00.20	*	
Eriachne helmsii	01.0	00.15		
Corchorus tridens	01.0	00.05		
Enneapogon caerulescens	01.0	00.05		
Rhynchosia minima	00.1	00.20		
Sida sp. Excedentifolia (J.L. Egan 1925)	00.1	00.20		
Dichanthium sericeum subsp. *humilius*	00.1	00.15		
Euphorbia tannensis subsp. *eremophila*	00.1	00.15		
Haloragis gossei	00.1	00.10		
Maireana tomentosa subsp. *tomentosa*	00.1	00.10		
Sida sp. Pindan (B.G. Thomson 3398)	00.1	00.08		
Cenchrus setiger	00.1	00.05	*	
Sporobolus virginicus	00.1	00.05		
Euphorbia drummondii	00.1	00.01		

Site details			
Site:	MSPAR05	**Type:**	Quadrat (50 m x 50 m)
Date(s):	20 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.252919, 116.079994 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	85	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	1	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	20	**Soil:**	clay loam,
Grass cover (%):	80	**Rock type:**	ferrous – ironstone
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid open *Acacia bivenosa*, *A. ancistrocarpa* and *A. atkinsiana* shrubland over isolated low *A. pyrifolia* var. *pyrifolia*, *A. inaequilatera* and *Maireana georgei* shrubs over low closed *Triodia wiseana* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Triodia wiseana	80.0	00.45		
Acacia bivenosa	10.0	02.00		
Acacia atkinsiana	05.0	01.80		
Acacia ancistrocarpa	02.0	01.50		
Acacia synchronicia	01.0	01.20		
Maireana georgei	01.0	01.00		
Corymbia hamersleyana	00.1	02.50		
Acacia trachycarpa	00.1	01.80		
Amyema preissii	00.1	01.50		
Senna glutinosa subsp. *glutinosa*	00.1	01.30		
Acacia inaequilatera	00.1	00.80		
Senna glutinosa subsp. *glutinosa*	00.1	00.80		
Hakea lorea subsp. *lorea*	00.1	00.50		
Ptilotus exaltatus	00.1	00.50		
Acacia pyrifolia var. *pyrifolia*	00.1	00.40		
Euphorbia boophthona	00.1	00.40		

Heliotropium ovalifolium	00.1	00.40
Abutilon sp. Pilbara (W.R. Barker 2025)	00.1	00.15
Tephrosia clementii	00.1	00.15

Site details			
Site:	MSPAR06	**Type:**	Quadrat (50 m x 50 m)
Date(s):	20 March 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-21.268029, 116.090082 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	plain
Tree/shrub cover >2 m (%):	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	0	**Soil:**	clay loam,
Grass cover (%):	55	**Rock type:**	ferrous – ironstone
Herb cover (%):	7	**Fire age:**	not evident
Vegetation condition:	Good, EPA (2016)	**Disturbance**	firebreak, grazing – high, livestock tracks, vehicle tracks, weed infestation,

Land system:

Vegetation description and type: Isolated clumps of mid *Acacia xiphophylla* and *A. inaequilatera* shrubs over low *Eragrostis xerohpila*, **Cenchrus ciliaris* and *Triodia epactia* grassland over sparse low *Corchorus tridens*, *Ipomoea muelleri* and *Gomphrena kansii* forbland.

Species	Cover (%)	Height (m)	Weed	Conservation status
Eragrostis xerophila	58.0	00.30		
Corchorus tridens	04.0	00.08		
Ipomoea muelleri	03.0	00.05		
Cenchrus ciliaris	02.0	00.25	*	
Eriachne ?helmsii	01.0	00.20		
Sida fibulifera	01.0	00.10		
Enneapogon caerulescens	00.5	00.10		
Dactyloctenium radulans	00.5	00.05		
Acacia synchronicia	00.1	01.80		
Euphorbia tannensis subsp. *eremophila*	00.1	01.50		
Acacia inaequilatera	00.1	01.40		
Acacia xiphophylla	00.1	01.20		
Triodia epactia	00.1	00.45		
Acacia bivenosa	00.1	00.40		

Solanum phlomoides	00.1	00.40	
Trichodesma zeylanicum var. *grandiflorum*	00.1	00.40	
Stemodia kingii	00.1	00.30	
Abutilon malvifolium	00.1	00.20	
Alysicarpus muelleri	00.1	00.20	
Gomphrena kanisii	00.1	00.20	
Rhynchosia minima	00.1	00.20	
Sclerolaena bicornis	00.1	00.20	
Sclerolaena costata	00.1	00.20	
Senna notabilis	00.1	00.20	
Solanum lasiophyllum	00.1	00.20	
Vachellia farnesiana	00.1	00.20	*
Cleome viscosa	00.1	00.15	
Indigofera linifolia	00.1	00.15	
Phyllanthus maderaspatensis	00.1	00.15	
Ptilotus gomphrenoides	00.1	00.15	
Senna artemisioides subsp. *oligophylla*	00.1	00.15	
Sporobolus australasicus	00.1	00.15	
Boerhavia burbidgeana	00.1	00.10	
Crotalaria medicaginea var. *neglecta*	00.1	00.10	
Eragrostis tenellula	00.1	00.10	
Ipomoea pes-caprae subsp. *brasiliensis*	00.1	00.10	
Malvastrum americanum	00.1	00.10	*
Trianthema turgidifolium	00.1	00.10	
Ptilotus axillaris	00.1	00.07	
Ptilotus carinatus	00.1	00.05	
Ptilotus exaltatus	00.1	00.05	
Streptoglossa ?*odora*	00.1	00.05	
Euphorbia drummondii	00.1	00.01	
Boerhavia paludosa	00.1		
Gomphrena canescens			

Appendix 3 Flora species records from desktop review

Family (66)	Species (414)	EPBC (1)	DBCA (43)
Acanthaceae (1)	*Avicennia marina*		
Aizoaceae (6)	*Carpobrotus* sp. Thevenard Island (M. White 050)		P3
	Sesuvium portulacastrum		
	Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)		P2
	Trianthema triquetrum		
	Trianthema turgidifolium		
	Zaleya galericulata subsp. *galericulata*		
Amaranthaceae (25)	*Achyranthes aspera*		
	**Aerva javanica*		
	Alternanthera denticulata		
	Amaranthus cuspidifolius		
	Amaranthus induratus		
	Amaranthus mitchellii		
	Amaranthus undulatus		
	**Amaranthus viridis*		
	Gomphrena affinis		
	Gomphrena affinis subsp. *pilbarensis*		
	Gomphrena cunninghamii		
	Gomphrena pusilla		P2
	Ptilotus aervoides		
	Ptilotus auriculifolius		
	Ptilotus clementii		
	Ptilotus divaricatus		
	Ptilotus drummondii		
	Ptilotus gomphrenoides		
	Ptilotus helipteroides		
	Ptilotus latifolius		
	Ptilotus macrocephalus		
	Ptilotus murrayi		
	Ptilotus obovatus		
	Ptilotus villosiflorus		
	Surreya diandra		
Amaryllidaceae (1)	*Crinum flaccidum*		P2
Apocynaceae (3)	*Cynanchum floribundum*		
	Cynanchum viminale subsp. *australe*		
	Gymnanthera cunninghamii		P3
Araliaceae (1)	*Trachymene oleracea* subsp. *oleracea*		
Arecaceae (1)	**Washingtonia filifera*		
Asphodelaceae (1)	**Asphodelus fistulosus*		
Asteraceae (26)	**Arctotheca calendula*		
	Angianthus acrohyalinus		
	Angianthus cunninghamii		
	Angianthus milnei		
	Blumea tenella		
	Calotis multicaulis		

Family (66)	Species (414)	EPBC (1)	DBCA (43)
	Calotis plumulifera		
	**Conyza bonariensis*		
	**Flaveria trinervia*		
	Gnephosis arachnoidea		
	Helichrysum oligochaetum		P1
	Launaea sarmentosa		
	Myriocephalus nudus		P1
	Pentalepis trichodesmoides subsp. *trichodesmoides*		
	Pluchea dunlopii		
	Pterocaulon sphacelatum		
	Pterocaulon sphaeranthoides		
	Rhodanthe ascendens		P1
	Rhodanthe floribunda		
	Rhodanthe frenchii		P2
	**Sonchus oleraceus*		
	Streptoglossa adscendens		
	Streptoglossa bubakii		
	Streptoglossa decurrens		
	Streptoglossa liatroides		
	Streptoglossa odora		
Boraginaceae (9)	*Ehretia saligna*		
	Heliotropium cunninghamii		
	Heliotropium curassavicum		
	Heliotropium heteranthum		
	Heliotropium ovalifolium		
	Heliotropium pachyphyllum		
	Heliotropium tenuifolium		
	Trichodesma zeylanicum		
	Trichodesma zeylanicum var. *zeylanicum*		
Brassicaceae 2)	*Lepidium pedicellosum*		
	Lepidium platypetalum		
Capparaceae (3)	*Capparis spinosa*		
Capparaceae	*Capparis spinosa* subsp. *nummularia*		
Capparaceae	*Capparis umbonata*		
Caryophyllaceae (3)	*Polycarpaea holtzei*		
	Polycarpaea longiflora		
	**Polycarpon tetraphyllum*		
Casuarinaceae (1)	**Casuarina equisetifolia*		
Celastraceae (2)	*Stackhousia clementii*		P3
	Stackhousia umbellata		P3
Chenopodiaceae (26)	*Atriplex bunburyana*		
	Atriplex flabelliformis		P3
	Atriplex isatidea		
	Atriplex semilunaris		
	Dysphania rhadinostachya subsp. *rhadinostachya*		
	Enchylaena tomentosa		
	Enchylaena tomentosa var. *tomentosa*		

Family (66)	Species (414)	EPBC (1)	DBCA (43)
	Maireana tomentosa		
	Maireana tomentosa subsp. *tomentosa*		
	Neobassia astrocarpa		
	Rhagodia eremaea		
	Rhagodia latifolia		
	Rhagodia preissii		
	Rhagodia preissii subsp. *obovata*		
	Salsola australis		
	Sclerolaena diacantha		
	Sclerolaena glabra		
	Tecticornia auriculata		
	Tecticornia globulifera		P1
	Tecticornia halocnemoides		
	Tecticornia halocnemoides subsp. *longispicata*		
	Tecticornia halocnemoides subsp. *tenuis*		
	Tecticornia indica subsp. *bidens*		
	Tecticornia medusa		P3
	Tecticornia sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063)		P1
	Threlkeldia diffusa		
Cleomaceae (1)	*Cleome viscosa*		
Combretaceae (2)	*Terminalia circumalata*		
	Terminalia supranitifolia		P3
Convolvulaceae (13)	*Bonamia brevifolia*		P1
	Bonamia erecta		
	Cuscuta australis		
	Cuscuta victoriana		
	Evolvulus alsinoides var. *villosicalyx*		
	**Ipomoea cairica*		
	Ipomoea coptica		
	Ipomoea muelleri		
	Ipomoea pes-caprae		
	Ipomoea pes-caprae subsp. *brasiliensis*		
	Operculina aequisepala		
	Polymeria ambigua		
	Polymeria calycina		
Cucurbitaceae (6)	**Citrullus colocynthis*		
	**Citrullus lanatus*		
	Cucumis melo		
	Cucumis sp. Barrow Island (D.W. Goodall 1264)		P2
	Cucumis variabilis		
	Trichosanthes cucumerina		
Cyperaceae (13)	*Cyperus bulbosus*		
	Cyperus difformis		
	Cyperus iria		
	Cyperus pulchellus		
	Cyperus squarrosus		

Family (66)	Species (414)	EPBC (1)	DBCA (43)
	Cyperus vaginatus		
	Eleocharis atropurpurea		
	Eleocharis papillosa	VU	P3
	Fimbristylis dichotoma		
	Fimbristylis simulans		
	Isolepis marginata		
	Schoenoplectus laevis		
	Schoenoplectus subulatus		
Euphorbiaceae (13)	*Adriana tomentosa* var. *tomentosa*		
	Euphorbia australis		
	Euphorbia biconvexa		
	Euphorbia careyi		
	Euphorbia coghlanii		
	Euphorbia drummondii		
	Euphorbia myrtoides		
	Euphorbia sharkoensis		
	Euphorbia tannensis		
	Euphorbia tannensis subsp. *eremophila*		
	Euphorbia trigonosperma		
	Euphorbia vaccaria var. *vaccaria*		
	Adriana tomentosa		
Fabaceae (78)	*Acacia ampliceps*		
	Acacia ancistrocarpa		
	Acacia aneura		
	Acacia aptaneura		
	Acacia atkinsiana		
	Acacia bivenosa		
	Acacia citrinoviridis		
	Acacia coriacea		
	Acacia coriacea subsp. coriacea		
	Acacia glaucocaesia		
	Acacia ligulata		
	Acacia monticola		
	Acacia pyrifolia var. *morrisonii*		
	Acacia pyrifolia var. *pyrifolia*		
	Acacia sclerosperma		
	Acacia sclerosperma subsp. *sclerosperma*		
	Acacia startii		P3
	Acacia synchronicia		
	Acacia tenuissima		
	Acacia trachycarpa		
	Acacia trachycarpa x tumida var. *pilbarensis*		
	Acacia wanyu		
	Acacia xiphophylla		
	Alysicarpus muelleri		
	Cajanus cinereus		
	Cajanus pubescens		

Family (66)	Species (414)	EPBC (1)	DBCA (43)
	Canavalia rosea		
	Crotalaria cunninghamii		
	Crotalaria medicaginea		
	Cullen lachnostachys		
	Cullen pogonocarpum		
	Erythrina vespertilio		
	Gastrolobium polystachyum		
	Indigofera boviperda		
	Indigofera boviperda subsp. *boviperda*		
	Indigofera colutea		
	Indigofera linifolia		
	Indigofera linnaei		
	Indigofera monophylla		
	Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)		P3
	Indigofera trita		
	Isotropis atropurpurea		
	Lotus cruentus		
	Neptunia dimorphantha		
	**Parkinsonia aculeata (WoNS)*		
	**Prosopis glandulosa* x *velutina (WoNS)*		
	**Prosopis pallida (WoNS)*		
	**Prosopis ssp.*		
	Rhynchosia bungarensis		P4
	Rhynchosia minima		
	Senna artemisioides subsp. *oligophylla*		
	Senna glutinosa subsp. *glutinosa*		
	Senna glutinosa subsp. *pruinosa*		
	Senna glutinosa subsp. *x luerssenii*		
	Senna notabilis		
	**Senna occidentalis*		
	**Stylosanthes hamata*		
	Swainsona formosa		
	Swainsona kingii		
	Swainsona leeana		
	Swainsona pterostylis		
	Swainsona thompsoniana		P3
	**Tamarindus indica*		
	Tephrosia clementii		
	Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)		
	Tephrosia rosea var. Port Hedland (A.S. George 1114)		P1
	Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)		
	Tephrosia sp. Kennedy Range (J.S. Beard 4392)		P1
	Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		
	Tephrosia supina		
	Tephrosia uniovulata		
	Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)		
Frankeniaceae (1)	*Frankenia ambita*		

Family (66)	Species (414)	EPBC (1)	DBCA (43)
Galaxauraceae (1)	*Galaxaura rugosa*		
Gentianaceae (2)	**Centaurium erythraea*		
	Schenkia clementii		
Goodeniaceae (13)	*Goodenia forrestii*		
	Goodenia lamprosperma		
	Goodenia microptera		
	Goodenia muelleriana		
	Goodenia nuda		P4
	Goodenia pallida		P1
	Goodenia pascua		
	Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)		P3
	Goodenia stobbsiana		
	Lechenaultia subcymosa		
	Scaevola crassifolia		
	Scaevola cunninghamii		
	Scaevola spinescens		
Gyrostemonaceae (1)	*Codonocarpus cotinifolius*		
Halimedaceae (1)	*Halimeda discoidea*		
Hydrocharitaceae (1)	*Halophila spinulosa*		
Lamiaceae (2)	*Basilicum polystachyon*		
	Clerodendrum floribundum var. *floribundum*		
Lauraceae (3)	*Cassytha aurea*		
	Cassytha capillaris		
	Cassytha filiformis		
Loranthaceae (2)	*Lysiana casuarinae*		
	Lysiana subfalcata		
Lythraceae (2)	*Rotala diandra*		
	Rotala mexicana		
Malvaceae (30)	*Abutilon fraseri*		
	Abutilon lepidum		
	Abutilon macrum		
	Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)		
	Abutilon sp. Onslow (F. Smith s.n. 10/9/61)		P1
	Abutilon sp. Quobba (H. Demarz 3858)		P2
	Brachychiton acuminatus		
	Corchorus congener		P3
	Corchorus parviflorus		
	Corchorus trilocularis		
	Corchorus walcottii		
	Gossypium australe		
	Gossypium robinsonii		
	Hibiscus brachysiphonius		
	Hibiscus leptocladus		
	Hibiscus sturtii var. *grandiflorus*		
	**Malvastrum americanum*		
	Melhania oblongifolia		
	**Melochia pyramidata*		

Family (66)	Species (414)	EPBC (1)	DBCA (43)
	Seringia nephrosperma		
	Sida arsiniata		
	Sida clementii		
	Sida fibulifera		
	Sida rohlenae subsp. *rohlenae*		
	Sida sp. Supplejack Station (T.S. Henshall 2345)		
	Sida sp. verrucose glands (F.H. Mollemans 2423)		
	Triumfetta appendiculata		
	Triumfetta clementii		
	Triumfetta echinata		P3
	Waltheria indica		
Meliaceae (1)	*Owenia acidula*		P3
Molluginaceae (1)	*Trigastrotheca molluginea*		
Myrtaceae (7)	*Corymbia candida*		
	Corymbia candida subsp. candida		
	Corymbia candida subsp. *dipsodes*		
	Corymbia hamersleyana		
	Eucalyptus camaldulensis subsp. *obtusa*		
	Melaleuca bracteata		
	Melaleuca linophylla		
Nyctaginaceae (6)	*Boerhavia burbidgeana*		
	Boerhavia coccinea		
	Boerhavia gardneri		
	Boerhavia repleta		
	Boerhavia schomburgkiana		
	Commicarpus australis		
Oleaceae (1)	*Jasminum didymum* subsp. *lineare*		
Orobanchaceae (1)	*Striga curviflora*		
Oxalidaceae (1)	**Oxalis corniculata*		
Papaveraceae (1)	**Papaver somniferum*		
Passifloraceae (2)	**Passiflora foetida*		
	**Passiflora foetida* var. *hispida*		
Phrymaceae (1)	*Uvedalia linearis*		
Phyllanthaceae (1)	*Phyllanthus maderaspatensis*		
Plantaginaceae (1)	*Stemodia kingii*		
Plumbaginaceae (1)	*Muellerolimon salicorniaceum*		
Poaceae (54)	*Aristida contorta*		
	Aristida latifolia		
	Astrebla pectinata		
	Bothriochloa decipiens var. *cloncurrensis*		P1
	Bothriochloa ewartiana		
	**Cenchrus ciliaris*		
	**Cenchrus echinatus*		
	**Cenchrus setaceus*		
	**Cenchrus setiger*		
	**Chloris virgata*		
	Cymbopogon ambiguus		

Family (66)	Species (414)	EPBC (1)	DBCA (43)
	Cymbopogon obtectus		
	**Cynodon dactylon*		
	Dactyloctenium radulans		
	Elytrophorus spicatus		
	Enneapogon caerulescens		
	Enneapogon polyphyllus		
	Eragrostis eriopoda		
	**Eragrostis minor*		
	Eragrostis setifolia		
	Eragrostis surreyana		P3
	Eragrostis tenellula		
	Eragrostis xerophila		
	Eriachne benthamii		
	Eriachne flaccida		
	Eriachne pulchella subsp. *dominii*		
	Eriachne pulchella subsp. *pulchella*		
	Eulalia aurea		
	Iseilema vaginiflorum		
	Panicum laevinode		
	Paspalidium constrictum		
	Paspalidium tabulatum		
	Perotis rara		
	Phragmites karka		
	Setaria dielsii		
	Setaria surgens		
	**Setaria verticillata*		
	Sorghum plumosum		
	Sorghum timorense		
	Spinifex longifolius		
	Sporobolus australasicus		
	Sporobolus virginicus		
	Themeda avenacea		
	Tragus australianus		
	Triodia epactia		
	Triodia pungens		
	Triodia sp. Robe River (M.E. Trudgen et al. MET 12367)		P3
	Triodia wiseana		
	Triraphis mollis		
	Whiteochloa airoides		
	Whiteochloa cymbiformis		
	Xerochloa laniflora		
Polygalaceae (1)	*Polygala isingii*		
Polygonaceae (1)	*Rumex crystallinus*		P2
Portulacaceae (5)	*Calandrinia ptychosperma*		
	Portulaca conspicua		
	Portulaca intraterranea		
	Portulaca oleracea		

Family (66)	Species (414)	EPBC (1)	DBCA (43)
	**Portulaca pilosa*		
Proteaceae (3)	*Grevillea berryana*		
	Grevillea wickhamii subsp. *hispidula*		
	Hakea lorea subsp. *lorea*		
Restionaceae (1)	*Lepidobolus quadratus*		P3
Rhizophoraceae (2)	*Bruguiera exaristata*		
	Rhizophora stylosa		
Rhodomelaceae (1)	*Digenea simplex*		
Rubiaceae (2)	*Synaptantha tillaeacea*		
	Synaptantha tillaeacea var. *tillaeacea*		
Santalaceae (2)	*Santalum acuminatum*		
	Santalum lanceolatum		
Sapindaceae (2)	*Alectryon oleifolius*		
	Diplopeltis stuartii var. *stuartii*		
Scrophulariaceae (4)	*Eremophila forrestii* subsp. *forrestii*		
	Eremophila forrestii subsp. viridis		P3
	Eremophila longifolia		
	Myoporum montanum		
Solanaceae (13)	**Datura leichhardtii* subsp. *leichhardtii*		
	Nicotiana benthamiana		
	Nicotiana occidentalis		
	Nicotiana occidentalis subsp. *obliqua*		
	Nicotiana occidentalis subsp. *occidentalis*		
	Solanum albostellatum		P3
	Solanum cataphractum		P3
	Solanum cleistogamum		
	Solanum diversiflorum		
	Solanum gabrielae		
	Solanum horridum		
	Solanum lasiophyllum		
	**Solanum nigrum*		
Stylidiaceae (1)	*Stylidium weeliwolli*		P2
Tamaricaceae (1)	**Tamarix aphylla (WoNS)*		
Udoteaceae (1)	*Udotea argentea*		
Violaceae (1)	*Hybanthus aurantiacus*		
Zygophyllaceae (6)	*Tribulus cistoides*		
	Tribulus hirsutus		
	Tribulus occidentalis		
	Tribulus platypterus		
	Tribulus suberosus		
	**Tribulus terrestris*		

Appendix 4 Flora species inventory

Family	Species	Status
Acanthaceae	*Avicennia marina*	
Aizoaceae	*Trianthema cusackianum*	
Aizoaceae	*Trianthema triquetrum*	
Aizoaceae	*Trianthema turgidifolium*	
Amaranthaceae	**Aerva javanica*	Weed
Amaranthaceae	*Alternanthera nana*	
Amaranthaceae	*Alternanthera nodiflora*	
Amaranthaceae	*Amaranthus clementii*	
Amaranthaceae	*Gomphrena ?canescens*	
Amaranthaceae	*Gomphrena canescens*	
Amaranthaceae	*Gomphrena cunninghamii*	
Amaranthaceae	*Gomphrena kanisii*	
Amaranthaceae	*Ptilotus aervoides*	
Amaranthaceae	*Ptilotus axillaris*	
Amaranthaceae	*Ptilotus carinatus*	
Amaranthaceae	*Ptilotus divaricatus*	
Amaranthaceae	*Ptilotus exaltatus*	
Amaranthaceae	*Ptilotus gomphrenoides*	
Amaranthaceae	*Ptilotus helipteroides*	
Amaranthaceae	*Ptilotus murrayi*	
Amaranthaceae	*Ptilotus obovatus*	
Amaranthaceae	*Ptilotus villosiflorus*	
Amaranthaceae	*Surreya diandra*	
Apocynaceae	*Carissa lanceolata*	
Arecaceae	**Phoenix dactylifera*	Weed
Asteraceae	*Angianthus acrohyalinus*	
Asteraceae	*Centipeda minima* subsp. *macrocephala*	
Asteraceae	*Minuria tridens*	(VU EPBC Act; P1 DBCA list)
Asteraceae	*Pluchea rubelliflora*	
Asteraceae	*Pterocaulon ?sphacelatum*	
Asteraceae	*Pterocaulon sphacelatum*	
Asteraceae	*Rhodanthe humboldtiana*	
Asteraceae	*Streptoglossa ?adscendens*	
Asteraceae	*Streptoglossa ?bubakii*	
Asteraceae	*Streptoglossa ?odora*	
Asteraceae	*Streptoglossa adscendens*	
Asteraceae	*Streptoglossa bubakii*	
Asteraceae	*Streptoglossa liatroides*	
Asteraceae	*Streptoglossa odora*	
Boraginaceae	*Ehretia saligna*	
Boraginaceae	*Heliotropium chrysocarpum*	
Boraginaceae	*Heliotropium cunninghamii*	
Boraginaceae	*Heliotropium inexplicitum*	
Boraginaceae	*Heliotropium ovalifolium*	
Boraginaceae	*Trichodesma zeylanicum*	

Boraginaceae	*Trichodesma zeylanicum* var. *grandiflorum*	
Boraginaceae	*Trichodesma zeylanicum* var. *zeylanicum*	
Capparaceae	*Capparis lasiantha*	
Capparaceae	*Capparis spinosa*	
Chenopodiaceae	*Atriplex* ?*bunburyana*	
Chenopodiaceae	*Atriplex* ?*codonocarpa*	
Chenopodiaceae	*Atriplex bunburyana*	
Chenopodiaceae	*Atriplex codonocarpa*	
Chenopodiaceae	*Atriplex vesicaria*	
Chenopodiaceae	*Dissocarpus paradoxus*	
Chenopodiaceae	*Dysphania kalpari*	
Chenopodiaceae	*Dysphania plantaginella*	
Chenopodiaceae	*Dysphania rhadinostachya* subsp. *rhadinostachya*	
Chenopodiaceae	*Enchylaena tomentosa*	
Chenopodiaceae	*Maireana georgei*	
Chenopodiaceae	*Maireana planifolia*	
Chenopodiaceae	*Maireana tomentosa*	
Chenopodiaceae	*Maireana tomentosa* subsp. *tomentosa*	
Chenopodiaceae	*Neobassia astrocarpa*	
Chenopodiaceae	*Rhagodia eremaea*	
Chenopodiaceae	*Rhagodia preissii* subsp. *obovata*	
Chenopodiaceae	*Salsola australis*	
Chenopodiaceae	*Sclerolaena bicornis*	
Chenopodiaceae	*Sclerolaena costata*	
Chenopodiaceae	*Sclerolaena densiflora*	
Chenopodiaceae	*Sclerolaena diacantha*	
Chenopodiaceae	*Suaeda arbusculoides*	
Chenopodiaceae	*Tecticornia auriculata*	
Chenopodiaceae	*Tecticornia halocnemoides* 'ovate seed aggregate'	
Chenopodiaceae	*Tecticornia halocnemoides* subsp. *longispicata*	
Chenopodiaceae	*Tecticornia halocnemoides* subsp. *tenuis*	
Chenopodiaceae	*Tecticornia indica* subsp. *bidens*	
Chenopodiaceae	*Tecticornia indica* subsp. *leiostachya*	
Chenopodiaceae	*Tecticornia pterygosperma* subsp. *denticulata*	
Chenopodiaceae	*Tecticornia* sp. (sterile 2)	
Chenopodiaceae	*Tecticornia* sp. affinity to *T. halocnemoides* large ovate seed aggregate	
Chenopodiaceae	*Tecticornia* sp. In early flower	
Chenopodiaceae	*Tecticornia* sp. sterile 1	
Chenopodiaceae	*Tecticornia* sp. sterile 3	
Chenopodiaceae	*Tecticornia* sp. sterile 4	
Chenopodiaceae	*Tecticornia* sp. sterile 6	
Chenopodiaceae	*Threlkeldia diffusa*	
Cleomaceae	*Cleome viscosa*	
Commelinaceae	*Commelina ensifolia*	
Convolvulaceae	*Bonamia erecta*	
Convolvulaceae	*Bonamia media*	

Convolvulaceae	*Bonamia pilbarensis*	
Convolvulaceae	*Duperreya commixta*	
Convolvulaceae	*Evolvulus alsinoides* var. *villosicalyx*	
Convolvulaceae	*Ipomoea coptica*	
Convolvulaceae	*Ipomoea muelleri*	
Convolvulaceae	*Ipomoea pes-caprae* subsp. *brasiliensis*	
Convolvulaceae	*Ipomoea* sp.	
Convolvulaceae	*Operculina aequisepala*	
Convolvulaceae	*Polymeria ambigua*	
Cucurbitaceae	*Cucumis melo*	
Cucurbitaceae	*Cucumis variabilis*	
Cyperaceae	*Cyperus vaginatus*	
Cyperaceae	*Schoenoplectus subulatus*	
Euphorbiaceae	*Adriana tomentosa* var. *tomentosa*	
Euphorbiaceae	*Euphorbia australis*	
Euphorbiaceae	*Euphorbia biconvexa*	
Euphorbiaceae	*Euphorbia boophthona*	
Euphorbiaceae	*Euphorbia coghlanii*	
Euphorbiaceae	*Euphorbia drummondii*	
Euphorbiaceae	*Euphorbia tannensis* subsp. *eremophila*	
Fabaceae	**Prosopis glandulosa* x *velutina*	Weed (WoNS)
Fabaceae	**Prosopis pallida*	Weed (WoNS)
Fabaceae	**Vachellia farnesiana*	Weed
Fabaceae	*Acacia ampliceps*	
Fabaceae	*Acacia ampliceps* x *bivenosa*	
Fabaceae	*Acacia ancistrocarpa*	
Fabaceae	*Acacia atkinsiana*	
Fabaceae	*Acacia bivenosa*	
Fabaceae	*Acacia citrinoviridis*	
Fabaceae	*Acacia coriacea*	
Fabaceae	*Acacia coriacea* subsp. ?*coriacea*	
Fabaceae	*Acacia coriacea* subsp. ?*pendens*	
Fabaceae	*Acacia coriacea* subsp. *coriacea*	
Fabaceae	*Acacia coriacea* subsp. *pendens*	
Fabaceae	*Acacia glaucocaesia*	
Fabaceae	*Acacia inaequilatera*	
Fabaceae	*Acacia ligulata*	
Fabaceae	*Acacia pyrifolia* ?var. *pyrifolia*	
Fabaceae	*Acacia pyrifolia* var. *pyrifolia*	
Fabaceae	*Acacia sclerosperma*	
Fabaceae	*Acacia sclerosperma* subsp. *sclerosperma*	
Fabaceae	*Acacia sericophylla*	
Fabaceae	*Acacia stellaticeps*	
Fabaceae	*Acacia synchronicia*	
Fabaceae	*Acacia tetragonophylla*	
Fabaceae	*Acacia trachycarpa*	
Fabaceae	*Acacia tumida* var. *pilbarensis*	

Fabaceae	*Acacia xiphophylla*	
Fabaceae	*Alysicarpus muelleri*	
Fabaceae	*Crotalaria medicaginea* var. *neglecta*	
Fabaceae	*Dichrostachys spicata*	
Fabaceae	*Erythrina vespertilio*	
Fabaceae	*Indigofera boviperda* subsp. *boviperda*	
Fabaceae	*Indigofera linifolia*	
Fabaceae	*Indigofera monophylla*	
Fabaceae	*Indigofera trita*	
Fabaceae	*Isotropis atropurpurea*	
Fabaceae	*Lotus australis*	
Fabaceae	*Neptunia dimorphantha*	
Fabaceae	*Petalostylis labicheoides*	
Fabaceae	*Rhynchosia minima*	
Fabaceae	*Senna artemisioides* subsp. *oligophylla*	
Fabaceae	*Senna ferraria*	
Fabaceae	*Senna glutinosa subsp. ?glutinosa*	
Fabaceae	*Senna glutinosa subsp. ?x lueissenii*	
Fabaceae	*Senna glutinosa subsp. glutinosa*	
Fabaceae	*Senna glutinosa subsp. pruinosa*	
Fabaceae	*Senna notabilis*	
Fabaceae	*Sesbania cannabina*	
Fabaceae	*Sesbania formosa*	
Fabaceae	*Swainsona kingii*	
Fabaceae	*Swainsona pterostylis*	
Fabaceae	*Swainsona* sp.	
Fabaceae	*Tephrosia clementii*	
Frankeniaceae	*Frankenia ?ambita*	
Frankeniaceae	*Frankenia ?pauciflora*	
Frankeniaceae	*Frankenia ambita*	
Gentianaceae	*Schenkia clementii*	
Goodeniaceae	*Goodenia ?armitiana*	
Goodeniaceae	*Goodenia forrestii*	
Goodeniaceae	*Goodenia muelleriana*	
Goodeniaceae	*Goodenia nuda*	P4 (DBCA list)
Goodeniaceae	*Scaevola acacioides*	
Goodeniaceae	*Scaevola cunninghamii*	
Goodeniaceae	*Scaevola spinescens*	
Haloragaceae	*Haloragis gossei*	
Lauraceae	*Cassytha aurea* var. *aurea*	
Lauraceae	*Cassytha capillaris*	
Loranthaceae	*Amyema preissii*	
Malvaceae	**Malvastrum americanum*	Weed
Malvaceae	*Abutilon ?fraseri*	
Malvaceae	*Abutilon lepidum*	
Malvaceae	*Abutilon malvifolium*	
Malvaceae	*Abutilon* sp.	

Malvaceae	*Abutilon* sp. Pilbara (W.R. Barker 2025)	
Malvaceae	*Corchorus laniflorus*	
Malvaceae	*Corchorus lasiocarpus*	
Malvaceae	*Corchorus tridens*	
Malvaceae	*Corchorus walcottii*	
Malvaceae	*Hibiscus coatesii*	
Malvaceae	*Hibiscus sturtii*	
Malvaceae	*Lawrencia viridigrisea*	
Malvaceae	*Sida* ?arenicola	
Malvaceae	*Sida* ?sp. Pilbara	
Malvaceae	*Sida fibulifera*	
Malvaceae	*Sida* sp. Excedentifolia (J.L. Egan 1925)	
Malvaceae	*Sida* sp. Pindan (B.G. Thomson 3398)	
Malvaceae	*Triumfetta appendiculata*	
Malvaceae	*Triumfetta clementii*	
Malvaceae	*Waltheria indica*	
Marsileaceae	*Marsilea hirsuta*	
Myrtaceae	*Corymbia candida*	
Myrtaceae	*Corymbia candida* subsp*. dipsodes*	
Myrtaceae	*Corymbia hamersleyana*	
Myrtaceae	*Eucalyptus* sp.	
Myrtaceae	*Eucalyptus victrix*	
Myrtaceae	*Melaleuca argentea*	
Myrtaceae	*Melaleuca globifera*	
Myrtaceae	*Melaleuca glomerata*	
Myrtaceae	*Melaleuca lasiandra*	
Nyctaginaceae	*Boerhavia burbidgeana*	
Nyctaginaceae	*Boerhavia paludosa*	
Orobanchaceae	*Striga curviflora*	
Orobanchaceae	*Striga squamigera*	
Phyllanthaceae	*Phyllanthus maderaspatensis*	
Plantaginaceae	*Stemodia grossa*	
Plantaginaceae	*Stemodia kingii*	
Plumbaginaceae	*Muellerolimon salicorniaceum*	
Poaceae	**Cenchrus ciliaris*	Weed
Poaceae	**Cenchrus setiger*	Weed
Poaceae	*Aristida* ?*holathera*	
Poaceae	*Aristida contorta*	
Poaceae	*Chrysopogon fallax*	
Poaceae	*Dactyloctenium radulans*	
Poaceae	*Dichanthium sericeum* subsp*. humilius*	
Poaceae	*Diplachne fusca* subsp*. fusca*	
Poaceae	*Enneapogon caerulescens*	
Poaceae	*Eragrostis brownii*	
Poaceae	*Eragrostis eriopoda*	
Poaceae	*Eragrostis falcata*	
Poaceae	*Eragrostis leptocarpa*	

Poaceae	*Eragrostis setifolia*	
Poaceae	*Eragrostis* sp.	
Poaceae	*Eragrostis tenellula*	
Poaceae	*Eragrostis xerophila*	
Poaceae	*Eriachne ?helmsii*	
Poaceae	*Eriachne helmsii*	
Poaceae	*Eriachne mucronata*	
Poaceae	*Eulalia aurea*	
Poaceae	*Spinifex longifolius*	
Poaceae	*Sporobolus actinocladus*	
Poaceae	*Sporobolus australasicus*	
Poaceae	*Sporobolus virginicus*	
Poaceae	*Triodia angusta*	
Poaceae	*Triodia epactia*	
Poaceae	*Triodia longiceps*	
Poaceae	*Triodia wiseana*	
Poaceae	*Whiteochloa ?airoides*	
Poaceae	*Whiteochloa airoides*	
Poaceae	*Xerochloa laniflora*	
Portulacaceae	*Portulaca oleracea*	
Proteaceae	*Grevillea pyramidalis*	
Proteaceae	*Grevillea wickhamii*	
Proteaceae	*Hakea chordophylla*	
Proteaceae	*Hakea lorea* subsp. *lorea*	
Rhizophoraceae	*Rhizophora stylosa*	
Rubiaceae	*Synaptantha tillaeacea* var. *tillaeacea*	
Sapindaceae	*Alectryon oleifolius* subsp. *oleifolius*	
Scrophulariaceae	*Eremophila forrestii* subsp. *forrestii*	
Scrophulariaceae	*Eremophila longifolia*	
Scrophulariaceae	*Myoporum montanum*	
Solanaceae	*Nicotiana occidentalis* subsp. *occidentalis*	
Solanaceae	*Solanum ?horridum*	
Solanaceae	*Solanum cleistogamum*	
Solanaceae	*Solanum diversiflorum*	
Solanaceae	*Solanum horridum*	
Solanaceae	*Solanum lasiophyllum*	
Solanaceae	*Solanum phlomoides*	
Surianaceae	*Stylobasium spathulatum*	
Typhaceae	*Typha domingensis*	
Violaceae	*Hybanthus aurantiacus*